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# MongoEngine Documentation

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**MongoEngine** is an Object-Document Mapper, written in Python for working with MongoDB. To install it, simply run

```
$ pip install -U mongoengine
```

**Tutorial** A quick tutorial building a tumblelog to get you up and running with MongoEngine.

**User Guide** The Full guide to MongoEngine — from modeling documents to storing files, from querying for data to firing signals and *everything* between.

**API Reference** The complete API documentation — the innards of documents, querysets and fields.

**Upgrading** How to upgrade MongoEngine.

**Django Support** Using MongoEngine and Django



# CHAPTER 1

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## Community

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To get help with using MongoEngine, use the [MongoEngine Users mailing list](#) or the ever popular [stackoverflow](#).



## CHAPTER 2

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### Contributing

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**Yes please!** We are always looking for contributions, additions and improvements.

The source is available on [GitHub](#) and contributions are always encouraged. Contributions can be as simple as minor tweaks to this documentation, the website or the core.

To contribute, fork the project on [GitHub](#) and send a pull request.



## CHAPTER 3

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### Changes

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See the *Changelog* for a full list of changes to MongoEngine and *Upgrading* for upgrade information.

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**Note:** Always read and test the [upgrade](#) documentation before putting updates live in production ;)

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Download the docs in [pdf](#) or [epub](#) formats for offline reading.

## 4.1 Tutorial

This tutorial introduces **MongoEngine** by means of example — we will walk through how to create a simple **Tumblelog** application. A Tumblelog is a type of blog where posts are not constrained to being conventional text-based posts. As well as text-based entries, users may post images, links, videos, etc. For simplicity's sake, we'll stick to text, image and link entries in our application. As the purpose of this tutorial is to introduce MongoEngine, we'll focus on the data-modelling side of the application, leaving out a user interface.

### 4.1.1 Getting started

Before we start, make sure that a copy of MongoDB is running in an accessible location — running it locally will be easier, but if that is not an option then it may be run on a remote server. If you haven't installed mongoengine, simply use pip to install it like so:

```
$ pip install mongoengine
```

Before we can start using MongoEngine, we need to tell it how to connect to our instance of **mongod**. For this we use the `connect()` function. If running locally the only argument we need to provide is the name of the MongoDB database to use:

```
from mongoengine import *  
  
connect('tumblelog')
```

There are lots of options for connecting to MongoDB, for more information about them see the [Connecting to MongoDB](#) guide.

### 4.1.2 Defining our documents

MongoDB is *schemaless*, which means that no schema is enforced by the database — we may add and remove fields however we want and MongoDB won't complain. This makes life a lot easier in many regards, especially when there is a change to the data model. However, defining schemata for our documents can help to iron out

bugs involving incorrect types or missing fields, and also allow us to define utility methods on our documents in the same way that traditional ORMs (Object-Relational Mappers) do.

In our Tumblelog application we need to store several different types of information. We will need to have a collection of **users**, so that we may link posts to an individual. We also need to store our different types of **posts** (eg: text, image and link) in the database. To aid navigation of our Tumblelog, posts may have **tags** associated with them, so that the list of posts shown to the user may be limited to posts that have been assigned a specific tag. Finally, it would be nice if **comments** could be added to posts. We'll start with **users**, as the other document models are slightly more involved.

### Users

Just as if we were using a relational database with an ORM, we need to define which fields a `User` may have, and what types of data they might store:

```
class User(Document):
    email = StringField(required=True)
    first_name = StringField(max_length=50)
    last_name = StringField(max_length=50)
```

This looks similar to how the structure of a table would be defined in a regular ORM. The key difference is that this schema will never be passed on to MongoDB — this will only be enforced at the application level, making future changes easy to manage. Also, the `User` documents will be stored in a MongoDB *collection* rather than a table.

### Posts, Comments and Tags

Now we'll think about how to store the rest of the information. If we were using a relational database, we would most likely have a table of **posts**, a table of **comments** and a table of **tags**. To associate the comments with individual posts, we would put a column in the comments table that contained a foreign key to the posts table. We'd also need a link table to provide the many-to-many relationship between posts and tags. Then we'd need to address the problem of storing the specialised post-types (text, image and link). There are several ways we can achieve this, but each of them have their problems — none of them stand out as particularly intuitive solutions.

### Posts

Happily mongoDB *isn't* a relational database, so we're not going to do it that way. As it turns out, we can use MongoDB's schemaless nature to provide us with a much nicer solution. We will store all of the posts in *one collection* and each post type will only store the fields it needs. If we later want to add video posts, we don't have to modify the collection at all, we just *start using* the new fields we need to support video posts. This fits with the Object-Oriented principle of *inheritance* nicely. We can think of `Post` as a base class, and `TextPost`, `ImagePost` and `LinkPost` as subclasses of `Post`. In fact, MongoEngine supports this kind of modelling out of the box — all you need do is turn on inheritance by setting `allow_inheritance` to `True` in the `meta`:

```
class Post(Document):
    title = StringField(max_length=120, required=True)
    author = ReferenceField(User)

    meta = {'allow_inheritance': True}

class TextPost(Post):
    content = StringField()

class ImagePost(Post):
    image_path = StringField()

class LinkPost(Post):
    link_url = StringField()
```

We are storing a reference to the author of the posts using a *ReferenceField* object. These are similar to foreign key fields in traditional ORMs, and are automatically translated into references when they are saved, and dereferenced when they are loaded.

## Tags

Now that we have our Post models figured out, how will we attach tags to them? MongoDB allows us to store lists of items natively, so rather than having a link table, we can just store a list of tags in each post. So, for both efficiency and simplicity's sake, we'll store the tags as strings directly within the post, rather than storing references to tags in a separate collection. Especially as tags are generally very short (often even shorter than a document's id), this denormalisation won't impact very strongly on the size of our database. So let's take a look at the code our modified Post class:

```
class Post (Document) :
    title = StringField(max_length=120, required=True)
    author = ReferenceField(User)
    tags = ListField(StringField(max_length=30))
```

The *ListField* object that is used to define a Post's tags takes a field object as its first argument — this means that you can have lists of any type of field (including lists).

---

**Note:** We don't need to modify the specialised post types as they all inherit from Post.

---

## Comments

A comment is typically associated with *one* post. In a relational database, to display a post with its comments, we would have to retrieve the post from the database, then query the database again for the comments associated with the post. This works, but there is no real reason to be storing the comments separately from their associated posts, other than to work around the relational model. Using MongoDB we can store the comments as a list of *embedded documents* directly on a post document. An embedded document should be treated no differently than a regular document; it just doesn't have its own collection in the database. Using MongoEngine, we can define the structure of embedded documents, along with utility methods, in exactly the same way we do with regular documents:

```
class Comment (EmbeddedDocument) :
    content = StringField()
    name = StringField(max_length=120)
```

We can then store a list of comment documents in our post document:

```
class Post (Document) :
    title = StringField(max_length=120, required=True)
    author = ReferenceField(User)
    tags = ListField(StringField(max_length=30))
    comments = ListField(EmbeddedDocumentField(Comment))
```

## Handling deletions of references

The *ReferenceField* object takes a keyword *reverse\_delete\_rule* for handling deletion rules if the reference is deleted. To delete all the posts if a user is deleted set the rule:

```
class Post (Document) :
    title = StringField(max_length=120, required=True)
    author = ReferenceField(User, reverse_delete_rule=CASCADE)
    tags = ListField(StringField(max_length=30))
    comments = ListField(EmbeddedDocumentField(Comment))
```

See *ReferenceField* for more information.

---

**Note:** MapFields and DictFields currently don't support automatic handling of deleted references

---

### 4.1.3 Adding data to our Tumblelog

Now that we've defined how our documents will be structured, let's start adding some documents to the database. Firstly, we'll need to create a User object:

```
ross = User(email='ross@example.com', first_name='Ross', last_name='Lawley').save()
```

---

**Note:** We could have also defined our user using attribute syntax:

```
ross = User(email='ross@example.com')
ross.first_name = 'Ross'
ross.last_name = 'Lawley'
ross.save()
```

---

Now that we've got our user in the database, let's add a couple of posts:

```
post1 = TextPost(title='Fun with MongoEngine', author=john)
post1.content = 'Took a look at MongoEngine today, looks pretty cool.'
post1.tags = ['mongodb', 'mongoengine']
post1.save()

post2 = LinkPost(title='MongoEngine Documentation', author=ross)
post2.link_url = 'http://docs.mongoengine.com/'
post2.tags = ['mongoengine']
post2.save()
```

---

**Note:** If you change a field on a object that has already been saved, then call `save()` again, the document will be updated.

---

### 4.1.4 Accessing our data

So now we've got a couple of posts in our database, how do we display them? Each document class (i.e. any class that inherits either directly or indirectly from *Document*) has an `objects` attribute, which is used to access the documents in the database collection associated with that class. So let's see how we can get our posts' titles:

```
for post in Post.objects:
    print post.title
```

#### Retrieving type-specific information

This will print the titles of our posts, one on each line. But What if we want to access the type-specific data (`link_url`, `content`, etc.)? One way is simply to use the `objects` attribute of a subclass of `Post`:

```
for post in TextPost.objects:
    print post.content
```

Using `TextPost`'s `objects` attribute only returns documents that were created using `TextPost`. Actually, there is a more general rule here: the `objects` attribute of any subclass of `Document` only looks for documents that were created using that subclass or one of its subclasses.

So how would we display all of our posts, showing only the information that corresponds to each post's specific type? There is a better way than just using each of the subclasses individually. When we used `Post`'s `objects` attribute earlier, the objects being returned weren't actually instances of `Post` — they were instances of the subclass of `Post` that matches the post's type. Let's look at how this works in practice:

```
for post in Post.objects:
    print post.title
    print '=' * len(post.title)

    if isinstance(post, TextPost):
        print post.content

    if isinstance(post, LinkPost):
        print 'Link:', post.link_url

print
```

This would print the title of each post, followed by the content if it was a text post, and “Link: <url>” if it was a link post.

### Searching our posts by tag

The `objects` attribute of a `Document` is actually a `QuerySet` object. This lazily queries the database only when you need the data. It may also be filtered to narrow down your query. Let's adjust our query so that only posts with the tag “mongodb” are returned:

```
for post in Post.objects(tags='mongodb'):
    print post.title
```

There are also methods available on `QuerySet` objects that allow different results to be returned, for example, calling `first()` on the `objects` attribute will return a single document, the first matched by the query you provide. Aggregation functions may also be used on `QuerySet` objects:

```
num_posts = Post.objects(tags='mongodb').count()
print 'Found %d posts with tag "mongodb"' % num_posts
```

### Learning more about mongoengine

If you got this far you've made a great start, so well done! The next step on your mongoengine journey is the [full user guide](#), where you can learn in depth about how to use mongoengine and mongoddb.

## 4.2 User Guide

### 4.2.1 Installing MongoEngine

To use MongoEngine, you will need to download [MongoDB](#) and ensure it is running in an accessible location. You will also need [PyMongo](#) to use MongoEngine, but if you install MongoEngine using `setuptools`, then the dependencies will be handled for you.

MongoEngine is available on PyPI, so to use it you can use `pip`:

```
$ pip install mongoengine
```

Alternatively, if you don't have `setuptools` installed, [download it from PyPi](#) and run

```
$ python setup.py install
```

To use the bleeding-edge version of MongoEngine, you can get the source from [GitHub](#) and install it as above:

```
$ git clone git://github.com/mongoengine/mongoengine
$ cd mongoengine
$ python setup.py install
```

### 4.2.2 Connecting to MongoDB

To connect to a running instance of `mongod`, use the `connect()` function. The first argument is the name of the database to connect to:

```
from mongoengine import connect
connect('project1')
```

By default, MongoEngine assumes that the `mongod` instance is running on `localhost` on port `27017`. If MongoDB is running elsewhere, you should provide the `host` and `port` arguments to `connect()`:

```
connect('project1', host='192.168.1.35', port=12345)
```

If the database requires authentication, `username` and `password` arguments should be provided:

```
connect('project1', username='webapp', password='pwd123')
```

URI style connections are also supported – just supply the URI as the `host` to `connect()`:

```
connect('project1', host='mongodb://localhost/database_name')
```

---

**Note:** Database, username and password from URI string overrides corresponding parameters in `connect()`:

```
connect (
    name='test',
    username='user',
    password='12345',
    host='mongodb://admin:qwerty@localhost/production'
)
```

will establish connection to `production` database using `admin` username and `qwerty` password.

---

### ReplicaSets

MongoEngine supports `MongoReplicaSetClient`. To use them, please use an URI style connection and provide the `replicaSet` name in the connection kwargs.

Read preferences are supported through the connection or via individual queries by passing the `read_preference`

```
Bar.objects().read_preference(ReadPreference.PRIMARY)
Bar.objects(read_preference=ReadPreference.PRIMARY)
```

### Multiple Databases

Multiple database support was added in MongoEngine 0.6. To use multiple databases you can use `connect()` and provide an `alias` name for the connection - if no `alias` is provided then “default” is used.

In the background this uses `register_connection()` to store the data and you can register all aliases up front if required.

Individual documents can also support multiple databases by providing a `db_alias` in their meta data. This allows DBRef objects to point across databases and collections. Below is an example schema, using 3 different databases to store data:

```
class User(Document):
    name = StringField()

    meta = {"db_alias": "user-db"}

class Book(Document):
    name = StringField()

    meta = {"db_alias": "book-db"}

class AuthorBooks(Document):
    author = ReferenceField(User)
    book = ReferenceField(Book)

    meta = {"db_alias": "users-books-db"}
```

## Context Managers

Sometimes you may want to switch the database or collection to query against for a class. For example, archiving older data into a separate database for performance reasons or writing functions that dynamically choose collections to write document to.

### Switch Database

The `switch_db` context manager allows you to change the database alias for a given class allowing quick and easy access the same User document across databases:

```
from mongoengine.context_managers import switch_db

class User(Document):
    name = StringField()

    meta = {"db_alias": "user-db"}

with switch_db(User, 'archive-user-db') as User:
    User(name="Ross").save() # Saves the 'archive-user-db'
```

### Switch Collection

The `switch_collection` context manager allows you to change the collection for a given class allowing quick and easy access the same Group document across collection:

```
from mongoengine.context_managers import switch_collection

class Group(Document):
    name = StringField()

Group(name="test").save() # Saves in the default db

with switch_collection(Group, 'group2000') as Group:
    Group(name="hello Group 2000 collection!").save() # Saves in group2000_
↪collection
```

---

**Note:** Make sure any aliases have been registered with `register_connection()` or `connect()` before using the context manager.

---

### 4.2.3 Defining documents

In MongoDB, a **document** is roughly equivalent to a **row** in an RDBMS. When working with relational databases, rows are stored in **tables**, which have a strict **schema** that the rows follow. MongoDB stores documents in **collections** rather than tables — the principal difference is that no schema is enforced at a database level.

#### Defining a document's schema

MongoEngine allows you to define schemata for documents as this helps to reduce coding errors, and allows for utility methods to be defined on fields which may be present.

To define a schema for a document, create a class that inherits from `Document`. Fields are specified by adding **field objects** as class attributes to the document class:

```
from mongoengine import *
import datetime

class Page(Document):
    title = StringField(max_length=200, required=True)
    date_modified = DateTimeField(default=datetime.datetime.now)
```

As BSON (the binary format for storing data in mongodb) is order dependent, documents are serialized based on their field order.

#### Dynamic document schemas

One of the benefits of MongoDB is dynamic schemas for a collection, whilst data should be planned and organised (after all explicit is better than implicit!) there are scenarios where having dynamic / expando style documents is desirable.

`DynamicDocument` documents work in the same way as `Document` but any data / attributes set to them will also be saved

```
from mongoengine import *

class Page(DynamicDocument):
    title = StringField(max_length=200, required=True)

# Create a new page and add tags
>>> page = Page(title='Using MongoEngine')
>>> page.tags = ['mongodb', 'mongoengine']
>>> page.save()

>>> Page.objects(tags='mongoengine').count()
>>> 1
```

---

**Note:** There is one caveat on Dynamic Documents: fields cannot start with `_`

---

Dynamic fields are stored in creation order *after* any declared fields.

## Fields

By default, fields are not required. To make a field mandatory, set the `required` keyword argument of a field to `True`. Fields also may have validation constraints available (such as `max_length` in the example above). Fields may also take default values, which will be used if a value is not provided. Default values may optionally be a callable, which will be called to retrieve the value (such as in the above example). The field types available are as follows:

- *BinaryField*
- *BooleanField*
- *ComplexDateTimeField*
- *DateTimeField*
- *DecimalField*
- *DictField*
- *DynamicField*
- *EmailField*
- *EmbeddedDocumentField*
- *FileField*
- *FloatField*
- *GenericEmbeddedDocumentField*
- *GenericReferenceField*
- *GeoPointField*
- *ImageField*
- *IntegerField*
- *ListField*
- *MapField*
- *ObjectIdField*
- *ReferenceField*
- *SequenceField*
- *SortedListField*
- *StringField*
- *URLField*
- *UUIDField*
- *PointField*
- *LineStringField*
- *PolygonField*
- *MultiPointField*
- *MultiLineStringField*
- *MultiPolygonField*

## Field arguments

Each field type can be customized by keyword arguments. The following keyword arguments can be set on all fields:

**db\_field (Default: None)** The MongoDB field name.

**required (Default: False)** If set to True and the field is not set on the document instance, a `ValidationError` will be raised when the document is validated.

**default (Default: None)** A value to use when no value is set for this field.

The definition of default parameters follow [the general rules on Python](#), which means that some care should be taken when dealing with default mutable objects (like in `ListField` or `DictField`):

```
class ExampleFirst(Document):
    # Default an empty list
    values = ListField(IntField(), default=list)

class ExampleSecond(Document):
    # Default a set of values
    values = ListField(IntField(), default=lambda: [1,2,3])

class ExampleDangerous(Document):
    # This can make an .append call to add values to the default (and all the_
    ↪following objects),
    # instead to just an object
    values = ListField(IntField(), default=[1,2,3])
```

---

**Note:** Unsetting a field with a default value will revert back to the default.

---

**unique (Default: False)** When True, no documents in the collection will have the same value for this field.

**unique\_with (Default: None)** A field name (or list of field names) that when taken together with this field, will not have two documents in the collection with the same value.

**primary\_key (Default: False)** When True, use this field as a primary key for the collection. `DictField` and `EmbeddedDocuments` both support being the primary key for a document.

---

**Note:** If set, this field is also accessible through the `pk` field.

---

**choices (Default: None)** An iterable (e.g. a list or tuple) of choices to which the value of this field should be limited.

Can be either be a nested tuples of value (stored in mongo) and a human readable key

```
SIZE = (('S', 'Small'),
        ('M', 'Medium'),
        ('L', 'Large'),
        ('XL', 'Extra Large'),
        ('XXL', 'Extra Extra Large'))

class Shirt(Document):
    size = StringField(max_length=3, choices=SIZE)
```

Or a flat iterable just containing values

```
SIZE = ('S', 'M', 'L', 'XL', 'XXL')
```

```
class Shirt(Document):
    size = StringField(max_length=3, choices=SIZE)
```

**\*\*kwargs (Optional)** You can supply additional metadata as arbitrary additional keyword arguments. You can not override existing attributes, however. Common choices include *help\_text* and *verbose\_name*, commonly used by form and widget libraries.

## List fields

MongoDB allows storing lists of items. To add a list of items to a *Document*, use the *ListField* field type. *ListField* takes another field object as its first argument, which specifies which type elements may be stored within the list:

```
class Page(Document):
    tags = ListField(StringField(max_length=50))
```

## Embedded documents

MongoDB has the ability to embed documents within other documents. Schemata may be defined for these embedded documents, just as they may be for regular documents. To create an embedded document, just define a document as usual, but inherit from *EmbeddedDocument* rather than *Document*:

```
class Comment(EmbeddedDocument):
    content = StringField()
```

To embed the document within another document, use the *EmbeddedDocumentField* field type, providing the embedded document class as the first argument:

```
class Page(Document):
    comments = ListField(EmbeddedDocumentField(Comment))

comment1 = Comment(content='Good work!')
comment2 = Comment(content='Nice article!')
page = Page(comments=[comment1, comment2])
```

## Dictionary Fields

Often, an embedded document may be used instead of a dictionary – generally this is recommended as dictionaries don't support validation or custom field types. However, sometimes you will not know the structure of what you want to store; in this situation a *DictField* is appropriate:

```
class SurveyResponse(Document):
    date = DateTimeField()
    user = ReferenceField(User)
    answers = DictField()

survey_response = SurveyResponse(date=datetime.now(), user=request.user)
response_form = ResponseForm(request.POST)
survey_response.answers = response_form.cleaned_data()
survey_response.save()
```

Dictionaries can store complex data, other dictionaries, lists, references to other objects, so are the most flexible field type available.

## Reference fields

References may be stored to other documents in the database using the *ReferenceField*. Pass in another document class as the first argument to the constructor, then simply assign document objects to the field:

```
class User(Document):
    name = StringField()

class Page(Document):
    content = StringField()
    author = ReferenceField(User)

john = User(name="John Smith")
john.save()

post = Page(content="Test Page")
post.author = john
post.save()
```

The *User* object is automatically turned into a reference behind the scenes, and dereferenced when the *Page* object is retrieved.

To add a *ReferenceField* that references the document being defined, use the string `'self'` in place of the document class as the argument to *ReferenceField*'s constructor. To reference a document that has not yet been defined, use the name of the undefined document as the constructor's argument:

```
class Employee(Document):
    name = StringField()
    boss = ReferenceField('self')
    profile_page = ReferenceField('ProfilePage')

class ProfilePage(Document):
    content = StringField()
```

## One to Many with ListFields

If you are implementing a one to many relationship via a list of references, then the references are stored as DBRefs and to query you need to pass an instance of the object to the query:

```
class User(Document):
    name = StringField()

class Page(Document):
    content = StringField()
    authors = ListField(ReferenceField(User))

bob = User(name="Bob Jones").save()
john = User(name="John Smith").save()

Page(content="Test Page", authors=[bob, john]).save()
Page(content="Another Page", authors=[john]).save()

# Find all pages Bob authored
Page.objects(authors__in=[bob])

# Find all pages that both Bob and John have authored
Page.objects(authors__all=[bob, john])

# Remove Bob from the authors for a page.
Page.objects(id='...').update_one(pull__authors=bob)
```

```
# Add John to the authors for a page.
Page.objects(id='...').update_one(push__authors=john)
```

## Dealing with deletion of referred documents

By default, MongoDB doesn't check the integrity of your data, so deleting documents that other documents still hold references to will lead to consistency issues. Mongoengine's `ReferenceField` adds some functionality to safeguard against these kinds of database integrity problems, providing each reference with a delete rule specification. A delete rule is specified by supplying the `reverse_delete_rule` attributes on the `ReferenceField` definition, like this:

```
class ProfilePage(Document):
    ...
    employee = ReferenceField('Employee', reverse_delete_rule=mongoengine.CASCADE)
```

The declaration in this example means that when an `Employee` object is removed, the `ProfilePage` that references that employee is removed as well. If a whole batch of employees is removed, all profile pages that are linked are removed as well.

Its value can take any of the following constants:

**`mongoengine.DO_NOTHING`** This is the default and won't do anything. Deletes are fast, but may cause database inconsistency or dangling references.

**`mongoengine.DENY`** Deletion is denied if there still exist references to the object being deleted.

**`mongoengine.NULLIFY`** Any object's fields still referring to the object being deleted are removed (using MongoDB's "unset" operation), effectively nullifying the relationship.

**`mongoengine.CASCADE`** Any object containing fields that are referring to the object being deleted are deleted first.

**`mongoengine.PULL`** Removes the reference to the object (using MongoDB's "pull" operation) from any object's fields of `ListField(ReferenceField)`.

**Warning:** A safety note on setting up these delete rules! Since the delete rules are not recorded on the database level by MongoDB itself, but instead at runtime, in-memory, by the MongoEngine module, it is of the utmost importance that the module that declares the relationship is loaded **BEFORE** the delete is invoked.

If, for example, the `Employee` object lives in the `payroll` app, and the `ProfilePage` in the `people` app, it is extremely important that the `people` app is loaded before any employee is removed, because otherwise, MongoEngine could never know this relationship exists.

In Django, be sure to put all apps that have such delete rule declarations in their `models.py` in the `INSTALLED_APPS` tuple.

**Warning:** Signals are not triggered when doing cascading updates / deletes - if this is required you must manually handle the update / delete.

## Generic reference fields

A second kind of reference field also exists, `GenericReferenceField`. This allows you to reference any kind of `Document`, and hence doesn't take a `Document` subclass as a constructor argument:

```
class Link(Document):
    url = StringField()
```

```
class Post(Document):
    title = StringField()

class Bookmark(Document):
    bookmark_object = GenericReferenceField()

link = Link(url='http://hmarr.com/mongoengine/')
link.save()

post = Post(title='Using MongoEngine')
post.save()

Bookmark(bookmark_object=link).save()
Bookmark(bookmark_object=post).save()
```

---

**Note:** Using *GenericReferenceFields* is slightly less efficient than the standard *ReferenceFields*, so if you will only be referencing one document type, prefer the standard *ReferenceField*.

---

### Uniqueness constraints

MongoEngine allows you to specify that a field should be unique across a collection by providing `unique=True` to a `Field`'s constructor. If you try to save a document that has the same value for a unique field as a document that is already in the database, a `NotUniqueError` will be raised. You may also specify multi-field uniqueness constraints by using `unique_with`, which may be either a single field name, or a list or tuple of field names:

```
class User(Document):
    username = StringField(unique=True)
    first_name = StringField()
    last_name = StringField(unique_with='first_name')
```

### Skipping Document validation on save

You can also skip the whole document validation process by setting `validate=False` when calling the `save()` method:

```
class Recipient(Document):
    name = StringField()
    email = EmailField()

recipient = Recipient(name='admin', email='root@localhost')
recipient.save() # will raise a ValidationError while
recipient.save(validate=False) # won't
```

### Document collections

Document classes that inherit **directly** from *Document* will have their own **collection** in the database. The name of the collection is by default the name of the class, converted to lowercase (so in the example above, the collection would be called *page*). If you need to change the name of the collection (e.g. to use MongoEngine with an existing database), then create a class dictionary attribute called `meta` on your document, and set `collection` to the name of the collection that you want your document class to use:

```
class Page(Document):
    title = StringField(max_length=200, required=True)
    meta = {'collection': 'cmsPage'}
```

## Capped collections

A *Document* may use a **Capped Collection** by specifying `max_documents` and `max_size` in the meta dictionary. `max_documents` is the maximum number of documents that is allowed to be stored in the collection, and `max_size` is the maximum size of the collection in bytes. `max_size` is rounded up to the next multiple of 256 by MongoDB internally and mongoengine before. Use also a multiple of 256 to avoid confusions. If `max_size` is not specified and `max_documents` is, `max_size` defaults to 10485760 bytes (10MB). The following example shows a `Log` document that will be limited to 1000 entries and 2MB of disk space:

```
class Log(Document):
    ip_address = StringField()
    meta = {'max_documents': 1000, 'max_size': 2000000}
```

## Indexes

You can specify indexes on collections to make querying faster. This is done by creating a list of index specifications called `indexes` in the meta dictionary, where an index specification may either be a single field name, a tuple containing multiple field names, or a dictionary containing a full index definition.

A direction may be specified on fields by prefixing the field name with a `+` (for ascending) or a `-` sign (for descending). Note that direction only matters on multi-field indexes. Text indexes may be specified by prefixing the field name with a `$`. Hashed indexes may be specified by prefixing the field name with a `#`:

```
class Page(Document):
    category = IntField()
    title = StringField()
    rating = StringField()
    created = DateTimeField()
    meta = {
        'indexes': [
            'title',
            '$title', # text index
            '#title', # hashed index
            ('title', '-rating'),
            ('category', '_cls'),
            {
                'fields': ['created'],
                'expireAfterSeconds': 3600
            }
        ]
    }
```

If a dictionary is passed then the following options are available:

**fields (Default: None)** The fields to index. Specified in the same format as described above.

**cls (Default: True)** If you have polymorphic models that inherit and have `allow_inheritance` turned on, you can configure whether the index should have the `_cls` field added automatically to the start of the index.

**sparse (Default: False)** Whether the index should be sparse.

**unique (Default: False)** Whether the index should be unique.

**expireAfterSeconds (Optional)** Allows you to automatically expire data from a collection by setting the time in seconds to expire the a field.

---

**Note:** Inheritance adds extra fields indices see: *Document inheritance*.

---

## Global index default options

There are a few top level defaults for all indexes that can be set:

```
class Page(Document):
    title = StringField()
    rating = StringField()
    meta = {
        'index_options': {},
        'index_background': True,
        'index_drop_dups': True,
        'index_cls': False
    }
```

**index\_options (Optional)** Set any default index options - see the [full options list](#)

**index\_background (Optional)** Set the default value for if an index should be indexed in the background

**index\_cls (Optional)** A way to turn off a specific index for `_cls`.

**index\_drop\_dups (Optional)** Set the default value for if an index should drop duplicates

---

**Note:** Since MongoDB 3.0 `drop_dups` is not supported anymore. Raises a Warning and has no effect

---

## Compound Indexes and Indexing sub documents

Compound indexes can be created by adding the Embedded field or dictionary field name to the index definition.

Sometimes its more efficient to index parts of Embedded / dictionary fields, in this case use 'dot' notation to identify the value to index eg: *rank.title*

## Geospatial indexes

The best geo index for mongodb is the new "2dsphere", which has an improved spherical model and provides better performance and more options when querying. The following fields will explicitly add a "2dsphere" index:

- *PointField*
- *LineStringField*
- *PolygonField*
- *MultiPointField*
- *MultiLineStringField*
- *MultiPolygonField*

As "2dsphere" indexes can be part of a compound index, you may not want the automatic index but would prefer a compound index. In this example we turn off auto indexing and explicitly declare a compound index on location and datetime:

```
class Log(Document):
    location = PointField(auto_index=False)
    datetime = DateTimeField()

    meta = {
        'indexes': [{"location", "2dsphere"}, ("datetime", 1)]
    }
```

## Pre MongoDB 2.4 Geo

**Note:** For MongoDB < 2.4 this is still current, however the new 2dsphere index is a big improvement over the previous 2D model - so upgrading is advised.

Geospatial indexes will be automatically created for all *GeoPointFields*

It is also possible to explicitly define geospatial indexes. This is useful if you need to define a geospatial index on a subfield of a *DictField* or a custom field that contains a point. To create a geospatial index you must prefix the field with the \* sign.

```
class Place(Document):
    location = DictField()
    meta = {
        'indexes': [
            '*location.point',
        ],
    }
```

## Time To Live indexes

A special index type that allows you to automatically expire data from a collection after a given period. See the official [ttl](#) documentation for more information. A common usecase might be session data:

```
class Session(Document):
    created = DateTimeField(default=datetime.now)
    meta = {
        'indexes': [
            {'fields': ['created'], 'expireAfterSeconds': 3600}
        ]
    }
```

**Warning:** TTL indexes happen on the MongoDB server and not in the application code, therefore no signals will be fired on document deletion. If you need signals to be fired on deletion, then you must handle the deletion of Documents in your application code.

## Comparing Indexes

Use `mongoengine.Document.compare_indexes()` to compare actual indexes in the database to those that your document definitions define. This is useful for maintenance purposes and ensuring you have the correct indexes for your schema.

## Ordering

A default ordering can be specified for your *QuerySet* using the `ordering` attribute of `meta`. Ordering will be applied when the *QuerySet* is created, and can be overridden by subsequent calls to `order_by()`.

```
from datetime import datetime

class BlogPost(Document):
    title = StringField()
    published_date = DateTimeField()

    meta = {
```

```
        'ordering': ['-published_date']
    }

    blog_post_1 = BlogPost(title="Blog Post #1")
    blog_post_1.published_date = datetime(2010, 1, 5, 0, 0, 0)

    blog_post_2 = BlogPost(title="Blog Post #2")
    blog_post_2.published_date = datetime(2010, 1, 6, 0, 0, 0)

    blog_post_3 = BlogPost(title="Blog Post #3")
    blog_post_3.published_date = datetime(2010, 1, 7, 0, 0, 0)

    blog_post_1.save()
    blog_post_2.save()
    blog_post_3.save()

    # get the "first" BlogPost using default ordering
    # from BlogPost.meta.ordering
    latest_post = BlogPost.objects.first()
    assert latest_post.title == "Blog Post #3"

    # override default ordering, order BlogPosts by "published_date"
    first_post = BlogPost.objects.order_by("+published_date").first()
    assert first_post.title == "Blog Post #1"
```

## Shard keys

If your collection is sharded, then you need to specify the shard key as a tuple, using the `shard_key` attribute of `meta`. This ensures that the shard key is sent with the query when calling the `save()` or `update()` method on an existing `Document` instance:

```
class LogEntry(Document):
    machine = StringField()
    app = StringField()
    timestamp = DateTimeField()
    data = StringField()

    meta = {
        'shard_key': ('machine', 'timestamp',)
    }
```

## Document inheritance

To create a specialised type of a `Document` you have defined, you may subclass it and add any extra fields or methods you may need. As this is new class is not a direct subclass of `Document`, it will not be stored in its own collection; it will use the same collection as its superclass uses. This allows for more convenient and efficient retrieval of related documents – all you need do is set `allow_inheritance` to `True` in the `meta` data for a document.:

```
# Stored in a collection named 'page'
class Page(Document):
    title = StringField(max_length=200, required=True)

    meta = {'allow_inheritance': True}

# Also stored in the collection named 'page'
class DatedPage(Page):
    date = DateTimeField()
```

---

**Note:** From 0.8 onwards `allow_inheritance` defaults to `False`, meaning you must set it to `True` to use inheritance.

---

## Working with existing data

As MongoEngine no longer defaults to needing `_cls`, you can quickly and easily get working with existing data. Just define the document to match the expected schema in your database

```
# Will work with data in an existing collection named 'cmsPage'
class Page(Document):
    title = StringField(max_length=200, required=True)
    meta = {
        'collection': 'cmsPage'
    }
```

If you have wildly varying schemas then using a *DynamicDocument* might be more appropriate, instead of defining all possible field types.

If you use *Document* and the database contains data that isn't defined then that data will be stored in the `document._data` dictionary.

## Abstract classes

If you want to add some extra functionality to a group of Document classes but you don't need or want the overhead of inheritance you can use the `abstract` attribute of `meta`. This won't turn on *Document inheritance* but will allow you to keep your code DRY:

```
class BaseDocument(Document):
    meta = {
        'abstract': True,
    }
    def check_permissions(self):
        ...

class User(BaseDocument):
    ...
```

Now the `User` class will have access to the inherited `check_permissions` method and won't store any of the extra `_cls` information.

### 4.2.4 Documents instances

To create a new document object, create an instance of the relevant document class, providing values for its fields as constructor keyword arguments. You may provide values for any of the fields on the document:

```
>>> page = Page(title="Test Page")
>>> page.title
'Test Page'
```

You may also assign values to the document's fields using standard object attribute syntax:

```
>>> page.title = "Example Page"
>>> page.title
'Example Page'
```

### Saving and deleting documents

MongoEngine tracks changes to documents to provide efficient saving. To save the document to the database, call the `save()` method. If the document does not exist in the database, it will be created. If it does already exist, then any changes will be updated atomically. For example:

```
>>> page = Page(title="Test Page")
>>> page.save() # Performs an insert
>>> page.title = "My Page"
>>> page.save() # Performs an atomic set on the title field.
```

---

**Note:** Changes to documents are tracked and on the whole perform `set` operations.

- `list_field.push(0)` — *sets* the resulting list
- `del(list_field)` — *unsets* whole list

With lists its preferable to use `Doc.update(push__list_field=0)` as this stops the whole list being updated — stopping any race conditions.

---

**See also:**

*Atomic updates*

### Pre save data validation and cleaning

MongoEngine allows you to create custom cleaning rules for your documents when calling `save()`. By providing a custom `clean()` method you can do any pre validation / data cleaning.

This might be useful if you want to ensure a default value based on other document values for example:

```
class Essay(Document):
    status = StringField(choices=('Published', 'Draft'), required=True)
    pub_date = DateTimeField()

    def clean(self):
        """Ensures that only published essays have a `pub_date` and
        automatically sets the pub_date if published and not set"""
        if self.status == 'Draft' and self.pub_date is not None:
            msg = 'Draft entries should not have a publication date.'
            raise ValidationError(msg)
        # Set the pub_date for published items if not set.
        if self.status == 'Published' and self.pub_date is None:
            self.pub_date = datetime.now()
```

---

**Note:** Cleaning is only called if validation is turned on and when calling `save()`.

---

### Cascading Saves

If your document contains `ReferenceField` or `GenericReferenceField` objects, then by default the `save()` method will not save any changes to those objects. If you want all references to be saved also, noting each save is a separate query, then passing `cascade` as `True` to the save method will cascade any saves.

## Deleting documents

To delete a document, call the `delete()` method. Note that this will only work if the document exists in the database and has a valid `id`.

## Document IDs

Each document in the database has a unique `id`. This may be accessed through the `id` attribute on `Document` objects. Usually, the `id` will be generated automatically by the database server when the object is save, meaning that you may only access the `id` field once a document has been saved:

```
>>> page = Page(title="Test Page")
>>> page.id
>>> page.save()
>>> page.id
ObjectId('123456789abcdef000000000')
```

Alternatively, you may define one of your own fields to be the document’s “primary key” by providing `primary_key=True` as a keyword argument to a field’s constructor. Under the hood, MongoEngine will use this field as the `id`; in fact `id` is actually aliased to your primary key field so you may still use `id` to access the primary key if you want:

```
>>> class User(Document):
...     email = StringField(primary_key=True)
...     name = StringField()
...
>>> bob = User(email='bob@example.com', name='Bob')
>>> bob.save()
>>> bob.id == bob.email == 'bob@example.com'
True
```

You can also access the document’s “primary key” using the `pk` field, it’s an alias to `id`:

```
>>> page = Page(title="Another Test Page")
>>> page.save()
>>> page.id == page.pk
True
```

---

**Note:** If you define your own primary key field, the field implicitly becomes required, so a `ValidationError` will be thrown if you don’t provide it.

---

## 4.2.5 Querying the database

`Document` classes have an `objects` attribute, which is used for accessing the objects in the database associated with the class. The `objects` attribute is actually a `QuerySetManager`, which creates and returns a new `QuerySet` object on access. The `QuerySet` object may be iterated over to fetch documents from the database:

```
# Prints out the names of all the users in the database
for user in User.objects:
    print user.name
```

---

**Note:** As of MongoEngine 0.8 the querysets utilise a local cache. So iterating it multiple times will only cause a single query. If this is not the desired behaviour you can call `no_cache` (version **0.8.3+**) to return a non-caching queryset.

---

## Filtering queries

The query may be filtered by calling the `QuerySet` object with field lookup keyword arguments. The keys in the keyword arguments correspond to fields on the `Document` you are querying:

```
# This will return a QuerySet that will only iterate over users whose
# 'country' field is set to 'uk'
uk_users = User.objects(country='uk')
```

Fields on embedded documents may also be referred to using field lookup syntax by using a double-underscore in place of the dot in object attribute access syntax:

```
# This will return a QuerySet that will only iterate over pages that have
# been written by a user whose 'country' field is set to 'uk'
uk_pages = Page.objects(author__country='uk')
```

---

**Note:** (version **0.9.1+**) if your field name is like mongodb operator name (for example `type`, `lte`, `lt...`) and you want to place it at the end of lookup keyword mongoengine automatically prepend `$` to it. To avoid this use `__` at the end of your lookup keyword. For example if your field name is `type` and you want to query by this field you must use `.objects(user__type__="admin")` instead of `.objects(user__type="admin")`

---

## Query operators

Operators other than equality may also be used in queries — just attach the operator name to a key with a double-underscore:

```
# Only find users whose age is 18 or less
young_users = Users.objects(age__lte=18)
```

Available operators are as follows:

- `ne` – not equal to
- `lt` – less than
- `lte` – less than or equal to
- `gt` – greater than
- `gte` – greater than or equal to
- `not` – negate a standard check, may be used before other operators (e.g. `Q(age__not__mod=5)`)
- `in` – value is in list (a list of values should be provided)
- `nin` – value is not in list (a list of values should be provided)
- `mod` – value `% x == y`, where `x` and `y` are two provided values
- `all` – every item in list of values provided is in array
- `size` – the size of the array is
- `exists` – value for field exists

## String queries

The following operators are available as shortcuts to querying with regular expressions:

- `exact` – string field exactly matches value
- `icontains` – string field exactly matches value (case insensitive)

- `contains` – string field contains value
- `icontains` – string field contains value (case insensitive)
- `startswith` – string field starts with value
- `istartswith` – string field starts with value (case insensitive)
- `endswith` – string field ends with value
- `iendswith` – string field ends with value (case insensitive)
- `match` – performs an `$elemMatch` so you can match an entire document within an array

## Geo queries

There are a few special operators for performing geographical queries. The following were added in MongoEngine 0.8 for `PointField`, `LineStringField` and `PolygonField`:

- `geo_within` – check if a geometry is within a polygon. For ease of use it accepts either a geojson geometry or just the polygon coordinates eg:

```
loc.objects(point__geo_within=[[40, 5], [40, 6], [41, 6], [40, 5]])
loc.objects(point__geo_within={"type": "Polygon",
                               "coordinates": [[[40, 5], [40, 6], [41, 6], [40, 5]]]})
↪
```

- `geo_within_box` – simplified `geo_within` searching with a box eg:

```
loc.objects(point__geo_within_box=[(-125.0, 35.0), (-100.0, 40.0)])
loc.objects(point__geo_within_box=[<bottom left coordinates>, <upper right_
↪coordinates>])
```

- `geo_within_polygon` – simplified `geo_within` searching within a simple polygon eg:

```
loc.objects(point__geo_within_polygon=[[40, 5], [40, 6], [41, 6], [40, 5]])
loc.objects(point__geo_within_polygon=[ [ <x1> , <y1> ] ,
                                         [ <x2> , <y2> ] ,
                                         [ <x3> , <y3> ] ])
```

- `geo_within_center` – simplified `geo_within` the flat circle radius of a point eg:

```
loc.objects(point__geo_within_center=[(-125.0, 35.0), 1])
loc.objects(point__geo_within_center=[ [ <x>, <y> ] , <radius> ])
```

- `geo_within_sphere` – simplified `geo_within` the spherical circle radius of a point eg:

```
loc.objects(point__geo_within_sphere=[(-125.0, 35.0), 1])
loc.objects(point__geo_within_sphere=[ [ <x>, <y> ] , <radius> ])
```

- `geo_intersects` – selects all locations that intersect with a geometry eg:

```
# Inferred from provided points lists:
loc.objects(poly__geo_intersects=[40, 6])
loc.objects(poly__geo_intersects=[[40, 5], [40, 6]])
loc.objects(poly__geo_intersects=[[40, 5], [40, 6], [41, 6], [41, 5], [40,
↪5]])

# With geoJson style objects
loc.objects(poly__geo_intersects={"type": "Point", "coordinates": [40, 6]})
loc.objects(poly__geo_intersects={"type": "LineString",
                                   "coordinates": [[40, 5], [40, 6]]})
loc.objects(poly__geo_intersects={"type": "Polygon",
                                   "coordinates": [[[40, 5], [40, 6], [41, 6],
↪[41, 5], [40, 5]]]})
```

- `near` – find all the locations near a given point:

```
loc.objects(point__near=[40, 5])
loc.objects(point__near={"type": "Point", "coordinates": [40, 5]})
```

You can also set the maximum and/or the minimum distance in meters as well:

```
loc.objects(point__near=[40, 5], point__max_distance=1000)
loc.objects(point__near=[40, 5], point__min_distance=100)
```

The older 2D indexes are still supported with the `GeoPointField`:

- `within_distance` – provide a list containing a point and a maximum distance (e.g. [(41.342, -87.653), 5])
- `within_spherical_distance` – same as above but using the spherical geo model (e.g. [(41.342, -87.653), 5/earth\_radius])
- `near` – order the documents by how close they are to a given point
- `near_sphere` – Same as above but using the spherical geo model
- `within_box` – filter documents to those within a given bounding box (e.g. [(35.0, -125.0), (40.0, -100.0)])
- `within_polygon` – filter documents to those within a given polygon (e.g. [(41.91,-87.69), (41.92,-87.68), (41.91,-87.65), (41.89,-87.65)]).

---

**Note:** Requires Mongo Server 2.0

---

- `max_distance` – can be added to your location queries to set a maximum distance.
- `min_distance` – can be added to your location queries to set a minimum distance.

## Querying lists

On most fields, this syntax will look up documents where the field specified matches the given value exactly, but when the field refers to a `ListField`, a single item may be provided, in which case lists that contain that item will be matched:

```
class Page(Document):
    tags = ListField(StringField())

# This will match all pages that have the word 'coding' as an item in the
# 'tags' list
Page.objects(tags='coding')
```

It is possible to query by position in a list by using a numerical value as a query operator. So if you wanted to find all pages whose first tag was `db`, you could use the following query:

```
Page.objects(tags__0='db')
```

If you only want to fetch part of a list eg: you want to paginate a list, then the `slice` operator is required:

```
# comments - skip 5, limit 10
Page.objects.fields(slice__comments=[5, 10])
```

For updating documents, if you don't know the position in a list, you can use the `$` positional operator

```
Post.objects(comments__by='joe').update(**{'inc__comments__$__votes': 1})
```

However, this doesn't map well to the syntax so you can also use a capital S instead

```
Post.objects(comments__by="joe").update(inc__comments__S__votes=1)
```

**Note:** Due to **Mongo**, currently the \$ operator only applies to the first matched item in the query.

## Raw queries

It is possible to provide a raw PyMongo query as a query parameter, which will be integrated directly into the query. This is done using the `__raw__` keyword argument:

```
Page.objects(__raw__={'tags': 'coding'})
```

New in version 0.4.

## Limiting and skipping results

Just as with traditional ORMs, you may limit the number of results returned or skip a number of results in you query. `limit()` and `skip()` and methods are available on `QuerySet` objects, but the *array-slicing* syntax is preferred for achieving this:

```
# Only the first 5 people
users = User.objects[:5]

# All except for the first 5 people
users = User.objects[5:]

# 5 users, starting from the 10th user found
users = User.objects[10:15]
```

You may also index the query to retrieve a single result. If an item at that index does not exist, an `IndexError` will be raised. A shortcut for retrieving the first result and returning `None` if no result exists is provided (`first()`):

```
>>> # Make sure there are no users
>>> User.drop_collection()
>>> User.objects[0]
IndexError: list index out of range
>>> User.objects.first() == None
True
>>> User(name='Test User').save()
>>> User.objects[0] == User.objects.first()
True
```

## Retrieving unique results

To retrieve a result that should be unique in the collection, use `get()`. This will raise `DoesNotExist` if no document matches the query, and `MultipleObjectsReturned` if more than one document matched the query. These exceptions are merged into your document definitions eg: `MyDoc.DoesNotExist`

A variation of this method, `get_or_create()` existed, but it was unsafe. It could not be made safe, because there are no transactions in mongoDB. Other approaches should be investigated, to ensure you don't accidentally duplicate data when using something similar to this method. Therefore it was deprecated in 0.8 and removed in 0.10.

## Default Document queries

By default, the objects `objects` attribute on a document returns a `QuerySet` that doesn't filter the collection – it returns all objects. This may be changed by defining a method on a document that modifies a queryset. The method should accept two arguments – `doc_cls` and `queryset`. The first argument is the `Document` class that the method is defined on (in this sense, the method is more like a `classmethod()` than a regular method), and the second argument is the initial queryset. The method needs to be decorated with `queryset_manager()` in order for it to be recognised.

```
class BlogPost(Document):
    title = StringField()
    date = DateTimeField()

    @queryset_manager
    def objects(doc_cls, queryset):
        # This may actually also be done by defining a default ordering for
        # the document, but this illustrates the use of manager methods
        return queryset.order_by('-date')
```

You don't need to call your method `objects` – you may define as many custom manager methods as you like:

```
class BlogPost(Document):
    title = StringField()
    published = BooleanField()

    @queryset_manager
    def live_posts(doc_cls, queryset):
        return queryset.filter(published=True)

BlogPost(title='test1', published=False).save()
BlogPost(title='test2', published=True).save()
assert len(BlogPost.objects) == 2
assert len(BlogPost.live_posts()) == 1
```

## Custom QuerySets

Should you want to add custom methods for interacting with or filtering documents, extending the `QuerySet` class may be the way to go. To use a custom `QuerySet` class on a document, set `queryset_class` to the custom class in a `Document`'s meta dictionary:

```
class AwesomerQuerySet(QuerySet):

    def get_awesome(self):
        return self.filter(awesome=True)

class Page(Document):
    meta = {'queryset_class': AwesomerQuerySet}

# To call:
Page.objects.get_awesome()
```

New in version 0.4.

## Aggregation

MongoDB provides some aggregation methods out of the box, but there are not as many as you typically get with an RDBMS. MongoEngine provides a wrapper around the built-in methods and provides some of its own, which are implemented as Javascript code that is executed on the database server.

## Counting results

Just as with limiting and skipping results, there is a method on *QuerySet* objects – *count()*, but there is also a more Pythonic way of achieving this:

```
num_users = len(User.objects)
```

Even if *len()* is the Pythonic way of counting results, keep in mind that if you concerned about performance, *count()* is the way to go since it only execute a server side count query, while *len()* retrieves the results, places them in cache, and finally counts them. If we compare the performance of the two operations, *len()* is much slower than *count()*.

## Further aggregation

You may sum over the values of a specific field on documents using *sum()*:

```
yearly_expense = Employee.objects.sum('salary')
```

**Note:** If the field isn't present on a document, that document will be ignored from the sum.

To get the average (mean) of a field on a collection of documents, use *average()*:

```
mean_age = User.objects.average('age')
```

As MongoDB provides native lists, MongoEngine provides a helper method to get a dictionary of the frequencies of items in lists across an entire collection – *item\_frequencies()*. An example of its use would be generating “tag-clouds”:

```
class Article(Document):
    tag = ListField(StringField())

# After adding some tagged articles...
tag_freqs = Article.objects.item_frequencies('tag', normalize=True)

from operator import itemgetter
top_tags = sorted(tag_freqs.items(), key=itemgetter(1), reverse=True)[:10]
```

## Query efficiency and performance

There are a couple of methods to improve efficiency when querying, reducing the information returned by the query or efficient dereferencing .

### Retrieving a subset of fields

Sometimes a subset of fields on a *Document* is required, and for efficiency only these should be retrieved from the database. This issue is especially important for MongoDB, as fields may often be extremely large (e.g. a *ListField* of *EmbeddedDocuments*, which represent the comments on a blog post. To select only a subset of fields, use *only()*, specifying the fields you want to retrieve as its arguments. Note that if fields that are not downloaded are accessed, their default value (or *None* if no default value is provided) will be given:

```
>>> class Film(Document):
...     title = StringField()
...     year = IntField()
...     rating = IntField(default=3)
... 
```

```
>>> Film(title='The Shawshank Redemption', year=1994, rating=5).save()
>>> f = Film.objects.only('title').first()
>>> f.title
'The Shawshank Redemption'
>>> f.year    # None
>>> f.rating  # default value
3
```

---

**Note:** The `exclude()` is the opposite of `only()` if you want to exclude a field.

---

If you later need the missing fields, just call `reload()` on your document.

### Getting related data

When iterating the results of `ListField` or `DictField` we automatically dereference any `DBRef` objects as efficiently as possible, reducing the number the queries to mongo.

There are times when that efficiency is not enough, documents that have `ReferenceField` objects or `GenericReferenceField` objects at the top level are expensive as the number of queries to MongoDB can quickly rise.

To limit the number of queries use `select_related()` which converts the `QuerySet` to a list and dereferences as efficiently as possible. By default `select_related()` only dereferences any references to the depth of 1 level. If you have more complicated documents and want to dereference more of the object at once then increasing the `max_depth` will dereference more levels of the document.

### Turning off dereferencing

Sometimes for performance reasons you don't want to automatically dereference data. To turn off dereferencing of the results of a query use `no_dereference()` on the queryset like so:

```
post = Post.objects.no_dereference().first()
assert(isinstance(post.author, ObjectId))
```

You can also turn off all dereferencing for a fixed period by using the `no_dereference` context manager:

```
with no_dereference(Post) as Post:
    post = Post.objects.first()
    assert(isinstance(post.author, ObjectId))

# Outside the context manager dereferencing occurs.
assert(isinstance(post.author, User))
```

### Advanced queries

Sometimes calling a `QuerySet` object with keyword arguments can't fully express the query you want to use – for example if you need to combine a number of constraints using *and* and *or*. This is made possible in MongoEngine through the `Q` class. A `Q` object represents part of a query, and can be initialised using the same keyword-argument syntax you use to query documents. To build a complex query, you may combine `Q` objects using the `&` (and) and `|` (or) operators. To use a `Q` object, pass it in as the first positional argument to `Document.objects` when you filter it by calling it with keyword arguments:

```
# Get published posts
Post.objects(Q(published=True) | Q(publish_date__lte=datetime.now()))
```

```
# Get top posts
Post.objects((Q(featured=True) & Q(hits__gte=1000)) | Q(hits__gte=5000))
```

**Warning:** You have to use bitwise operators. You cannot use `or`, and to combine queries as `Q(a=a) or Q(b=b)` is not the same as `Q(a=a) | Q(b=b)`. As `Q(a=a)` equates to `true` `Q(a=a) or Q(b=b)` is the same as `Q(a=a)`.

## Atomic updates

Documents may be updated atomically by using the `update_one()`, `update()` and `modify()` methods on a `QuerySet` or `modify()` and `save()` (with `save_condition` argument) on a `Document`. There are several different “modifiers” that you may use with these methods:

- `set` – set a particular value
- `unset` – delete a particular value (since MongoDB v1.3)
- `inc` – increment a value by a given amount
- `dec` – decrement a value by a given amount
- `push` – append a value to a list
- `push_all` – append several values to a list
- `pop` – remove the first or last element of a list [depending on the value](#)
- `pull` – remove a value from a list
- `pull_all` – remove several values from a list
- `add_to_set` – add value to a list only if its not in the list already

The syntax for atomic updates is similar to the querying syntax, but the modifier comes before the field, not after it:

```
>>> post = BlogPost(title='Test', page_views=0, tags=['database'])
>>> post.save()
>>> BlogPost.objects(id=post.id).update_one(inc__page_views=1)
>>> post.reload() # the document has been changed, so we need to reload it
>>> post.page_views
1
>>> BlogPost.objects(id=post.id).update_one(set__title='Example Post')
>>> post.reload()
>>> post.title
'Example Post'
>>> BlogPost.objects(id=post.id).update_one(push__tags='nosql')
>>> post.reload()
>>> post.tags
['database', 'nosql']
```

**Note:** If no modifier operator is specified the default will be `$set`. So the following sentences are identical:

```
>>> BlogPost.objects(id=post.id).update(title='Example Post')
>>> BlogPost.objects(id=post.id).update(set__title='Example Post')
```

**Note:** In version 0.5 the `save()` runs atomic updates on changed documents by tracking changes to that document.

The positional operator allows you to update list items without knowing the index position, therefore making the update a single atomic operation. As we cannot use the `$` syntax in keyword arguments it has been mapped to `S`:

```
>>> post = BlogPost(title='Test', page_views=0, tags=['database', 'mongo'])
>>> post.save()
>>> BlogPost.objects(id=post.id, tags='mongo').update(set__tags__S='mongodb')
>>> post.reload()
>>> post.tags
['database', 'mongodb']
```

---

**Note:** Currently only top level lists are handled, future versions of `mongodb / pymongo` plan to support nested positional operators. See [The `\$` positional operator](#).

---

### Server-side javascript execution

Javascript functions may be written and sent to the server for execution. The result of this is the return value of the Javascript function. This functionality is accessed through the `exec_js()` method on `QuerySet()` objects. Pass in a string containing a Javascript function as the first argument.

The remaining positional arguments are names of fields that will be passed into your Javascript function as its arguments. This allows functions to be written that may be executed on any field in a collection (e.g. the `sum()` method, which accepts the name of the field to sum over as its argument). Note that field names passed in in this manner are automatically translated to the names used on the database (set using the `name` keyword argument to a field constructor).

Keyword arguments to `exec_js()` are combined into an object called `options`, which is available in the Javascript function. This may be used for defining specific parameters for your function.

Some variables are made available in the scope of the Javascript function:

- `collection` – the name of the collection that corresponds to the `Document` class that is being used; this should be used to get the `Collection` object from `db` in Javascript code
- `query` – the query that has been generated by the `QuerySet` object; this may be passed into the `find()` method on a `Collection` object in the Javascript function
- `options` – an object containing the keyword arguments passed into `exec_js()`

The following example demonstrates the intended usage of `exec_js()` by defining a function that sums over a field on a document (this functionality is already available through `sum()` but is shown here for sake of example):

```
def sum_field(document, field_name, include_negatives=True):
    code = """
    function(sumField) {
        var total = 0.0;
        db[collection].find(query).forEach(function(doc) {
            var val = doc[sumField];
            if (val >= 0.0 || options.includeNegatives) {
                total += val;
            }
        });
        return total;
    }
    """
    options = {'includeNegatives': include_negatives}
    return document.objects.exec_js(code, field_name, **options)
```

As fields in MongoEngine may use different names in the database (set using the `db_field` keyword argument to a `Field` constructor), a mechanism exists for replacing MongoEngine field names with the database field names in Javascript code. When accessing a field on a collection object, use square-bracket notation, and prefix the MongoEngine field name with a tilde. The field name that follows the tilde will be translated to

the name used in the database. Note that when referring to fields on embedded documents, the name of the *EmbeddedDocumentField*, followed by a dot, should be used before the name of the field on the embedded document. The following example shows how the substitutions are made:

```
class Comment(EmbeddedDocument):
    content = StringField(db_field='body')

class BlogPost(Document):
    title = StringField(db_field='doctitle')
    comments = ListField(EmbeddedDocumentField(Comment), name='cs')

# Returns a list of dictionaries. Each dictionary contains a value named
# "document", which corresponds to the "title" field on a BlogPost, and
# "comment", which corresponds to an individual comment. The substitutions
# made are shown in the comments.
BlogPost.objects.exec_js("""
function() {
    var comments = [];
    db[collection].find(query).forEach(function(doc) {
        // doc[~comments] -> doc["cs"]
        var docComments = doc[~comments];

        for (var i = 0; i < docComments.length; i++) {
            // doc[~comments][i] -> doc["cs"][i]
            var comment = doc[~comments][i];

            comments.push({
                // doc[~title] -> doc["doctitle"]
                'document': doc[~title],

                // comment[~comments.content] -> comment["body"]
                'comment': comment[~comments.content]
            });
        }
    });
    return comments;
}
""")
```

## 4.2.6 GridFS

New in version 0.4.

### Writing

GridFS support comes in the form of the *FileField* field object. This field acts as a file-like object and provides a couple of different ways of inserting and retrieving data. Arbitrary metadata such as content type can also be stored alongside the files. In the following example, a document is created to store details about animals, including a photo:

```
class Animal(Document):
    genus = StringField()
    family = StringField()
    photo = FileField()

marmot = Animal(genus='Marmota', family='Sciuridae')

marmot_photo = open('marmot.jpg', 'rb')
marmot.photo.put(marmot_photo, content_type = 'image/jpeg')
marmot.save()
```

## Retrieval

So using the *FileField* is just like using any other field. The file can also be retrieved just as easily:

```
marmot = Animal.objects(genus='Marmota').first()
photo = marmot.photo.read()
content_type = marmot.photo.content_type
```

## Streaming

Streaming data into a *FileField* is achieved in a slightly different manner. First, a new file must be created by calling the `new_file()` method. Data can then be written using `write()`:

```
marmot.photo.new_file()
marmot.photo.write('some_image_data')
marmot.photo.write('some_more_image_data')
marmot.photo.close()

marmot.save()
```

## Deletion

Deleting stored files is achieved with the `delete()` method:

```
marmot.photo.delete()
```

**Warning:** The *FileField* in a Document actually only stores the ID of a file in a separate GridFS collection. This means that deleting a document with a defined *FileField* does not actually delete the file. You must be careful to delete any files in a Document as above before deleting the Document itself.

## Replacing files

Files can be replaced with the `replace()` method. This works just like the `put()` method so even metadata can (and should) be replaced:

```
another_marmot = open('another_marmot.png', 'rb')
marmot.photo.replace(another_marmot, content_type='image/png')
```

## 4.2.7 Signals

New in version 0.5.

---

**Note:** Signal support is provided by the excellent [blinker](#) library. If you wish to enable signal support this library must be installed, though it is not required for MongoEngine to function.

---

## Overview

Signals are found within the *mongoengine.signals* module. Unless specified signals receive no additional arguments beyond the *sender* class and *document* instance. Post-signals are only called if there were no exceptions raised during the processing of their related function.

Available signals include:

**pre\_init** Called during the creation of a new *Document* or *EmbeddedDocument* instance, after the constructor arguments have been collected but before any additional processing has been done to them. (I.e. assignment of default values.) Handlers for this signal are passed the dictionary of arguments using the *values* keyword argument and may modify this dictionary prior to returning.

**post\_init** Called after all processing of a new *Document* or *EmbeddedDocument* instance has been completed.

**pre\_save** Called within *save()* prior to performing any actions.

**pre\_save\_post\_validation** Called within *save()* after validation has taken place but before saving.

**post\_save** Called within *save()* after all actions (validation, insert/update, cascades, clearing dirty flags) have completed successfully. Passed the additional boolean keyword argument *created* to indicate if the save was an insert or an update.

**pre\_delete** Called within *delete()* prior to attempting the delete operation.

**post\_delete** Called within *delete()* upon successful deletion of the record.

**pre\_bulk\_insert** Called after validation of the documents to insert, but prior to any data being written. In this case, the *document* argument is replaced by a *documents* argument representing the list of documents being inserted.

**post\_bulk\_insert** Called after a successful bulk insert operation. As per *pre\_bulk\_insert*, the *document* argument is omitted and replaced with a *documents* argument. An additional boolean argument, *loaded*, identifies the contents of *documents* as either *Document* instances when *True* or simply a list of primary key values for the inserted records if *False*.

## Attaching Events

After writing a handler function like the following:

```
import logging
from datetime import datetime

from mongoengine import *
from mongoengine import signals

def update_modified(sender, document):
    document.modified = datetime.utcnow()
```

You attach the event handler to your *Document* or *EmbeddedDocument* subclass:

```
class Record(Document):
    modified = DateTimeField()

signals.pre_save.connect(update_modified)
```

While this is not the most elaborate document model, it does demonstrate the concepts involved. As a more complete demonstration you can also define your handlers within your subclass:

```
class Author(Document):
    name = StringField()

    @classmethod
    def pre_save(cls, sender, document, **kwargs):
        logging.debug("Pre Save: %s" % document.name)

    @classmethod
    def post_save(cls, sender, document, **kwargs):
        logging.debug("Post Save: %s" % document.name)
        if 'created' in kwargs:
            if kwargs['created']:
```

```
        logging.debug("Created")
    else:
        logging.debug("Updated")

signals.pre_save.connect(Author.pre_save, sender=Author)
signals.post_save.connect(Author.post_save, sender=Author)
```

Finally, you can also use this small decorator to quickly create a number of signals and attach them to your *Document* or *EmbeddedDocument* subclasses as class decorators:

```
def handler(event):
    """Signal decorator to allow use of callback functions as class decorators."""

    def decorator(fn):
        def apply(cls):
            event.connect(fn, sender=cls)
            return cls

        fn.apply = apply
        return fn

    return decorator
```

Using the first example of updating a modification time the code is now much cleaner looking while still allowing manual execution of the callback:

```
@handler(signals.pre_save)
def update_modified(sender, document):
    document.modified = datetime.utcnow()

@update_modified.apply
class Record(Document):
    modified = DateTimeField()
```

## ReferenceFields and Signals

Currently *reverse\_delete\_rule* does not trigger signals on the other part of the relationship. If this is required you must manually handle the reverse deletion.

### 4.2.8 Text Search

After MongoDB 2.4 version, supports search documents by text indexes.

#### Defining a Document with text index

Use the \$ prefix to set a text index, Look the declaration:

```
class News(Document):
    title = StringField()
    content = StringField()
    is_active = BooleanField()

    meta = {'indexes': [
        {'fields': ['$title', '$content'],
         'default_language': 'english',
         'weights': {'title': 10, 'content': 2}
        }
    ]}
```

## Querying

Saving a document:

```
News(title="Using mongodb text search",
      content="Testing text search").save()

News(title="MongoEngine 0.9 released",
      content="Various improvements").save()
```

Next, start a text search using `QuerySet.search_text` method:

```
document = News.objects.search_text('testing').first()
document.title # may be: "Using mongodb text search"

document = News.objects.search_text('released').first()
document.title # may be: "MongoEngine 0.9 released"
```

## Ordering by text score

```
objects = News.objects.search('mongo').order_by('$text_score')
```

## 4.2.9 Use mongomock for testing

`mongomock` is a package to do just what the name implies, mocking a mongo database.

To use with mongoengine, simply specify `mongomock` when connecting with mongoengine:

```
connect('mongoengine-test', host='mongomock://localhost')
conn = get_connection()
```

or with an alias:

```
connect('mongoengine-test', host='mongomock://localhost', alias='testdb')
conn = get_connection('testdb')
```

## 4.3 API Reference

### 4.3.1 Connecting

`mongoengine.connect` (*db=None, alias='default', \*\*kwargs*)

Connect to the database specified by the 'db' argument.

Connection settings may be provided here as well if the database is not running on the default port on localhost. If authentication is needed, provide username and password arguments as well.

Multiple databases are supported by using aliases. Provide a separate *alias* to connect to a different instance of `mongod`.

Changed in version 0.6: - added multiple database support.

`mongoengine.register_connection` (*alias, name=None, host=None, port=None, read\_preference=Primary(), username=None, password=None, authentication\_source=None, \*\*kwargs*)

Add a connection.

#### Parameters

- **alias** – the name that will be used to refer to this connection throughout MongoEngine

- **name** – the name of the specific database to use
- **host** – the host name of the `mongod` instance to connect to
- **port** – the port that the `mongod` instance is running on
- **read\_preference** – The read preference for the collection **\*\* Added pymongo 2.1**
- **username** – username to authenticate with
- **password** – password to authenticate with
- **authentication\_source** – database to authenticate against
- **kwargs** – allow ad-hoc parameters to be passed into the pymongo driver

### 4.3.2 Documents

**class** `mongoengine.Document` (*\*args, \*\*values*)

The base class used for defining the structure and properties of collections of documents stored in MongoDB. Inherit from this class, and add fields as class attributes to define a document's structure. Individual documents may then be created by making instances of the `Document` subclass.

By default, the MongoDB collection used to store documents created using a `Document` subclass will be the name of the subclass converted to lowercase. A different collection may be specified by providing `collection` to the `meta` dictionary in the class definition.

A `Document` subclass may be itself subclassed, to create a specialised version of the document that will be stored in the same collection. To facilitate this behaviour a `_cls` field is added to documents (hidden though the MongoEngine interface). To disable this behaviour and remove the dependence on the presence of `_cls` set `allow_inheritance` to `False` in the `meta` dictionary.

A `Document` may use a **Capped Collection** by specifying `max_documents` and `max_size` in the `meta` dictionary. `max_documents` is the maximum number of documents that is allowed to be stored in the collection, and `max_size` is the maximum size of the collection in bytes. `max_size` is rounded up to the next multiple of 256 by MongoDB internally and mongoengine before. Use also a multiple of 256 to avoid confusions. If `max_size` is not specified and `max_documents` is, `max_size` defaults to 10485760 bytes (10MB).

Indexes may be created by specifying `indexes` in the `meta` dictionary. The value should be a list of field names or tuples of field names. Index direction may be specified by prefixing the field names with a `+` or `-` sign.

Automatic index creation can be disabled by specifying `auto_create_index` in the `meta` dictionary. If this is set to `False` then indexes will not be created by MongoEngine. This is useful in production systems where index creation is performed as part of a deployment system.

By default, `_cls` will be added to the start of every index (that doesn't contain a list) if `allow_inheritance` is `True`. This can be disabled by either setting `cls` to `False` on the specific index or by setting `index_cls` to `False` on the `meta` dictionary for the document.

By default, any extra attribute existing in stored data but not declared in your model will raise a `FieldDoesNotExist` error. This can be disabled by setting `strict` to `False` in the `meta` dictionary.

Initialise a document or embedded document

#### Parameters

- **\_\_auto\_convert** – Try and will cast python objects to Object types
- **values** – A dictionary of values for the document

#### objects

A `QuerySet` object that is created lazily on access.

**cascade\_save** (\*args, \*\*kwargs)

Recursively saves any references / generic references on the document

**classmethod compare\_indexes** ()

Compares the indexes defined in MongoEngine with the ones existing in the database. Returns any missing/extra indexes.

**classmethod create\_index** (keys, background=False, \*\*kwargs)

Creates the given indexes if required.

#### Parameters

- **keys** – a single index key or a list of index keys (to construct a multi-field index); keys may be prefixed with a + or a - to determine the index ordering
- **background** – Allows index creation in the background

**delete** (\*\*write\_concern)

Delete the *Document* from the database. This will only take effect if the document has been previously saved.

**Parameters write\_concern** – Extra keyword arguments are passed down which will be used as options for the resultant `getLastError` command. For example, `save(.., write_concern={w: 2, fsync: True}, ..)` will wait until at least two servers have recorded the write and will force an `fsync` on the primary server.

**classmethod drop\_collection** ()

Drops the entire collection associated with this *Document* type from the database.

**classmethod ensure\_index** (key\_or\_list, drop\_dups=False, background=False, \*\*kwargs)

Ensure that the given indexes are in place. Deprecated in favour of `create_index`.

#### Parameters

- **key\_or\_list** – a single index key or a list of index keys (to construct a multi-field index); keys may be prefixed with a + or a - to determine the index ordering
- **background** – Allows index creation in the background
- **drop\_dups** – Was removed/ignored with MongoDB >2.7.5. The value will be removed if PyMongo3+ is used

**classmethod ensure\_indexes** ()

Checks the document meta data and ensures all the indexes exist.

Global defaults can be set in the meta - see *Defining documents*

---

**Note:** You can disable automatic index creation by setting `auto_create_index` to `False` in the documents meta data

---

**classmethod list\_indexes** ()

Lists all of the indexes that should be created for given collection. It includes all the indexes from super- and sub-classes.

**modify** (query={}, \*\*update)

Perform an atomic update of the document in the database and reload the document object using updated version.

Returns `True` if the document has been updated or `False` if the document in the database doesn't match the query.

---

**Note:** All unsaved changes that have been made to the document are rejected if the method returns `True`.

---

### Parameters

- **query** – the update will be performed only if the document in the database matches the query
- **update** – Django-style update keyword arguments

### **my\_metaclass**

alias of `TopLevelDocumentMetaclass`

### **classmethod register\_delete\_rule** (*document\_cls, field\_name, rule*)

This method registers the delete rules to apply when removing this object.

### **reload** (*\*fields, \*\*kwargs*)

Reloads all attributes from the database.

### Parameters

- **fields** – (optional) args list of fields to reload
- **max\_depth** – (optional) depth of dereferencing to follow

New in version 0.1.2.

Changed in version 0.6: Now chainable

Changed in version 0.9: Can provide specific fields to reload

### **save** (*force\_insert=False, validate=True, clean=True, write\_concern=None, cascade=None, cascade\_kwargs=None, \_refs=None, save\_condition=None, \*\*kwargs*)

Save the *Document* to the database. If the document already exists, it will be updated, otherwise it will be created.

### Parameters

- **force\_insert** – only try to create a new document, don't allow updates of existing documents
- **validate** – validates the document; set to `False` to skip.
- **clean** – call the document clean method, requires *validate* to be `True`.
- **write\_concern** – Extra keyword arguments are passed down to `save()` OR `insert()` which will be used as options for the resultant `getLastError` command. For example, `save(..., write_concern={w: 2, fsync: True}, ...)` will wait until at least two servers have recorded the write and will force an `fsync` on the primary server.
- **cascade** – Sets the flag for cascading saves. You can set a default by setting “`cascade`” in the document `__meta__`
- **cascade\_kwargs** – (optional) kwargs dictionary to be passed throw to cascading saves. Implies `cascade=True`.
- **\_refs** – A list of processed references used in cascading saves
- **save\_condition** – only perform save if matching record in db satisfies condition(s) (e.g. version number). Raises `OperationError` if the conditions are not satisfied

Changed in version 0.5: In existing documents it only saves changed fields using `set / unset`. Saves are cascaded and any `DBRef` objects that have changes are saved as well.

Changed in version 0.6: Added cascading saves

Changed in version 0.8: Cascade saves are optional and default to `False`. If you want fine grain control then you can turn off using document `meta['cascade'] = True`. Also you can pass different kwargs to the cascade save using `cascade_kwargs` which overwrites the existing kwargs with custom values.

Changed in version 0.8.5: Optional `save_condition` that only overwrites existing documents if the condition is satisfied in the current db record.

Changed in version 0.10: `OperationError` exception raised if `save_condition` fails.

Changed in version 0.10.1: `:class: save_condition` failure now raises a `SaveConditionError`

**select\_related** (*max\_depth=1*)

Handles dereferencing of `DBRef` objects to a maximum depth in order to cut down the number queries to `mongodb`.

New in version 0.5.

**switch\_collection** (*collection\_name, keep\_created=True*)

Temporarily switch the collection for a document instance.

Only really useful for archiving off data and calling `save()`:

```
user = User.objects.get(id=user_id)
user.switch_collection('old-users')
user.save()
```

#### Parameters

- **collection\_name** (*str*) – The database alias to use for saving the document
- **keep\_created** (*bool*) – keep `self._created` value after switching collection, else is reset to `True`

#### See also:

Use `switch_db` if you need to read from another database

**switch\_db** (*db\_alias, keep\_created=True*)

Temporarily switch the database for a document instance.

Only really useful for archiving off data and calling `save()`:

```
user = User.objects.get(id=user_id)
user.switch_db('archive-db')
user.save()
```

#### Parameters

- **db\_alias** (*str*) – The database alias to use for saving the document
- **keep\_created** (*bool*) – keep `self._created` value after switching db, else is reset to `True`

#### See also:

Use `switch_collection` if you need to read from another collection

**to\_dbref** ()

Returns an instance of `DBRef` useful in `__raw__` queries.

**update** (*\*\*kwargs*)

Performs an update on the `Document`. A convenience wrapper to `update()`.

Raises `OperationError` if called on an object that has not yet been saved.

**class** `mongoengine.EmbeddedDocument` (*\*args, \*\*kwargs*)

A `Document` that isn't stored in its own collection. `EmbeddedDocuments` should be used as fields on `Documents` through the `EmbeddedDocumentField` field type.

A *EmbeddedDocument* subclass may be itself subclassed, to create a specialised version of the embedded document that will be stored in the same collection. To facilitate this behaviour a `_cls` field is added to documents (hidden though the MongoEngine interface). To disable this behaviour and remove the dependence on the presence of `_cls` set `allow_inheritance` to `False` in the meta dictionary.

### **my\_metaclass**

alias of `DocumentMetaaclass`

**class** `mongoengine.DynamicDocument` (*\*args, \*\*values*)

A Dynamic Document class allowing flexible, expandable and uncontrolled schemas. As a *Document* subclass, acts in the same way as an ordinary document but has expando style properties. Any data passed or set against the *DynamicDocument* that is not a field is automatically converted into a *DynamicField* and data can be attributed to that field.

---

**Note:** There is one caveat on Dynamic Documents: fields cannot start with `_`

---

Initialise a document or embedded document

### **Parameters**

- **\_\_auto\_convert** – Try and will cast python objects to Object types
- **values** – A dictionary of values for the document

### **my\_metaclass**

alias of `TopLevelDocumentMetaaclass`

**class** `mongoengine.DynamicEmbeddedDocument` (*\*args, \*\*kwargs*)

A Dynamic Embedded Document class allowing flexible, expandable and uncontrolled schemas. See *DynamicDocument* for more information about dynamic documents.

### **my\_metaclass**

alias of `DocumentMetaaclass`

**class** `mongoengine.document.MapReduceDocument` (*document, collection, key, value*)

A document returned from a map/reduce query.

### **Parameters**

- **collection** – An instance of `Collection`
- **key** – Document/result key, often an instance of `ObjectId`. If supplied as an `ObjectId` found in the given `collection`, the object can be accessed via the `object` property.
- **value** – The result(s) for this key.

New in version 0.3.

### **object**

Lazy-load the object referenced by `self.key`. `self.key` should be the `primary_key`.

**class** `mongoengine.ValidationError` (*message=''*, *\*\*kwargs*)

Validation exception.

May represent an error validating a field or a document containing fields with validation errors.

**Variables errors** – A dictionary of errors for fields within this document or list, or `None` if the error is for an individual field.

### **to\_dict** ()

Returns a dictionary of all errors within a document

Keys are field names or list indices and values are the validation error messages, or a nested dictionary of errors for an embedded document or list.

**class** `mongoengine.FieldDoesNotExist`

Raised when trying to set a field not declared in a *Document* or an *EmbeddedDocument*.

To avoid this behavior on data loading, you should the `strict` to `False` in the meta dictionary.

### 4.3.3 Context Managers

**class** `mongoengine.context_managers.switch_db` (*cls*, *db\_alias*)

`switch_db` alias context manager.

Example

```
# Register connections
register_connection('default', 'mongoengine2test')
register_connection('testdb-1', 'mongoengine2test2')

class Group(Document):
    name = StringField()

Group(name="test").save() # Saves in the default db

with switch_db(Group, 'testdb-1') as Group:
    Group(name="hello testdb!").save() # Saves in testdb-1
```

Construct the `switch_db` context manager

#### Parameters

- **cls** – the class to change the registered db
- **db\_alias** – the name of the specific database to use

**class** `mongoengine.context_managers.switch_collection` (*cls*, *collection\_name*)

`switch_collection` alias context manager.

Example

```
class Group(Document):
    name = StringField()

Group(name="test").save() # Saves in the default db

with switch_collection(Group, 'group1') as Group:
    Group(name="hello testdb!").save() # Saves in group1 collection
```

Construct the `switch_collection` context manager

#### Parameters

- **cls** – the class to change the registered db
- **collection\_name** – the name of the collection to use

**class** `mongoengine.context_managers.no_dereference` (*cls*)

`no_dereference` context manager.

Turns off all dereferencing in Documents for the duration of the context manager:

```
with no_dereference(Group) as Group:
    Group.objects.find()
```

Construct the `no_dereference` context manager.

**Parameters** **cls** – the class to turn dereferencing off on

**class** `mongoengine.context_managers.query_counter`

Query\_counter context manager to get the number of queries.

Construct the query\_counter.

### 4.3.4 Querying

**class** `mongoengine.queryset.QuerySet` (*document, collection*)

The default queryset, that builds queries and handles a set of results returned from a query.

Wraps a MongoDB cursor, providing *Document* objects as the results.

`__call__` (*q\_obj=None, class\_check=True, read\_preference=None, \*\*query*)

Filter the selected documents by calling the *QuerySet* with a query.

#### Parameters

- **q\_obj** – a *Q* object to be used in the query; the *QuerySet* is filtered multiple times with different *Q* objects, only the last one will be used
- **class\_check** – If set to `False` bypass class name check when querying collection
- **read\_preference** – if set, overrides connection-level `read_preference` from *ReplSetConnection*.
- **query** – Django-style query keyword arguments

**aggregate** (*\*pipeline, \*\*kwargs*)

Perform an aggregate function based in your queryset params :param pipeline: list of aggregation commands, see: <http://docs.mongodb.org/manual/core/aggregation-pipeline/>

New in version 0.9.

**aggregate\_average** (*field*)

Average over the values of the specified field.

**Parameters** **field** – the field to average over; use dot-notation to refer to embedded document fields

This method is more performant than the regular *average*, because it uses the aggregation framework instead of map-reduce.

**aggregate\_sum** (*field*)

Sum over the values of the specified field.

**Parameters** **field** – the field to sum over; use dot-notation to refer to embedded document fields

This method is more performant than the regular *sum*, because it uses the aggregation framework instead of map-reduce.

**all** ()

Returns all documents.

**all\_fields** ()

Include all fields. Reset all previously calls of `.only()` or `.exclude()`.

```
post = BlogPost.objects.exclude("comments").all_fields()
```

New in version 0.5.

**as\_pymongo** (*coerce\_types=False*)

Instead of returning *Document* instances, return raw values from *pymongo*.

**Parameters** **coerce\_types** – Field types (if applicable) would be use to coerce types.

**average** (*field*)

Average over the values of the specified field.

**Parameters field** – the field to average over; use dot-notation to refer to embedded document fields

Changed in version 0.5: - updated to map\_reduce as db.eval doesnt work with sharding.

**clone()**

Creates a copy of the current *QuerySet*

New in version 0.5.

**clone\_into(*cls*)**

Creates a copy of the current *BaseQuerySet* into another child class

**count** (*with\_limit\_and\_skip=False*)

Count the selected elements in the query.

**Parameters (optional)** (*with\_limit\_and\_skip*) – take any *limit()* or *skip()* that has been applied to this cursor into account when getting the count

**create** (*\*\*kwargs*)

Create new object. Returns the saved object instance.

New in version 0.4.

**delete** (*write\_concern=None, \_from\_doc\_delete=False, cascade\_refs=None*)

Delete the documents matched by the query.

**Parameters**

- **write\_concern** – Extra keyword arguments are passed down which will be used as options for the resultant `getLastErrorMessage` command. For example, `save(..., write_concern={w: 2, fsync: True}, ...)` will wait until at least two servers have recorded the write and will force an fsync on the primary server.
- **\_from\_doc\_delete** – True when called from document delete therefore signals will have been triggered so don't loop.

:returns number of deleted documents

**distinct** (*field*)

Return a list of distinct values for a given field.

**Parameters field** – the field to select distinct values from

---

**Note:** This is a command and won't take ordering or limit into account.

---

New in version 0.4.

Changed in version 0.5: - Fixed handling references

Changed in version 0.6: - Improved db\_field refrence handling

**ensure\_index** (*\*\*kwargs*)

Deprecated use `Document.ensure_index()`

**exclude** (*\*fields*)

Opposite to `.only()`, exclude some document's fields.

```
post = BlogPost.objects(...).exclude("comments")
```

---

**Note:** `exclude()` is chainable and will perform a union :: So with the following it will exclude both: `title` and `author.name`:

```
post = BlogPost.objects.exclude("title").exclude("author.name")
```

`all_fields()` will reset any field filters.

**Parameters** `fields` – fields to exclude

New in version 0.5.

**exec\_js** (`code`, `*fields`, `**options`)

Execute a Javascript function on the server. A list of fields may be provided, which will be translated to their correct names and supplied as the arguments to the function. A few extra variables are added to the function's scope: `collection`, which is the name of the collection in use; `query`, which is an object representing the current query; and `options`, which is an object containing any options specified as keyword arguments.

As fields in MongoEngine may use different names in the database (set using the `db_field` keyword argument to a `Field` constructor), a mechanism exists for replacing MongoEngine field names with the database field names in Javascript code. When accessing a field, use square-bracket notation, and prefix the MongoEngine field name with a tilde (~).

**Parameters**

- **code** – a string of Javascript code to execute
- **fields** – fields that you will be using in your function, which will be passed in to your function as arguments
- **options** – options that you want available to the function (accessed in Javascript through the `options` object)

**explain** (`format=False`)

Return an explain plan record for the `QuerySet`'s cursor.

**Parameters** `format` – format the plan before returning it

**fields** (`_only_called=False`, `**kwargs`)

Manipulate how you load this document's fields. Used by `.only()` and `.exclude()` to manipulate which fields to retrieve. Fields also allows for a greater level of control for example:

Retrieving a Subrange of Array Elements:

You can use the `$slice` operator to retrieve a subrange of elements in an array. For example to get the first 5 comments:

```
post = BlogPost.objects(...).fields(slice__comments=5)
```

**Parameters** `kwargs` – A dictionary identifying what to include

New in version 0.5.

**filter** (`*q_objs`, `**query`)

An alias of `__call__()`

**first** ()

Retrieve the first object matching the query.

**from\_json** (`json_data`)

Converts json data to unsaved objects

**get** (`*q_objs`, `**query`)

Retrieve the the matching object raising `MultipleObjectsReturned` or `DocumentName.MultipleObjectsReturned` exception if multiple results and `DoesNotExist` or `DocumentName.DoesNotExist` if no results are found.

New in version 0.3.

**hint** (*index=None*)

Added 'hint' support, telling Mongo the proper index to use for the query.

Judicious use of hints can greatly improve query performance. When doing a query on multiple fields (at least one of which is indexed) pass the indexed field as a hint to the query.

Hinting will not do anything if the corresponding index does not exist. The last hint applied to this cursor takes precedence over all others.

New in version 0.5.

**in\_bulk** (*object\_ids*)

Retrieve a set of documents by their ids.

**Parameters** **object\_ids** – a list or tuple of `ObjectIds`

**Return type** dict of `ObjectIds` as keys and collection-specific `Document` subclasses as values.

New in version 0.3.

**insert** (*doc\_or\_docs, load\_bulk=True, write\_concern=None*)

bulk insert documents

**Parameters**

- **doc\_or\_docs** – a document or list of documents to be inserted
- **(optional)** (*load\_bulk*) – If `True` returns the list of document instances
- **write\_concern** – Extra keyword arguments are passed down to `insert()` which will be used as options for the resultant `getLastError` command. For example, `insert(..., {w: 2, fsync: True})` will wait until at least two servers have recorded the write and will force an `fsync` on each server being written to.

By default returns document instances, set `load_bulk` to `False` to return just `ObjectIds`

New in version 0.5.

**item\_frequencies** (*field, normalize=False, map\_reduce=True*)

Returns a dictionary of all items present in a field across the whole queried set of documents, and their corresponding frequency. This is useful for generating tag clouds, or searching documents.

---

**Note:** Can only do direct simple mappings and cannot map across `ReferenceField` or `GenericReferenceField` for more complex counting a manual map reduce call would be required.

---

If the field is a `ListField`, the items within each list will be counted individually.

**Parameters**

- **field** – the field to use
- **normalize** – normalize the results so they add to 1.0
- **map\_reduce** – Use `map_reduce` over `exec_js`

Changed in version 0.5: defaults to `map_reduce` and can handle embedded document lookups

**limit** (*n*)

Limit the number of returned documents to *n*. This may also be achieved using array-slicing syntax (e.g. `User.objects[:5]`).

**Parameters** **n** – the maximum number of objects to return

**map\_reduce** (*map\_f, reduce\_f, output, finalize\_f=None, limit=None, scope=None*)

Perform a map/reduce query using the current query spec and ordering. While `map_reduce` respects `QuerySet` chaining, it must be the last call made, as it does not return a malleable `QuerySet`.

See the `test_map_reduce()` and `test_map_advanced()` tests in `tests.queryset.QuerySetTest` for usage examples.

#### Parameters

- **map\_f** – map function, as Code or string
- **reduce\_f** – reduce function, as Code or string
- **output** – output collection name, if set to 'inline' will try to use `inline_map_reduce`. This can also be a dictionary containing output options see: <http://docs.mongodb.org/manual/reference/command/mapReduce/#dbcmd.mapReduce>
- **finalize\_f** – finalize function, an optional function that performs any post-reduction processing.
- **scope** – values to insert into map/reduce global scope. Optional.
- **limit** – number of objects from current query to provide to map/reduce method

Returns an iterator yielding *MapReduceDocument*.

---

**Note:** Map/Reduce changed in server version  $\geq 1.7.4$ . The PyMongo `map_reduce()` helper requires PyMongo version  $\geq 1.11$ .

---

Changed in version 0.5: - removed `keep_temp` keyword argument, which was only relevant for MongoDB server versions older than 1.7.4

New in version 0.3.

#### **max\_time\_ms** (*ms*)

Wait *ms* milliseconds before killing the query on the server

**Parameters** **ms** – the number of milliseconds before killing the query on the server

#### **modify** (*upsert=False, full\_response=False, remove=False, new=False, \*\*update*)

Update and return the updated document.

Returns either the document before or after modification based on *new* parameter. If no documents match the query and *upsert* is false, returns `None`. If upserting and *new* is false, returns `None`.

If the *full\_response* parameter is `True`, the return value will be the entire response object from the server, including the 'ok' and 'lastErrorObject' fields, rather than just the modified document. This is useful mainly because the 'lastErrorObject' document holds information about the command's execution.

#### Parameters

- **upsert** – insert if document doesn't exist (default `False`)
- **full\_response** – return the entire response object from the server (default `False`, not available for PyMongo 3+)
- **remove** – remove rather than updating (default `False`)
- **new** – return updated rather than original document (default `False`)
- **update** – Django-style update keyword arguments

New in version 0.9.

#### **next** ()

Wrap the result in a *Document* object.

#### **no\_cache** ()

Convert to a non\_caching queryset

New in version 0.8.3: Convert to non caching queryset

**no\_dereference ()**

Turn off any dereferencing for the results of this queryset.

**no\_sub\_classes ()**

Only return instances of this document and not any inherited documents

**none ()**

Helper that just returns a list

**only (\*fields)**

Load only a subset of this document's fields.

```
post = BlogPost.objects(...).only("title", "author.name")
```

**Note:** `only()` is chainable and will perform a union :: So with the following it will fetch both: `title` and `author.name`:

```
post = BlogPost.objects.only("title").only("author.name")
```

`all_fields ()` will reset any field filters.

**Parameters fields** – fields to include

New in version 0.3.

Changed in version 0.5: - Added subfield support

**order\_by (\*keys)**

Order the *QuerySet* by the keys. The order may be specified by prepending each of the keys by a + or a -. Ascending order is assumed.

**Parameters keys** – fields to order the query results by; keys may be prefixed with + or - to determine the ordering direction

**read\_preference (read\_preference)**

Change the `read_preference` when querying.

**Parameters read\_preference** – override `ReplicaSetConnection`-level preference.

**rewind ()**

Rewind the cursor to its unevaluated state.

New in version 0.3.

**scalar (\*fields)**

Instead of returning Document instances, return either a specific value or a tuple of values in order.

Can be used along with `no_dereference ()` to turn off dereferencing.

**Note:** This effects all results and can be unset by calling `scalar` without arguments. Calls `only` automatically.

**Parameters fields** – One or more fields to return instead of a Document.

**search\_text (text, language=None)**

Start a text search, using text indexes. Require: MongoDB server version 2.6+.

**Parameters language** – The language that determines the list of stop words for the search and the rules for the stemmer and tokenizer. If not specified, the search uses the default language of the index. For supported languages, see *Text Search Languages* <<http://docs.mongodb.org/manual/reference/text-search-languages/#text-search-languages>>.

**select\_related** (*max\_depth=1*)

Handles dereferencing of DBRef objects or ObjectId a maximum depth in order to cut down the number queries to mongodb.

New in version 0.5.

**skip** (*n*)

Skip *n* documents before returning the results. This may also be achieved using array-slicing syntax (e.g. `User.objects[5:]`).

**Parameters** **n** – the number of objects to skip before returning results

**slave\_okay** (*enabled*)

Enable or disable the slave\_okay when querying.

**Parameters** **enabled** – whether or not the slave\_okay is enabled

Deprecated since version Ignored: with PyMongo 3+

**snapshot** (*enabled*)

Enable or disable snapshot mode when querying.

**Parameters** **enabled** – whether or not snapshot mode is enabled

..versionchanged:: 0.5 - made chainable .. deprecated:: Ignored with PyMongo 3+

**sum** (*field*)

Sum over the values of the specified field.

**Parameters** **field** – the field to sum over; use dot-notation to refer to embedded document fields

Changed in version 0.5: - updated to map\_reduce as db.eval doesnt work with sharding.

**timeout** (*enabled*)

Enable or disable the default mongod timeout when querying.

**Parameters** **enabled** – whether or not the timeout is used

..versionchanged:: 0.5 - made chainable

**to\_json** (*\*args, \*\*kwargs*)

Converts a queryset to JSON

**update** (*upsert=False, multi=True, write\_concern=None, full\_result=False, \*\*update*)

Perform an atomic update on the fields matched by the query.

**Parameters**

- **upsert** – Any existing document with that “\_id” is overwritten.
- **multi** – Update multiple documents.
- **write\_concern** – Extra keyword arguments are passed down which will be used as options for the resultant `getLastError` command. For example, `save(..., write_concern={w: 2, fsync: True}, ...)` will wait until at least two servers have recorded the write and will force an fsync on the primary server.
- **full\_result** – Return the full result rather than just the number updated.
- **update** – Django-style update keyword arguments

New in version 0.2.

**update\_one** (*upsert=False, write\_concern=None, \*\*update*)

Perform an atomic update on the fields of the first document matched by the query.

**Parameters**

- **upsert** – Any existing document with that “\_id” is overwritten.

- **write\_concern** – Extra keyword arguments are passed down which will be used as options for the resultant `getLastError` command. For example, `save(..., write_concern={w: 2, fsync: True}, ...)` will wait until at least two servers have recorded the write and will force an `fsync` on the primary server.
- **update** – Django-style update keyword arguments

New in version 0.2.

**upsert\_one** (*write\_concern=None, \*\*update*)

Overwrite or add the first document matched by the query.

#### Parameters

- **write\_concern** – Extra keyword arguments are passed down which will be used as options for the resultant `getLastError` command. For example, `save(..., write_concern={w: 2, fsync: True}, ...)` will wait until at least two servers have recorded the write and will force an `fsync` on the primary server.
- **update** – Django-style update keyword arguments

:returns the new or overwritten document

New in version 0.10.2.

**using** (*alias*)

This method is for controlling which database the `QuerySet` will be evaluated against if you are using more than one database.

**Parameters** *alias* – The database alias

New in version 0.9.

**values\_list** (*\*fields*)

An alias for `scalar`

**where** (*where\_clause*)

Filter `QuerySet` results with a `$where` clause (a Javascript expression). Performs automatic field name substitution like `mongoengine.queryset.QuerySet.exec_js()`.

---

**Note:** When using this mode of query, the database will call your function, or evaluate your predicate clause, for each object in the collection.

---

New in version 0.5.

**with\_id** (*object\_id*)

Retrieve the object matching the `id` provided. Uses `object_id` only and raises `InvalidQueryError` if a filter has been applied. Returns `None` if no document exists with that `id`.

**Parameters** *object\_id* – the value for the `id` of the document to look up

Changed in version 0.6: Raises `InvalidQueryError` if filter has been set

**class** `mongoengine.queryset.QuerySetNoCache` (*document, collection*)

A non caching `QuerySet`

**\_\_call\_\_** (*q\_obj=None, class\_check=True, read\_preference=None, \*\*query*)

Filter the selected documents by calling the `QuerySet` with a query.

#### Parameters

- **q\_obj** – a `Q` object to be used in the query; the `QuerySet` is filtered multiple times with different `Q` objects, only the last one will be used
- **class\_check** – If set to `False` bypass class name check when querying collection
- **read\_preference** – if set, overrides connection-level `read_preference` from `ReplicaSetConnection`.
- **query** – Django-style query keyword arguments

`cache()`

Convert to a caching queryset

New in version 0.8.3: Convert to caching queryset

`mongoengine.queryset.QuerySetManager` (*func*)

Decorator that allows you to define custom QuerySet managers on *Document* classes. The manager must be a function that accepts a *Document* class as its first argument, and a *QuerySet* as its second argument. The method function should return a *QuerySet*, probably the same one that was passed in, but modified in some way.

## 4.3.5 Fields

```
class mongoengine.base.fields.BaseField(db_field=None, name=None, required=False,
                                         default=None, unique=False, unique_with=None,
                                         primary_key=False, validation=None,
                                         choices=None, null=False, sparse=False,
                                         **kwargs)
```

A base class for fields in a MongoDB document. Instances of this class may be added to subclasses of *Document* to define a document's schema.

Changed in version 0.5: - added verbose and help text

### Parameters

- **db\_field** – The database field to store this field in (defaults to the name of the field)
- **name** – Deprecated - use `db_field`
- **required** – If the field is required. Whether it has to have a value or not. Defaults to `False`.
- **default** – (optional) The default value for this field if no value has been set (or if the value has been unset). It can be a callable.
- **unique** – Is the field value unique or not. Defaults to `False`.
- **unique\_with** – (optional) The other field this field should be unique with.
- **primary\_key** – Mark this field as the primary key. Defaults to `False`.
- **validation** – (optional) A callable to validate the value of the field. Generally this is deprecated in favour of the *FIELD.validate* method
- **choices** – (optional) The valid choices
- **null** – (optional) Is the field value can be null. If no and there is a default value then the default value is set
- **sparse** – (optional) `sparse=True` combined with `unique=True` and `required=False` means that uniqueness won't be enforced for *None* values
- **\*\*kwargs** – (optional) Arbitrary indirection-free metadata for this field can be supplied as additional keyword arguments and accessed as attributes of the field. Must not conflict with any existing attributes. Common metadata includes `verbose_name` and `help_text`.

```
class mongoengine.fields.StringField(regex=None, max_length=None, min_length=None,
                                     **kwargs)
```

A unicode string field.

```
class mongoengine.fields.URLField(verify_exists=False, url_regex=None, schemes=None,
                                  **kwargs)
```

A field that validates input as an URL.

New in version 0.3.

**class** `mongoengine.fields.EmailField` (*regex=None, max\_length=None, min\_length=None, \*\*kwargs*)

A field that validates input as an E-Mail-Address.

New in version 0.4.

**class** `mongoengine.fields.IntField` (*min\_value=None, max\_value=None, \*\*kwargs*)

An 32-bit integer field.

**class** `mongoengine.fields.LongField` (*min\_value=None, max\_value=None, \*\*kwargs*)

An 64-bit integer field.

**class** `mongoengine.fields.FloatField` (*min\_value=None, max\_value=None, \*\*kwargs*)

An floating point number field.

**class** `mongoengine.fields.DecimalField` (*min\_value=None, max\_value=None, force\_string=False, precision=2, rounding='ROUND\_HALF\_UP', \*\*kwargs*)

A fixed-point decimal number field.

Changed in version 0.8.

New in version 0.3.

#### Parameters

- **min\_value** – Validation rule for the minimum acceptable value.
- **max\_value** – Validation rule for the maximum acceptable value.
- **force\_string** – Store as a string.
- **precision** – Number of decimal places to store.
- **rounding** – The rounding rule from the python decimal library:
  - `decimal.ROUND_CEILING` (towards Infinity)
  - `decimal.ROUND_DOWN` (towards zero)
  - `decimal.ROUND_FLOOR` (towards -Infinity)
  - `decimal.ROUND_HALF_DOWN` (to nearest with ties going towards zero)
  - `decimal.ROUND_HALF_EVEN` (to nearest with ties going to nearest even integer)
  - `decimal.ROUND_HALF_UP` (to nearest with ties going away from zero)
  - `decimal.ROUND_UP` (away from zero)
  - `decimal.ROUND_05UP` (away from zero if last digit after rounding towards zero would have been 0 or 5; otherwise towards zero)

Defaults to: `decimal.ROUND_HALF_UP`

**class** `mongoengine.fields.BooleanField` (*db\_field=None, name=None, required=False, default=None, unique=False, unique\_with=None, primary\_key=False, validation=None, choices=None, null=False, sparse=False, \*\*kwargs*)

A boolean field type.

New in version 0.1.2.

#### Parameters

- **db\_field** – The database field to store this field in (defaults to the name of the field)
- **name** – Deprecated - use `db_field`
- **required** – If the field is required. Whether it has to have a value or not. Defaults to False.

- **default** – (optional) The default value for this field if no value has been set (or if the value has been unset). It can be a callable.
- **unique** – Is the field value unique or not. Defaults to False.
- **unique\_with** – (optional) The other field this field should be unique with.
- **primary\_key** – Mark this field as the primary key. Defaults to False.
- **validation** – (optional) A callable to validate the value of the field. Generally this is deprecated in favour of the *FIELD.validate* method
- **choices** – (optional) The valid choices
- **null** – (optional) Is the field value can be null. If no and there is a default value then the default value is set
- **sparse** – (optional) *sparse=True* combined with *unique=True* and *required=False* means that uniqueness won't be enforced for *None* values
- **\*\*kwargs** – (optional) Arbitrary indirection-free metadata for this field can be supplied as additional keyword arguments and accessed as attributes of the field. Must not conflict with any existing attributes. Common metadata includes *verbose\_name* and *help\_text*.

```
class mongoengine.fields.DateTimeField(db_field=None, name=None, required=False,
                                     default=None, unique=False, unique_with=None,
                                     primary_key=False, validation=None,
                                     choices=None, null=False, sparse=False,
                                     **kwargs)
```

A datetime field.

Uses the python-dateutil library if available alternatively use `time.strptime` to parse the dates. Note: python-dateutil's parser is fully featured and when installed you can utilise it to convert varying types of date formats into valid python datetime objects.

**Note: Microseconds are rounded to the nearest millisecond.** Pre UTC microsecond support is effectively broken. Use *ComplexDateTimeField* if you need accurate microsecond support.

#### Parameters

- **db\_field** – The database field to store this field in (defaults to the name of the field)
- **name** – Deprecated - use `db_field`
- **required** – If the field is required. Whether it has to have a value or not. Defaults to False.
- **default** – (optional) The default value for this field if no value has been set (or if the value has been unset). It can be a callable.
- **unique** – Is the field value unique or not. Defaults to False.
- **unique\_with** – (optional) The other field this field should be unique with.
- **primary\_key** – Mark this field as the primary key. Defaults to False.
- **validation** – (optional) A callable to validate the value of the field. Generally this is deprecated in favour of the *FIELD.validate* method
- **choices** – (optional) The valid choices
- **null** – (optional) Is the field value can be null. If no and there is a default value then the default value is set
- **sparse** – (optional) *sparse=True* combined with *unique=True* and *required=False* means that uniqueness won't be enforced for *None* values

- **\*\*kwargs** – (optional) Arbitrary indirection-free metadata for this field can be supplied as additional keyword arguments and accessed as attributes of the field. Must not conflict with any existing attributes. Common metadata includes *verbose\_name* and *help\_text*.

**class** `mongoengine.fields.ComplexDateTimeField` (*separator=' , '\*\*kwargs*)

`ComplexDateTimeField` handles microseconds exactly instead of rounding like `DateTimeField` does.

Derives from a `StringField` so you can do *gte* and *lte* filtering by using lexicographical comparison when filtering / sorting strings.

The stored string has the following format:

YYYY,MM,DD,HH,MM,SS,NNNNNN

Where NNNNNN is the number of microseconds of the represented *datetime*. The `,` as the separator can be easily modified by passing the *separator* keyword when initializing the field.

New in version 0.5.

**class** `mongoengine.fields.EmbeddedDocumentField` (*document\_type, \*\*kwargs*)

An embedded document field - with a declared *document\_type*. Only valid values are subclasses of `EmbeddedDocument`.

**class** `mongoengine.fields.GenericEmbeddedDocumentField` (*db\_field=None, name=None, required=False, default=None, unique=False, unique\_with=None, primary\_key=False, validation=None, choices=None, null=False, sparse=False, \*\*kwargs*)

A generic embedded document field - allows any `EmbeddedDocument` to be stored.

Only valid values are subclasses of `EmbeddedDocument`.

---

**Note:** You can use the *choices* param to limit the acceptable `EmbeddedDocument` types

---

### Parameters

- **db\_field** – The database field to store this field in (defaults to the name of the field)
- **name** – Deprecated - use *db\_field*
- **required** – If the field is required. Whether it has to have a value or not. Defaults to `False`.
- **default** – (optional) The default value for this field if no value has been set (or if the value has been unset). It can be a callable.
- **unique** – Is the field value unique or not. Defaults to `False`.
- **unique\_with** – (optional) The other field this field should be unique with.
- **primary\_key** – Mark this field as the primary key. Defaults to `False`.
- **validation** – (optional) A callable to validate the value of the field. Generally this is deprecated in favour of the `FIELD.validate` method
- **choices** – (optional) The valid choices
- **null** – (optional) Is the field value can be null. If no and there is a default value then the default value is set
- **sparse** – (optional) *sparse=True* combined with *unique=True* and *required=False* means that uniqueness won't be enforced for `None` values

- **\*\*kwargs** – (optional) Arbitrary indirection-free metadata for this field can be supplied as additional keyword arguments and accessed as attributes of the field. Must not conflict with any existing attributes. Common metadata includes *verbose\_name* and *help\_text*.

**class** `mongoengine.fields.DynamicField` (*db\_field=None, name=None, required=False, default=None, unique=False, unique\_with=None, primary\_key=False, validation=None, choices=None, null=False, sparse=False, \*\*kwargs*)

A truly dynamic field type capable of handling different and varying types of data.

Used by *DynamicDocument* to handle dynamic data

#### Parameters

- **db\_field** – The database field to store this field in (defaults to the name of the field)
- **name** – Deprecated - use `db_field`
- **required** – If the field is required. Whether it has to have a value or not. Defaults to `False`.
- **default** – (optional) The default value for this field if no value has been set (or if the value has been unset). It can be a callable.
- **unique** – Is the field value unique or not. Defaults to `False`.
- **unique\_with** – (optional) The other field this field should be unique with.
- **primary\_key** – Mark this field as the primary key. Defaults to `False`.
- **validation** – (optional) A callable to validate the value of the field. Generally this is deprecated in favour of the *FIELD.validate* method
- **choices** – (optional) The valid choices
- **null** – (optional) Is the field value can be null. If no and there is a default value then the default value is set
- **sparse** – (optional) *sparse=True* combined with *unique=True* and *required=False* means that uniqueness won't be enforced for *None* values
- **\*\*kwargs** – (optional) Arbitrary indirection-free metadata for this field can be supplied as additional keyword arguments and accessed as attributes of the field. Must not conflict with any existing attributes. Common metadata includes *verbose\_name* and *help\_text*.

**class** `mongoengine.fields.ListField` (*field=None, \*\*kwargs*)

A list field that wraps a standard field, allowing multiple instances of the field to be used as a list in the database.

If using with ReferenceFields see: *One to Many with ListFields*

---

**Note:** Required means it cannot be empty - as the default for ListFields is []

---

**class** `mongoengine.fields.EmbeddedDocumentListField` (*document\_type, \*\*kwargs*)

A `ListField` designed specially to hold a list of embedded documents to provide additional query helpers.

---

**Note:** The only valid list values are subclasses of *EmbeddedDocument*.

---

New in version 0.9.

#### Parameters

- **document\_type** – The type of *EmbeddedDocument* the list will hold.
- **kwargs** – Keyword arguments passed directly into the parent *ListField*.

**class** `mongoengine.fields.SortedListField` (*field*, *\*\*kwargs*)

A *ListField* that sorts the contents of its list before writing to the database in order to ensure that a sorted list is always retrieved.

**Warning:** There is a potential race condition when handling lists. If you set / save the whole list then other processes trying to save the whole list as well could overwrite changes. The safest way to append to a list is to perform a push operation.

New in version 0.4.

Changed in version 0.6: - added reverse keyword

**class** `mongoengine.fields.DictField` (*basecls=None*, *field=None*, *\*args*, *\*\*kwargs*)

A dictionary field that wraps a standard Python dictionary. This is similar to an embedded document, but the structure is not defined.

---

**Note:** Required means it cannot be empty - as the default for *DictFields* is { }

---

New in version 0.3.

Changed in version 0.5: - Can now handle complex / varying types of data

**class** `mongoengine.fields.MapField` (*field=None*, *\*args*, *\*\*kwargs*)

A field that maps a name to a specified field type. Similar to a *DictField*, except the ‘value’ of each item must match the specified field type.

New in version 0.5.

**class** `mongoengine.fields.ReferenceField` (*document\_type*, *dbref=False*, *reverse\_delete\_rule=0*, *\*\*kwargs*)

A reference to a document that will be automatically dereferenced on access (lazily).

Use the *reverse\_delete\_rule* to handle what should happen if the document the field is referencing is deleted. *EmbeddedDocuments*, *DictFields* and *MapFields* does not support *reverse\_delete\_rule* and an *InvalidDocumentError* will be raised if trying to set on one of these *Document / Field* types.

The options are:

- DO\_NOTHING (0) - don’t do anything (default).
- NULLIFY (1) - Updates the reference to null.
- CASCADE (2) - Deletes the documents associated with the reference.
- DENY (3) - Prevent the deletion of the reference object.
- PULL (4) - Pull the reference from a *ListField* of references

Alternative syntax for registering delete rules (useful when implementing bi-directional delete rules)

```
class Bar(Document):
    content = StringField()
    foo = ReferenceField('Foo')

Bar.register_delete_rule(Foo, 'bar', NULLIFY)
```

---

**Note:** *reverse\_delete\_rule* does not trigger pre / post delete signals to be triggered.

---

Changed in version 0.5: added *reverse\_delete\_rule*

Initialises the Reference Field.

#### Parameters

- **dbref** – Store the reference as DBRef or as the ObjectId.id .
- **reverse\_delete\_rule** – Determines what to do when the referring object is deleted

---

**Note:** A reference to an abstract document type is always stored as a DBRef, regardless of the value of *dbref*.

---

**class** `mongoengine.fields.GenericReferenceField(*args, **kwargs)`  
 A reference to *any* Document subclass that will be automatically dereferenced on access (lazily).

#### Note:

- Any documents used as a generic reference must be registered in the document registry. Importing the model will automatically register it.
  - You can use the choices param to limit the acceptable Document types
- 

New in version 0.3.

**class** `mongoengine.fields.CachedReferenceField(document_type, fields=[], auto_sync=True, **kwargs)`

A referencefield with cache fields to purpose pseudo-joins

New in version 0.9.

Initialises the Cached Reference Field.

#### Parameters

- **fields** – A list of fields to be cached in document
- **auto\_sync** – if True documents are auto updated.

**class** `mongoengine.fields.BinaryField(max_bytes=None, **kwargs)`  
 A binary data field.

**class** `mongoengine.fields.FileField(db_alias='default', collection_name='fs', **kwargs)`  
 A GridFS storage field.

New in version 0.4.

Changed in version 0.5: added optional size param for read

Changed in version 0.6: added db\_alias for multodb support

**class** `mongoengine.fields.ImageField(size=None, thumbnail_size=None, collection_name='images', **kwargs)`

A Image File storage field.

**@size (width, height, force):** max size to store images, if larger will be automatically resized ex: size=(800, 600, True)

**@thumbnail (width, height, force):** size to generate a thumbnail

New in version 0.6.

**class** `mongoengine.fields.SequenceField(collection_name=None, db_alias=None, sequence_name=None, value_decorator=None, *args, **kwargs)`

**Provides a sequential counter see:** <http://www.mongodb.org/display/DOCS/Object+IDs#ObjectIDs-SequenceNumbers>

---

**Note:** Although traditional databases often use increasing sequence numbers for primary keys. In MongoDB, the preferred approach is to use Object IDs instead. The concept is that in a very large cluster of machines, it is easier to create an object ID than have global, uniformly increasing sequence numbers.

---

### Parameters

- **collection\_name** – Name of the counter collection (default ‘mongo-engine.counters’)
- **sequence\_name** – Name of the sequence in the collection (default ‘Class-Name.counter’)
- **value\_decorator** – Any callable to use as a counter (default int)

Use any callable as *value\_decorator* to transform calculated counter into any value suitable for your needs, e.g. string or hexadecimal representation of the default integer counter value.

---

**Note:** In case the counter is defined in the abstract document, it will be common to all inherited documents and the default sequence name will be the class name of the abstract document.

---

New in version 0.5.

Changed in version 0.8: added *value\_decorator*

```
class mongoengine.fields.ObjectIdField(db_field=None, name=None, required=False,
                                       default=None, unique=False, unique_with=None,
                                       primary_key=False, validation=None,
                                       choices=None, null=False, sparse=False,
                                       **kwargs)
```

A field wrapper around MongoDB’s ObjectIds.

### Parameters

- **db\_field** – The database field to store this field in (defaults to the name of the field)
- **name** – Deprecated - use *db\_field*
- **required** – If the field is required. Whether it has to have a value or not. Defaults to False.
- **default** – (optional) The default value for this field if no value has been set (or if the value has been unset). It can be a callable.
- **unique** – Is the field value unique or not. Defaults to False.
- **unique\_with** – (optional) The other field this field should be unique with.
- **primary\_key** – Mark this field as the primary key. Defaults to False.
- **validation** – (optional) A callable to validate the value of the field. Generally this is deprecated in favour of the *FIELD.validate* method
- **choices** – (optional) The valid choices
- **null** – (optional) Is the field value can be null. If no and there is a default value then the default value is set
- **sparse** – (optional) *sparse=True* combined with *unique=True* and *required=False* means that uniqueness won’t be enforced for *None* values
- **\*\*kwargs** – (optional) Arbitrary indirection-free metadata for this field can be supplied as additional keyword arguments and accessed as attributes of the field. Must not conflict with any existing attributes. Common metadata includes *verbose\_name* and *help\_text*.

**class** `mongoengine.fields.UUIDField` (*binary=True, \*\*kwargs*)  
A UUID field.

New in version 0.6.

Store UUID data in the database

**Parameters** **binary** – if False store as a string.

Changed in version 0.8.0.

Changed in version 0.6.19.

**class** `mongoengine.fields.GeoPointField` (*db\_field=None, name=None, required=False, default=None, unique=False, unique\_with=None, primary\_key=False, validation=None, choices=None, null=False, sparse=False, \*\*kwargs*)

A list storing a longitude and latitude coordinate.

---

**Note:** this represents a generic point in a 2D plane and a legacy way of representing a geo point. It admits 2d indexes but not “2dsphere” indexes in MongoDB > 2.4 which are more natural for modeling geospatial points. See [Geospatial indexes](#)

---

New in version 0.4.

#### Parameters

- **db\_field** – The database field to store this field in (defaults to the name of the field)
- **name** – Deprecated - use `db_field`
- **required** – If the field is required. Whether it has to have a value or not. Defaults to False.
- **default** – (optional) The default value for this field if no value has been set (or if the value has been unset). It can be a callable.
- **unique** – Is the field value unique or not. Defaults to False.
- **unique\_with** – (optional) The other field this field should be unique with.
- **primary\_key** – Mark this field as the primary key. Defaults to False.
- **validation** – (optional) A callable to validate the value of the field. Generally this is deprecated in favour of the `FIELD.validate` method
- **choices** – (optional) The valid choices
- **null** – (optional) Is the field value can be null. If no and there is a default value then the default value is set
- **sparse** – (optional) `sparse=True` combined with `unique=True` and `required=False` means that uniqueness won't be enforced for `None` values
- **\*\*kwargs** – (optional) Arbitrary indirection-free metadata for this field can be supplied as additional keyword arguments and accessed as attributes of the field. Must not conflict with any existing attributes. Common metadata includes `verbose_name` and `help_text`.

**class** `mongoengine.fields.PointField` (*auto\_index=True, \*args, \*\*kwargs*)  
A GeoJSON field storing a longitude and latitude coordinate.

The data is represented as:

```
{ "type" : "Point" ,  
  "coordinates" : [x, y]}
```

You can either pass a dict with the full information or a list to set the value.

Requires mongodb >= 2.4

New in version 0.8.

**Parameters** `auto_index` (*bool*) – Automatically create a “2dsphere” index. Defaults to *True*.

**class** `mongoengine.fields.LineStringField` (`auto_index=True`, `*args`, `**kwargs`)  
A GeoJSON field storing a line of longitude and latitude coordinates.

The data is represented as:

```
{ "type" : "LineString" ,
  "coordinates" : [[x1, y1], [x1, y1] ... [xn, yn]] }
```

You can either pass a dict with the full information or a list of points.

Requires mongodb >= 2.4

New in version 0.8.

**Parameters** `auto_index` (*bool*) – Automatically create a “2dsphere” index. Defaults to *True*.

**class** `mongoengine.fields.PolygonField` (`auto_index=True`, `*args`, `**kwargs`)  
A GeoJSON field storing a polygon of longitude and latitude coordinates.

The data is represented as:

```
{ "type" : "Polygon" ,
  "coordinates" : [[[x1, y1], [x1, y1] ... [xn, yn]],
                  [[x1, y1], [x1, y1] ... [xn, yn]] ] }
```

You can either pass a dict with the full information or a list of LineStrings. The first LineString being the outside and the rest being holes.

Requires mongodb >= 2.4

New in version 0.8.

**Parameters** `auto_index` (*bool*) – Automatically create a “2dsphere” index. Defaults to *True*.

**class** `mongoengine.fields.MultiPointField` (`auto_index=True`, `*args`, `**kwargs`)  
A GeoJSON field storing a list of Points.

The data is represented as:

```
{ "type" : "MultiPoint" ,
  "coordinates" : [[x1, y1], [x2, y2]] }
```

You can either pass a dict with the full information or a list to set the value.

Requires mongodb >= 2.6

New in version 0.9.

**Parameters** `auto_index` (*bool*) – Automatically create a “2dsphere” index. Defaults to *True*.

**class** `mongoengine.fields.MultiLineStringField` (`auto_index=True`, `*args`, `**kwargs`)  
A GeoJSON field storing a list of LineStrings.

The data is represented as:

```
{ "type" : "MultiLineString" ,
  "coordinates" : [[[x1, y1], [x1, y1] ... [xn, yn]],
                  [[x1, y1], [x1, y1] ... [xn, yn]] ] }
```

You can either pass a dict with the full information or a list of points.

Requires pymongo >= 2.6

New in version 0.9.

**Parameters** `auto_index` (*bool*) – Automatically create a “2dsphere” index. Defaults to *True*.

**class** `mongoengine.fields.MultiPolygonField` (*auto\_index=True, \*args, \*\*kwargs*)

A GeoJSON field storing list of Polygons.

The data is represented as:

```
{ "type" : "MultiPolygon" ,
  "coordinates" : [[
    [[x1, y1], [x1, y1] ... [xn, yn]],
    [[x1, y1], [x1, y1] ... [xn, yn]]
  ], [
    [[x1, y1], [x1, y1] ... [xn, yn]],
    [[x1, y1], [x1, y1] ... [xn, yn]]
  ]
}
```

You can either pass a dict with the full information or a list of Polygons.

Requires pymongo >= 2.6

New in version 0.9.

**Parameters** `auto_index` (*bool*) – Automatically create a “2dsphere” index. Defaults to *True*.

**class** `mongoengine.fields.GridFSError`

**class** `mongoengine.fields.GridFSProxy` (*grid\_id=None, key=None, instance=None, db\_alias='default', collection\_name='fs'*)

Proxy object to handle writing and reading of files to and from GridFS

New in version 0.4.

Changed in version 0.5: - added optional size param to read

Changed in version 0.6: - added collection name param

**class** `mongoengine.fields.ImageGridFsProxy` (*grid\_id=None, key=None, instance=None, db\_alias='default', collection\_name='fs'*)

Proxy for ImageField

versionadded: 0.6

**class** `mongoengine.fields.ImproperlyConfigured`

## 4.3.6 Embedded Document Querying

New in version 0.9.

Additional queries for Embedded Documents are available when using the `EmbeddedDocumentListField` to store a list of embedded documents.

A list of embedded documents is returned as a special list with the following methods:

**class** `mongoengine.base.datastructures.EmbeddedDocumentList` (*list\_items, instance, name*)

**count** ()

The number of embedded documents in the list.

**Returns** The length of the list, equivalent to the result of `len()`.

**create** (\*\*values)

Creates a new embedded document and saves it to the database.

---

**Note:** The embedded document changes are not automatically saved to the database after calling this method.

---

**Parameters values** – A dictionary of values for the embedded document.

**Returns** The new embedded document instance.

**delete** ()

Deletes the embedded documents from the database.

---

**Note:** The embedded document changes are not automatically saved to the database after calling this method.

---

**Returns** The number of entries deleted.

**exclude** (\*\*kwargs)

Filters the list by excluding embedded documents with the given keyword arguments.

**Parameters kwargs** – The keyword arguments corresponding to the fields to exclude on.  
*Multiple arguments are treated as if they are ANDed together.*

**Returns** A new `EmbeddedDocumentList` containing the non-matching embedded documents.

Raises `AttributeError` if a given keyword is not a valid field for the embedded document class.

**filter** (\*\*kwargs)

Filters the list by only including embedded documents with the given keyword arguments.

**Parameters kwargs** – The keyword arguments corresponding to the fields to filter on.  
*Multiple arguments are treated as if they are ANDed together.*

**Returns** A new `EmbeddedDocumentList` containing the matching embedded documents.

Raises `AttributeError` if a given keyword is not a valid field for the embedded document class.

**first** ()

Returns the first embedded document in the list, or `None` if empty.

**get** (\*\*kwargs)

Retrieves an embedded document determined by the given keyword arguments.

**Parameters kwargs** – The keyword arguments corresponding to the fields to search on.  
*Multiple arguments are treated as if they are ANDed together.*

**Returns** The embedded document matched by the given keyword arguments.

Raises `DoesNotExist` if the arguments used to query an embedded document returns no results.  
`MultipleObjectsReturned` if more than one result is returned.

**save** (\*args, \*\*kwargs)

Saves the ancestor document.

**Parameters**

- **args** – Arguments passed up to the ancestor Document's save method.
- **kwargs** – Keyword arguments passed up to the ancestor Document's save method.

`update (**update)`

Updates the embedded documents with the given update values.

---

**Note:** The embedded document changes are not automatically saved to the database after calling this method.

---

**Parameters** `update` – A dictionary of update values to apply to each embedded document.

**Returns** The number of entries updated.

### 4.3.7 Misc

`mongoengine.common._import_class (cls_name)`

Cache mechanism for imports.

Due to complications of circular imports mongoengine needs to do lots of inline imports in functions. This is inefficient as classes are imported repeated throughout the mongoengine code. This is compounded by some recursive functions requiring inline imports.

`mongoengine.common` provides a single point to import all these classes. Circular imports aren't an issue as it dynamically imports the class when first needed. Subsequent calls to the `_import_class()` can then directly retrieve the class from the `mongoengine.common._class_registry_cache`.

## 4.4 Changelog

### 4.4.1 Changes in 0.10.6 - Dev

- Add support for mocking MongoEngine based on mongomock. #1151
- Fixed not being able to run tests on Windows. #1153
- Allow creation of sparse compound indexes. #1114

### 4.4.2 Changes in 0.10.5

- Fix for reloading of strict with special fields. #1156

### 4.4.3 Changes in 0.10.4

- `SaveConditionError` is now importable from the top level package. #1165
- `upsert_one` method added. #1157

### 4.4.4 Changes in 0.10.3

- Fix `read_preference` (it had chaining issues with PyMongo 2.x and it didn't work at all with PyMongo 3.x) #1042

### 4.4.5 Changes in 0.10.2

- Allow shard key to point to a field in an embedded document. #551
- Allow arbitrary metadata in fields. #1129

- ReferenceFields now support abstract document types. #837

#### 4.4.6 Changes in 0.10.1

- Fix infinite recursion with CASCADE delete rules under specific conditions. #1046
- Fix CachedReferenceField bug when loading cached docs as DBRef but failing to save them. #1047
- Fix ignored chained options #842
- Document save's save\_condition error raises *SaveConditionError* exception #1070
- Fix Document.reload for DynamicDocument. #1050
- StrictDict & SemiStrictDict are shadowed at init time. #1105
- Remove test dependencies (nose and rednose) from install dependencies list. #1079
- Recursively build query when using elemMatch operator. #1130
- Fix instance back references for lists of embedded documents. #1131

#### 4.4.7 Changes in 0.10.0

- Django support was removed and will be available as a separate extension. #958
- Allow to load undeclared field with meta attribute 'strict': False #957
- Support for PyMongo 3+ #946
- Removed get\_or\_create() deprecated since 0.8.0. #300
- Improve Document.\_created status when switch collection and db #1020
- Queryset update doesn't go through field validation #453
- Added support for specifying authentication source as option *authSource* in URI. #967
- Fixed mark\_as\_changed to handle higher/lower level fields changed. #927
- ListField of embedded docs doesn't set the \_instance attribute when iterating over it #914
- Support += and \*= for ListField #595
- Use sets for populating dbrefs to dereference
- Fixed unpickled documents replacing the global field's list. #888
- Fixed storage of microseconds in ComplexDateTimeField and unused separator option. #910
- Don't send a "cls" option to ensureIndex (related to <https://jira.mongodb.org/browse/SERVER-769>)
- Fix for updating sorting in SortedListField. #978
- Added \_\_ support to escape field name in fields lookup keywords that match operators names #949
- Fix for issue where FileField deletion did not free space in GridFS.
- No\_dereference() not respected on embedded docs containing reference. #517
- Document save raise an exception if save\_condition fails #1005
- Fixes some internal \_id handling issue. #961
- Updated URL and Email Field regex validators, added schemes argument to URLField validation. #652
- Capped collection multiple of 256. #1011
- Added *BaseQuerySet.aggregate\_sum* and *BaseQuerySet.aggregate\_average* methods.
- Fix for delete with write\_concern {'w': 0}. #1008

- Allow dynamic lookup for more than two parts. #882
- Added support for `min_distance` on geo queries. #831
- Allow to add custom metadata to fields #705

#### 4.4.8 Changes in 0.9.0

- Update `FileField` when creating a new file #714
- Added `EmbeddedDocumentListField` for Lists of Embedded Documents. #826
- `ComplexDateTimeField` should fall back to `None` when `null=True` #864
- Request Support for `$min`, `$max` Field update operators #863
- `BaseDict` does not follow `setdefault` #866
- Add support for `$type` operator # 766
- Fix tests for `pymongo 2.8+` #877
- No module named 'django.utils.importlib' (Django dev) #872
- Field Choices Now Accept Subclasses of Documents
- Ensure Indexes before Each Save #812
- Generate Unique Indices for Lists of EmbeddedDocuments #358
- Sparse fields #515
- `write_concern` not in params of `Collection#remove` #801
- Better `BaseDocument` equality check when not saved #798
- `OperationError: Shard Keys are immutable. Tried to update id even though the document is not yet saved` #771
- `with_limit_and_skip` for count should default like in `pymongo` #759
- Fix storing value of precision attribute in `DecimalField` #787
- Set attribute to `None` does not work (at least for fields with default values) #734
- Querying by a field defined in a subclass raises `InvalidQueryError` #744
- Add Support For MongoDB 2.6.X's `maxTimeMS` #778
- `abstract` shouldn't be inherited in `EmbeddedDocument` # 789
- Allow specifying the '`_cls`' as a field for indexes #397
- Stop ensure\_indexes running on a secondaries unless connection is through mongos #746
- Not overriding default values when loading a subset of fields #399
- Saving document doesn't create new fields in existing collection #620
- Added `Queryset.aggregate` wrapper to aggregation framework #703
- Added support to show original model fields on `to_json` calls instead of `db_field` #697
- Added `Queryset.search_text` to Text indexes searches #700
- Fixed tests for Django 1.7 #696
- Follow `ReferenceFields` in `EmbeddedDocuments` with `select_related` #690
- Added preliminary support for text indexes #680
- Added `elemMatch` operator as well - `match` is too obscure #653
- Added support for progressive JPEG #486 #548

- Allow strings to be used in index creation #675
- Fixed EmbeddedDoc weakref proxy issue #592
- Fixed nested reference field distinct error #583
- Fixed change tracking on nested MapFields #539
- Dynamic fields in embedded documents now visible to `queryset.only()` / `qs.exclude()` #425 #507
- Add `authentication_source` option to `register_connection` #178 #464 #573 #580 #590
- Implemented equality between Documents and DBRefs #597
- Fixed ReferenceField inside nested ListFields dereferencing problem #368
- Added the ability to reload specific document fields #100
- Added `db_alias` support and fixes for custom map/reduce output #586
- `post_save` signal now has access to delta information about field changes #594 #589
- Don't query with `$orderby` for `qs.get()` #600
- Fix id shard key save issue #636
- Fixes issue with recursive embedded document errors #557
- Fix `clear_changed_fields()` clearing unsaved documents bug #602
- Removing support for Django 1.4.x, pymongo 2.5.x, pymongo 2.6.x.
- Removing support for Python < 2.6.6
- Fixed `$maxDistance` location for geoJSON `$near` queries with MongoDB 2.6+ #664
- `QuerySet.modify()` and `Document.modify()` methods to provide `find_and_modify()` like behaviour #677 #773
- Added support for the `using()` method on a queryset #676
- PYPY support #673
- Connection pooling #674
- Avoid to open all documents from cursors in an if stmt #655
- Ability to clear the ordering #657
- Raise `NotUniqueError` in `Document.update()` on `pymongo.errors.DuplicateKeyError` #626
- Slots - memory improvements #625
- Fixed incorrectly split a query key when it ends with “\_” #619
- Geo docs updates #613
- Workaround a dateutil bug #608
- Conditional save for atomic-style operations #511
- Allow dynamic dictionary-style field access #559
- Increase email field length to accommodate new TLDs #726
- `index_cls` is ignored when deciding to set `_cls` as index prefix #733
- Make ‘db’ argument to connection optional #737
- Allow atomic update for the entire *DictField* #742
- Added `MultiPointField`, `MultiLineField`, `MultiPolygonField`
- Fix multiple connections aliases being rewritten #748
- Fixed a few instances where `reverse_delete_rule` was written as `reverse_delete_rules`. #791

- Make `in_bulk()` respect `no_dereference()` #775
- Handle None from model `__str__`; Fixes #753 #754
- `_get_changed_fields` fix for embedded documents with id field. #925

#### 4.4.9 Changes in 0.8.7

- Calling reload on deleted / nonexistent documents raises `DoesNotExist` (#538)
- Stop `ensure_indexes` running on a secondaries (#555)
- Fix circular import issue with `django auth` (#531) (#545)

#### 4.4.10 Changes in 0.8.6

- Fix `django auth` import (#531)

#### 4.4.11 Changes in 0.8.5

- Fix multi level nested fields getting marked as changed (#523)
- Django 1.6 login fix (#522) (#527)
- Django 1.6 session fix (#509)
- `EmbeddedDocument._instance` is now set when setting the attribute (#506)
- Fixed `EmbeddedDocument` with `ReferenceField` equality issue (#502)
- Fixed `GenericReferenceField` serialization order (#499)
- Fixed count and none bug (#498)
- Fixed bug with `.only()` and `DictField` with digit keys (#496)
- Added `user_permissions` to Django User object (#491, #492)
- Fix updating Geo Location fields (#488)
- Fix handling invalid dict field value (#485)
- Added `app_label` to `MongoUser` (#484)
- Use defaults when host and port are passed as None (#483)
- Fixed distinct casting issue with `ListField` of `EmbeddedDocuments` (#470)
- Fixed Django 1.6 sessions (#454, #480)

#### 4.4.12 Changes in 0.8.4

- Remove database name necessity in uri connection schema (#452)
- Fixed “\$pull” semantics for nested `ListFields` (#447)
- Allow fields to be named the same as query operators (#445)
- Updated field filter logic - can now exclude subclass fields (#443)
- Fixed dereference issue with embedded listfield referencefields (#439)
- Fixed slice when using inheritance causing fields to be excluded (#437)
- Fixed `._get_db()` attribute after a `Document.switch_db()` (#441)
- Dynamic Fields store and recompose Embedded Documents / Documents correctly (#449)

- Handle dynamic fieldnames that look like digits (#434)
- Added `get_user_document` and improve `mongo_auth` module (#423)
- Added str representation of `GridFSProxy` (#424)
- Update transform to handle docs erroneously passed to `unset` (#416)
- Fixed indexing - turn off `_cls` (#414)
- Fixed dereference threading issue in `ComplexField.__get__` (#412)
- Fixed `QuerySetNoCache.count()` caching (#410)
- Don't follow references in `_get_changed_fields` (#422, #417)
- Allow args and kwargs to be passed through to `_json` (#420)

#### 4.4.13 Changes in 0.8.3

- Fixed `EmbeddedDocuments` with `id` also storing `_id` (#402)
- Added `get_proxy_object` helper to filefields (#391)
- Added `QuerySetNoCache` and `QuerySet.no_cache()` for lower memory consumption (#365)
- Fixed sum and average mapreduce dot notation support (#375, #376, #393)
- Fixed `as_pymongo` to return the id (#386)
- `Document.select_related()` now respects `db_alias` (#377)
- Reload uses `shard_key` if applicable (#384)
- Dynamic fields are ordered based on creation and stored in `_fields_ordered` (#396)  
**Potential breaking change:** <http://docs.mongoengine.org/en/latest/upgrade.html#to-0-8-3>
- Fixed pickling dynamic documents `_dynamic_fields` (#387)
- Fixed `ListField` `setslice` and `delslice` dirty tracking (#390)
- Added Django 1.5 PY3 support (#392)
- Added `match` (`$elemMatch`) support for `EmbeddedDocuments` (#379)
- Fixed `weakref` being valid after reload (#374)
- Fixed `queryset.get()` respecting `no_dereference` (#373)
- Added `full_result` kwarg to `update` (#380)

#### 4.4.14 Changes in 0.8.2

- Added `compare_indexes` helper (#361)
- Fixed cascading saves which weren't turned off as planned (#291)
- Fixed Datastructures so instances are a `Document` or `EmbeddedDocument` (#363)
- Improved cascading saves write performance (#361)
- Fixed ambiguity and differing behaviour regarding field defaults (#349)
- `ImageFields` now include PIL error messages if invalid error (#353)
- Added lock when calling `doc.Delete()` for when signals have no sender (#350)
- Reload forces read preference to be `PRIMARY` (#355)
- Querysets are now less restrictive when querying duplicate fields (#332, #333)

- FileField now honouring db\_alias (#341)
- Removed customised \_\_set\_\_ change tracking in ComplexBaseField (#344)
- Removed unused var in \_get\_changed\_fields (#347)
- Added pre\_save\_post\_validation signal (#345)
- DateTimeField now auto converts valid datetime isostrings into dates (#343)
- DateTimeField now uses dateutil for parsing if available (#343)
- Fixed Doc.objects(read\_preference=X) not setting read preference (#352)
- Django session ttl index expiry fixed (#329)
- Fixed pickle.loads (#342)
- Documentation fixes

#### 4.4.15 Changes in 0.8.1

- Fixed Python 2.6 django auth importlib issue (#326)
- Fixed pickle unsaved document regression (#327)

#### 4.4.16 Changes in 0.8.0

- Fixed querying ReferenceField custom\_id (#317)
- Fixed pickle issues with collections (#316)
- Added get\_next\_value preview for SequenceFields (#319)
- Added no\_sub\_classes context manager and queryset helper (#312)
- Querysets now utilises a local cache
- Changed \_\_len\_\_ behaviour in the queryset (#247, #311)
- Fixed querying string versions of ObjectIds issue with ReferenceField (#307)
- Added \$setOnInsert support for upserts (#308)
- Upserts now possible with just query parameters (#309)
- Upserting is the only way to ensure docs are saved correctly (#306)
- Fixed register\_delete\_rule inheritance issue
- Fix cloning of sliced querysets (#303)
- Fixed update\_one write concern (#302)
- Updated minimum requirement for pymongo to 2.5
- Add support for new gejson fields, indexes and queries (#299)
- If values cant be compared mark as changed (#287)
- Ensure as\_pymongo() and to\_json honour only() and exclude() (#293)
- Document serialization uses field order to ensure a strict order is set (#296)
- DecimalField now stores as float not string (#289)
- UUIDField now stores as a binary by default (#292)
- Added Custom User Model for Django 1.5 (#285)
- Cascading saves now default to off (#291)

- ReferenceField now store ObjectId's by default rather than DBRef (#290)
- Added ImageField support for inline replacements (#86)
- Added SequenceField.set\_next\_value(value) helper (#159)
- Updated .only() behaviour - now like exclude it is chainable (#202)
- Added with\_limit\_and\_skip support to count() (#235)
- Objects queryset manager now inherited (#256)
- Updated connection to use MongoClient (#262, #274)
- Fixed db\_alias and inherited Documents (#143)
- Documentation update for document errors (#124)
- Deprecated *get\_or\_create* (#35)
- Updated inheritable objects created by upsert now contain *\_cls* (#118)
- Added support for creating documents with embedded documents in a single operation (#6)
- Added *to\_json* and *from\_json* to Document (#1)
- Added *to\_json* and *from\_json* to QuerySet (#131)
- Updated index creation now tied to Document class (#102)
- Added *none()* to queryset (#127)
- Updated SequenceFields to allow post processing of the calculated counter value (#141)
- Added *clean* method to documents for pre validation data cleaning (#60)
- Added support setting for read preference at a query level (#157)
- Added *\_instance* to EmbeddedDocuments pointing to the parent (#139)
- Inheritance is off by default (#122)
- Remove *\_types* and just use *\_cls* for inheritance (#148)
- Only allow QNode instances to be passed as query objects (#199)
- Dynamic fields are now validated on save (#153) (#154)
- Added support for multiple slices and made slicing chainable. (#170) (#190) (#191)
- Fixed GridFSProxy *\_\_getattr\_\_* behaviour (#196)
- Fix Django timezone support (#151)
- Simplified Q objects, removed QueryTreeTransformerVisitor (#98) (#171)
- FileFields now copyable (#198)
- Querysets now return clones and are no longer edit in place (#56)
- Added support for \$maxDistance (#179)
- Uses *getlasterror* to test created on updated saves (#163)
- Fixed inheritance and unique index creation (#140)
- Fixed reverse delete rule with inheritance (#197)
- Fixed validation for GenericReferences which haven't been dereferenced
- Added *switch\_db* context manager (#106)
- Added *switch\_db* method to document instances (#106)
- Added *no\_dereference* context manager (#82) (#61)
- Added *switch\_collection* context manager (#220)

- Added `switch_collection` method to document instances (#220)
- Added support for compound primary keys (#149) (#121)
- Fixed overriding objects with custom manager (#58)
- Added `no_dereference` method for querysets (#82) (#61)
- Undefined data should not override instance methods (#49)
- Added Django Group and Permission (#142)
- Added Doc class and pk to Validation messages (#69)
- Fixed Documents deleted via a queryset don't call any signals (#105)
- Added the “`get_decoded`” method to the `MongoSession` class (#216)
- Fixed invalid choices error bubbling (#214)
- Updated Save so it calls `$set` and `$unset` in a single operation (#211)
- Fixed inner queryset looping (#204)

#### 4.4.17 Changes in 0.7.10

- Fix `UnicodeEncodeError` for `dbref` (#278)
- Allow construction using positional parameters (#268)
- Updated `EmailField` length to support long domains (#243)
- Added 64-bit integer support (#251)
- Added Django sessions TTL support (#224)
- Fixed issue with numerical keys in `MapField(EmbeddedDocumentField())` (#240)
- Fixed clearing `_changed_fields` for complex nested embedded documents (#237, #239, #242)
- Added “`id`” back to `_data` dictionary (#255)
- Only mark a field as changed if the value has changed (#258)
- Explicitly check for Document instances when dereferencing (#261)
- Fixed `order_by` chaining issue (#265)
- Added dereference support for tuples (#250)
- Resolve field name to db field name when using `distinct` (#260, #264, #269)
- Added `kwargs` to `doc.save` to help interop with django (#223, #270)
- Fixed cloning querysets in PY3
- Int fields no longer unset in save when changed to 0 (#272)
- Fixed `ReferenceField` query chaining bug fixed (#254)

#### 4.4.18 Changes in 0.7.9

- Better fix handling for old style `_types`
- Embedded `SequenceFields` follow collection naming convention

#### 4.4.19 Changes in 0.7.8

- Fix sequence fields in embedded documents (#166)
- Fix query chaining with `.order_by()` (#176)
- Added optional encoding and collection config for Django sessions (#180, #181, #183)
- Fixed EmailField so can add extra validation (#173, #174, #187)
- Fixed bulk inserts can now handle custom pk's (#192)
- Added `as_pymongo` method to return raw or cast results from pymongo (#193)

#### 4.4.20 Changes in 0.7.7

- Fix handling for old style `_types`

#### 4.4.21 Changes in 0.7.6

- Unicode fix for repr (#133)
- Allow updates with match operators (#144)
- Updated URLField - now can have a override the regex (#136)
- Allow Django AuthenticationBackends to work with Django user (hmarr/mongoengine#573)
- Fixed reload issue with ReferenceField where `dbref=False` (#138)

#### 4.4.22 Changes in 0.7.5

- ReferenceFields with `dbref=False` use ObjectId instead of strings (#134) See ticket for upgrade notes (#134)

#### 4.4.23 Changes in 0.7.4

- Fixed index inheritance issues - firmed up testcases (#123) (#125)

#### 4.4.24 Changes in 0.7.3

- Reverted EmbeddedDocuments meta handling - now can turn off inheritance (#119)

#### 4.4.25 Changes in 0.7.2

- Update index spec generation so its not destructive (#113)

#### 4.4.26 Changes in 0.7.1

- Fixed index spec inheritance (#111)

#### 4.4.27 Changes in 0.7.0

- Updated `queryset.delete` so you can use with `skip / limit` (#107)
- Updated index creation allows `kwargs` to be passed through `refs` (#104)
- Fixed Q object merge edge case (#109)
- Fixed reloading on sharded documents (hmarr/mongoengine#569)
- Added `NotUniqueError` for duplicate keys (#62)
- Added custom collection / sequence naming for `SequenceFields` (#92)
- Fixed `UnboundLocalError` in composite index with `pk` field (#88)
- Updated `ReferenceField`'s to optionally store `ObjectId` strings this will become the default in 0.8 (#89)
- Added `FutureWarning` - save will default to `cascade=False` in 0.8
- Added example of indexing embedded document fields (#75)
- Fixed `ImageField` resizing when forcing size (#80)
- Add flexibility for fields handling bad data (#78)
- Embedded Documents no longer handle meta definitions
- Use `weakref` proxies in base lists / dicts (#74)
- Improved `queryset` filtering (hmarr/mongoengine#554)
- Fixed Dynamic Documents and Embedded Documents (hmarr/mongoengine#561)
- Fixed abstract classes and shard keys (#64)
- Fixed Python 2.5 support
- Added Python 3 support (thanks to Laine Heron)

#### 4.4.28 Changes in 0.6.20

- Added support for `distinct` and `db_alias` (#59)
- Improved support for chained `querysets` when constraining the same fields (hmarr/mongoengine#554)
- Fixed `BinaryField` lookup re (#48)

#### 4.4.29 Changes in 0.6.19

- Added Binary support to `UUID` (#47)
- Fixed `MapField` lookup for fields without declared lookups (#46)
- Fixed `BinaryField` python value issue (#48)
- Fixed `SequenceField` non numeric value lookup (#41)
- Fixed `queryset` manager issue (#52)
- Fixed `FileField` comparison (hmarr/mongoengine#547)

#### 4.4.30 Changes in 0.6.18

- Fixed recursion loading bug in `_get_changed_fields`

#### 4.4.31 Changes in 0.6.17

- Fixed issue with custom queryset manager expecting explicit variable names

#### 4.4.32 Changes in 0.6.16

- Fixed issue where `db_alias` wasn't inherited

#### 4.4.33 Changes in 0.6.15

- Updated validation error messages
- Added support for null / zero / false values in `item_frequencies`
- Fixed cascade save edge case
- Fixed geo index creation through reference fields
- Added support for args / kwargs when using `@queryset_manager`
- Deref list custom id fix

#### 4.4.34 Changes in 0.6.14

- Fixed error dict with nested validation
- Fixed Int/Float fields and not equals None
- Exclude tests from installation
- Allow tuples for index meta
- Fixed use of str in instance checks
- Fixed unicode support in transform update
- Added support for `add_to_set` and `each`

#### 4.4.35 Changes in 0.6.13

- Fixed EmbeddedDocument `db_field` validation issue
- Fixed StringField unicode issue
- Fixes `__repr__` modifying the cursor

#### 4.4.36 Changes in 0.6.12

- Fixes scalar lookups for `primary_key`
- Fixes error with `_delta` handling DBRefs

#### 4.4.37 Changes in 0.6.11

- Fixed inconsistency handling None values field attrs
- Fixed `map_field` embedded `db_field` issue
- Fixed `.save()` `_delta` issue with DBRefs
- Fixed Django TestCase

- Added cmp to Embedded Document
- Added PULL reverse\_delete\_rule
- Fixed CASCADE delete bug
- Fixed db\_field data load error
- Fixed recursive save with FileField

#### 4.4.38 Changes in 0.6.10

- Fixed basedict / baselist to return super(..)
- Promoted BaseDynamicField to DynamicField

#### 4.4.39 Changes in 0.6.9

- Fixed sparse indexes on inherited docs
- Removed FileField auto deletion, needs more work maybe 0.7

#### 4.4.40 Changes in 0.6.8

- Fixed FileField losing reference when no default set
- Removed possible race condition from FileField (grid\_file)
- Added assignment to save, can now do: *b = MyDoc(\*\*kwargs).save()*
- Added support for pull operations on nested EmbeddedDocuments
- Added support for choices with GenericReferenceFields
- Added support for choices with GenericEmbeddedDocumentFields
- Fixed Django 1.4 sessions first save data loss
- FileField now automatically delete files on .delete()
- Fix for GenericReference to\_mongo method
- Fixed connection regression
- Updated Django User document, now allows inheritance

#### 4.4.41 Changes in 0.6.7

- Fixed indexing on ‘\_id’ or ‘pk’ or ‘id’
- Invalid data from the DB now raises a InvalidDocumentError
- Cleaned up the Validation Error - docs and code
- Added meta *auto\_create\_index* so you can disable index creation
- Added write concern options to inserts
- Fixed typo in meta for index options
- Bug fix Read preference now passed correctly
- Added support for File like objects for GridFS
- Fix for #473 - Dereferencing abstracts

#### 4.4.42 Changes in 0.6.6

- Django 1.4 fixed (finally)
- Added tests for Django

#### 4.4.43 Changes in 0.6.5

- More Django updates

#### 4.4.44 Changes in 0.6.4

- Refactored connection / fixed replicasetconnection
- Bug fix for unknown connection alias error message
- Sessions support Django 1.3 and Django 1.4
- Minor fix for ReferenceField

#### 4.4.45 Changes in 0.6.3

- Updated sessions for Django 1.4
- Bug fix for updates where listfields contain embedded documents
- Bug fix for collection naming and mixins

#### 4.4.46 Changes in 0.6.2

- Updated documentation for ReplicaSet connections
- Hack round `_types` issue with SERVER-5247 - querying other arrays may also cause problems.

#### 4.4.47 Changes in 0.6.1

- Fix for replicaSet connections

#### 4.4.48 Changes in 0.6

- Added FutureWarning to inherited classes not declaring 'allow\_inheritance' as the default will change in 0.7
- Added support for covered indexes when inheritance is off
- No longer always upsert on save for items with a '\_id'
- Error raised if update doesn't have an operation
- DeReferencing is now thread safe
- Errors raised if trying to perform a join in a query
- Updates can now take `__raw__` queries
- Added custom 2D index declarations
- Added replicaSet connection support
- Updated deprecated imports from pymongo (safe for pymongo 2.2)

- Added uri support for connections
- Added scalar for efficiently returning partial data values (aliased to values\_list)
- Fixed limit skip bug
- Improved Inheritance / Mixin
- Added sharding support
- Added pymongo 2.1 support
- Fixed Abstract documents can now declare indexes
- Added db\_alias support to individual documents
- Fixed GridFS documents can now be pickled
- Added Now raises an InvalidDocumentError when declaring multiple fields with the same db\_field
- Added InvalidQueryError when calling with\_id with a filter
- Added support for DBRefs in distinct()
- Fixed issue saving False booleans
- Fixed issue with dynamic documents deltas
- Added Reverse Delete Rule support to ListFields - MapFields aren't supported
- Added customisable cascade kwarg options
- Fixed Handle None values for non-required fields
- Removed Document.\_get\_subclasses() - no longer required
- Fixed bug requiring subclasses when not actually needed
- Fixed deletion of dynamic data
- Added support for the \$elementMatch operator
- Added reverse option to SortedListFields
- Fixed dereferencing - multi directional list dereferencing
- Fixed issue creating indexes with recursive embedded documents
- Fixed recursive lookup in \_unique\_with\_indexes
- Fixed passing ComplexField defaults to constructor for ReferenceFields
- Fixed validation of DictField Int keys
- Added optional cascade saving
- Fixed dereferencing - max\_depth now taken into account
- Fixed document mutation saving issue
- Fixed positional operator when replacing embedded documents
- Added Non-Django Style choices back (you can have either)
- Fixed \_\_repr\_\_ of a sliced queryset
- Added recursive validation error of documents / complex fields
- Fixed breaking during queryset iteration
- Added pre and post bulk-insert signals
- Added ImageField - requires PIL
- Fixed Reference Fields can be None in get\_or\_create / queries
- Fixed accessing pk on an embedded document

- Fixed calling a queryset after drop\_collection now recreates the collection
- Add field name to validation exception messages
- Added UUID field
- Improved efficiency of .get()
- Updated ComplexFields so if required they won't accept empty lists / dicts
- Added spec file for rpm-based distributions
- Fixed ListField so it doesn't accept strings
- Added DynamicDocument and EmbeddedDynamicDocument classes for expando schemas

#### 4.4.49 Changes in v0.5.2

- A Robust Circular reference bugfix

#### 4.4.50 Changes in v0.5.1

- Fixed simple circular reference bug

#### 4.4.51 Changes in v0.5

- Added InvalidDocumentError - so Document core methods can't be overwritten
- Added GenericEmbeddedDocument - so you can embed any type of embeddable document
- Added within\_polygon support - for those with mongodb 1.9
- Updated sum / average to use map\_reduce as db.eval doesn't work in sharded environments
- Added where() - filter to allowing users to specify query expressions as Javascript
- Added SequenceField - for creating sequential counters
- Added update() convenience method to a document
- Added cascading saves - so changes to Referenced documents are saved on .save()
- Added select\_related() support
- Added support for the positional operator
- Updated geo index checking to be recursive and check in embedded documents
- Updated default collection naming convention
- Added Document Mixin support
- Fixed queryet \_\_repr\_\_ mid iteration
- Added hint() support, so can tell Mongo the proper index to use for the query
- Fixed issue with inconsistent setting of \_cls breaking inherited referencing
- Added help\_text and verbose\_name to fields to help with some form libs
- Updated item\_frequencies to handle embedded document lookups
- Added delta tracking now only sets / unsets explicitly changed fields
- Fixed saving so sets updated values rather than overwrites
- Added ComplexDateTimeField - Handles datetimes correctly with microseconds
- Added ComplexBaseField - for improved flexibility and performance

- Added `get_FIELD_display()` method for easy choice field displaying
- Added `queryset.slave_okay(enabled)` method
- Updated `queryset.timeout(enabled)` and `queryset.snapshot(enabled)` to be chainable
- Added `insert` method for bulk inserts
- Added blinker signal support
- Added `query_counter` context manager for tests
- Added `map_reduce` method `item_frequencies` and set as default (as `db.eval` doesn't work in sharded environments)
- Added `inline_map_reduce` option to `map_reduce`
- Updated connection exception so it provides more info on the cause.
- Added searching multiple levels deep in `DictField`
- Added `DictField` entries containing strings to use matching operators
- Added `MapField`, similar to `DictField`
- Added Abstract Base Classes
- Added Custom Objects Managers
- Added sliced subfields updating
- Added `NotRegistered` exception if dereferencing `Document` not in the registry
- Added a write concern for `save`, `update`, `update_one` and `get_or_create`
- Added slicing / subarray fetching controls
- Fixed various unique index and other index issues
- Fixed threaded connection issues
- Added spherical geospatial query operators
- Updated `queryset` to handle latest version of `pymongo` `map_reduce` now requires an output.
- Added `Document.__hash__`, `__ne__` for pickling
- Added `FileField` optional size arg for read method
- Fixed `FileField` seek and tell methods for reading files
- Added `QuerySet.clone` to support copying querysets
- Fixed `item_frequencies` when using name that's the same as a native js function
- Added reverse delete rules
- Fixed issue with unset operation
- Fixed Q-object bug
- Added `QuerySet.all_fields` resets previous `.only()` and `.exclude()`
- Added `QuerySet.exclude`
- Added django style choices
- Fixed order and filter issue
- Added `QuerySet.only` subfield support
- Added `creation_counter` to `BaseField` allowing fields to be sorted in the way the user has specified them
- Fixed various errors
- Added many tests

#### 4.4.52 Changes in v0.4

- Added `GridFSStorage` Django storage backend
- Added `FileField` for GridFS support
- New Q-object implementation, which is no longer based on Javascript
- Added `SortedListField`
- Added `EmailField`
- Added `GeoPointField`
- Added `exact` and `iexact` match operators to `QuerySet`
- Added `get_document_or_404` and `get_list_or_404` Django shortcuts
- Added new query operators for Geo queries
- Added `not` query operator
- Added new update operators: `pop` and `add_to_set`
- Added `__raw__` query parameter
- Added support for custom queriesets
- Fixed document inheritance primary key issue
- Added support for querying by array element position
- Base class can now be defined for `DictField`
- Fixed MRO error that occurred on document inheritance
- Added `QuerySet.distinct`, `QuerySet.create`, `QuerySet.snapshot`, `QuerySet.timeout` and `QuerySet.all`
- Subsequent calls to `connect()` now work
- Introduced `min_length` for `StringField`
- Fixed multi-process connection issue
- Other minor fixes

#### 4.4.53 Changes in v0.3

- Added MapReduce support
- Added `contains`, `startswith` and `endswith` query operators (and case-insensitive versions that are prefixed with 'i')
- Deprecated fields' `name` parameter, replaced with `db_field`
- Added `QuerySet.only` for only retrieving specific fields
- Added `QuerySet.in_bulk()` for bulk querying using ids
- `QuerySets` now have a `rewind()` method, which is called automatically when the iterator is exhausted, allowing `QuerySets` to be reused
- Added `DictField`
- Added `URLField`
- Added `DecimalField`
- Added `BinaryField`
- Added `GenericReferenceField`

- Added `get()` and `get_or_create()` methods to `QuerySet`
- `ReferenceFields` may now reference the document they are defined on (recursive references) and documents that have not yet been defined
- `Document` objects may now be compared for equality (equal if `_ids` are equal and documents are of same type)
- `QuerySet` update methods now have an `upsert` parameter
- Added field name substitution for Javascript code (allows the user to use the Python names for fields in JS, which are later substituted for the real field names)
- `Q` objects now support regex querying
- Fixed bug where referenced documents within lists weren't properly dereferenced
- `ReferenceFields` may now be queried using their `_id`
- Fixed bug where `EmbeddedDocuments` couldn't be non-polymorphic
- `queryset_manager` functions now accept two arguments – the document class as the first and the query-set as the second
- Fixed bug where `QuerySet.exec_js` ignored `Q` objects
- Other minor fixes

### 4.4.54 Changes in v0.2.2

- Fixed bug that prevented indexes from being used on `ListFields`
- `Document.filter()` added as an alias to `Document.__call__()`
- `validate()` may now be used on `EmbeddedDocuments`

### 4.4.55 Changes in v0.2.1

- Added a MongoEngine backend for Django sessions
- Added `force_insert` to `Document.save()`
- Improved querying syntax for `ListField` and `EmbeddedDocumentField`
- Added support for user-defined primary keys (`_id` in MongoDB)

### 4.4.56 Changes in v0.2

- Added `Q` class for building advanced queries
- Added `QuerySet` methods for atomic updates to documents
- Fields may now specify `unique=True` to enforce uniqueness across a collection
- Added option for default document ordering
- Fixed bug in index definitions

### 4.4.57 Changes in v0.1.3

- Added Django authentication backend
- Added `Document.meta` support for indexes, which are ensured just before querying takes place
- A few minor bugfixes

#### 4.4.58 Changes in v0.1.2

- Query values may be processed before before being used in queries
- Made connections lazy
- Fixed bug in Document dictionary-style access
- Added `BooleanField`
- Added `Document.reload()` method

#### 4.4.59 Changes in v0.1.1

- Documents may now use capped collections

### 4.5 Upgrading

#### 4.5.1 0.9.0

The 0.8.7 package on pypi was corrupted. If upgrading from 0.8.7 to 0.9.0 please follow:

```
pip uninstall pymongo
pip uninstall mongoengine
pip install pymongo==2.8
pip install mongoengine
```

#### 4.5.2 0.8.7

Calling `reload` on deleted / nonexistent documents now raises a `DoesNotExist` exception.

#### 4.5.3 0.8.2 to 0.8.3

Minor change that may impact users:

`DynamicDocument` fields are now stored in creation order after any declared fields. Previously they were stored alphabetically.

#### 4.5.4 0.7 to 0.8

There have been numerous backwards breaking changes in 0.8. The reasons for these are to ensure that MongoEngine has sane defaults going forward and that it performs the best it can out of the box. Where possible there have been `FutureWarnings` to help get you ready for the change, but that hasn't been possible for the whole of the release.

**Warning:** Breaking changes - test upgrading on a test system before putting live. There maybe multiple manual steps in migrating and these are best honed on a staging / test system.

### Python and PyMongo

MongoEngine requires python 2.6 (or above) and pymongo 2.5 (or above)

## Data Model

### Inheritance

The inheritance model has changed, we no longer need to store an array of `types` with the model we can just use the classname in `_cls`. This means that you will have to update your indexes for each of your inherited classes like so:

```
# 1. Declaration of the class
class Animal(Document):
    name = StringField()
    meta = {
        'allow_inheritance': True,
        'indexes': ['name']
    }

# 2. Remove _types
collection = Animal._get_collection()
collection.update({}, {"$unset": {"_types": 1}}, multi=True)

# 3. Confirm extra data is removed
count = collection.find({'_types': {"$exists": True}}).count()
assert count == 0

# 4. Remove indexes
info = collection.index_information()
indexes_to_drop = [key for key, value in info.iteritems()
                   if '_types' in dict(value['key'])]
for index in indexes_to_drop:
    collection.drop_index(index)

# 5. Recreate indexes
Animal.ensure_indexes()
```

### Document Definition

The default for inheritance has changed - it is now off by default and `_cls` will not be stored automatically with the class. So if you extend your `Document` or `EmbeddedDocuments` you will need to declare `allow_inheritance` in the meta data like so:

```
class Animal(Document):
    name = StringField()

    meta = {'allow_inheritance': True}
```

Previously, if you had data in the database that wasn't defined in the Document definition, it would set it as an attribute on the document. This is no longer the case and the data is set only in the document `._data` dictionary:

```
>>> from mongoengine import *
>>> class Animal(Document):
...     name = StringField()
...
>>> cat = Animal(name="kit", size="small")

# 0.7
>>> cat.size
u'small'

# 0.8
>>> cat.size
```

```
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
AttributeError: 'Animal' object has no attribute 'size'
```

The Document class has introduced a reserved function `clean()`, which will be called before saving the document. If your document class happens to have a method with the same name, please try to rename it.

```
def clean(self): pass
```

## ReferenceField

ReferenceFields now store ObjectIds by default - this is more efficient than DBRefs as we already know what Document types they reference:

```
# Old code
class Animal(Document):
    name = ReferenceField('self')

# New code to keep dbrefs
class Animal(Document):
    name = ReferenceField('self', dbref=True)
```

To migrate all the references you need to touch each object and mark it as dirty eg:

```
# Doc definition
class Person(Document):
    name = StringField()
    parent = ReferenceField('self')
    friends = ListField(ReferenceField('self'))

# Mark all ReferenceFields as dirty and save
for p in Person.objects:
    p._mark_as_changed('parent')
    p._mark_as_changed('friends')
    p.save()
```

An example test migration for ReferenceFields is available on [github](#).

---

**Note:** Internally mongoengine handles ReferenceFields the same, so they are converted to DBRef on loading and ObjectIds or DBRefs depending on settings on storage.

---

## UUIDField

UUIDFields now default to storing binary values:

```
# Old code
class Animal(Document):
    uuid = UUIDField()

# New code
class Animal(Document):
    uuid = UUIDField(binary=False)
```

To migrate all the uuids you need to touch each object and mark it as dirty eg:

```
# Doc definition
class Animal(Document):
    uuid = UUIDField()
```

```
# Mark all UUIDFields as dirty and save
for a in Animal.objects:
    a._mark_as_changed('uuid')
    a.save()
```

An example test migration for UUIDFields is available on [github](#).

### DecimalField

DecimalFields now store floats - previously it was storing strings and that made it impossible to do comparisons when querying correctly.:

```
# Old code
class Person(Document):
    balance = DecimalField()

# New code
class Person(Document):
    balance = DecimalField(force_string=True)
```

To migrate all the DecimalFields you need to touch each object and mark it as dirty eg:

```
# Doc definition
class Person(Document):
    balance = DecimalField()

# Mark all DecimalField's as dirty and save
for p in Person.objects:
    p._mark_as_changed('balance')
    p.save()
```

---

**Note:** DecimalFields have also been improved with the addition of precision and rounding. See [DecimalField](#) for more information.

---

An example test migration for DecimalFields is available on [github](#).

### Cascading Saves

To improve performance document saves will no longer automatically cascade. Any changes to a Document's references will either have to be saved manually or you will have to explicitly tell it to cascade on save:

```
# At the class level:
class Person(Document):
    meta = {'cascade': True}

# Or on save:
my_document.save(cascade=True)
```

### Storage

Document and Embedded Documents are now serialized based on declared field order. Previously, the data was passed to mongoddb as a dictionary and which meant that order wasn't guaranteed - so things like \$addToSet operations on [EmbeddedDocument](#) could potentially fail in unexpected ways.

If this impacts you, you may want to rewrite the objects using the `doc.mark_as_dirty('field')` pattern described above. If you are using a compound primary key then you will need to ensure the order is fixed and match your `EmbeddedDocument` to that order.

## Querysets

### Attack of the clones

Querysets now return clones and should no longer be considered editable in place. This brings us in line with how Django's querysets work and removes a long running gotcha. If you edit your querysets inplace you will have to update your code like so:

```
# Old code:
mammals = Animal.objects(type="mammal")
mammals.filter(order="Carnivora") # Returns a cloned queryset that isn't
↳assigned to anything - so this will break in 0.8
[m for m in mammals] # This will return all mammals in 0.8 as
↳the 2nd filter returned a new queryset

# Update example a) assign queryset after a change:
mammals = Animal.objects(type="mammal")
carnivores = mammals.filter(order="Carnivora") # Reassign the new queryset so
↳filter can be applied
[m for m in carnivores] # This will return all carnivores

# Update example b) chain the queryset:
mammals = Animal.objects(type="mammal").filter(order="Carnivora") # The final
↳queryset is assigned to mammals
[m for m in mammals] # This will
↳return all carnivores
```

### Len iterates the queryset

If you ever did `len(queryset)` it previously did a `count()` under the covers, this caused some unusual issues. As `len(queryset)` is most often used by `list(queryset)` we now cache the queryset results and use that for the length.

This isn't as performant as a `count()` and if you aren't iterating the queryset you should upgrade to use `count`:

```
# Old code
len(Animal.objects(type="mammal"))

# New code
Animal.objects(type="mammal").count()
```

### .only() now inline with .exclude()

The behaviour of `.only()` was highly ambiguous, now it works in mirror fashion to `.exclude()`. Chaining `.only()` calls will increase the fields required:

```
# Old code
Animal.objects().only(['type', 'name']).only('name', 'order') # Would have
↳returned just `name`

# New code
Animal.objects().only('name')

# Note:
Animal.objects().only(['name']).only('order') # Now returns `name` *and* `order`
```

### Client

PyMongo 2.4 came with a new connection client; `MongoClient` and started the depreciation of the old `Connection`. MongoEngine now uses the latest `MongoClient` for connections. By default operations were *safe* but if you turned them off or used the connection directly this will impact your queries.

### Querysets

#### Safe

*safe* has been depreciated in the new `MongoClient` connection. Please use *write\_concern* instead. As *safe* always defaulted as *True* normally no code change is required. To disable confirmation of the write just pass `{"w": 0}` eg:

```
# Old
Animal(name="Dinasour").save(safe=False)

# new code:
Animal(name="Dinasour").save(write_concern={"w": 0})
```

#### Write Concern

*write\_options* has been replaced with *write\_concern* to bring it inline with pymongo. To upgrade simply rename any instances where you used the *write\_option* keyword to *write\_concern* like so:

```
# Old code:
Animal(name="Dinasour").save(write_options={"w": 2})

# new code:
Animal(name="Dinasour").save(write_concern={"w": 2})
```

### Indexes

Index methods are no longer tied to querysets but rather to the document class. Although `QuerySet.ensure_indexes` and `QuerySet.ensure_index` still exist. They should be replaced with `ensure_indexes()` / `ensure_index()`.

### SequenceFields

`SequenceField` now inherits from `BaseField` to allow flexible storage of the calculated value. As such MIN and MAX settings are no longer handled.

#### 4.5.5 0.6 to 0.7

#### Cascade saves

Saves will raise a `FutureWarning` if they cascade and `cascade` hasn't been set to `True`. This is because in 0.8 it will default to `False`. If you require cascading saves then either set it in the *meta* or pass via *save* eg

```
# At the class level:
class Person(Document):
    meta = {'cascade': True}

# Or in code:
my_document.save(cascade=True)
```

---

**Note:** Remember: cascading saves **do not** cascade through lists.

---

## ReferenceFields

ReferenceFields now can store references as ObjectId strings instead of DBRefs. This will become the default in 0.8 and if *dbref* is not set a *FutureWarning* will be raised.

To explicitly continue to use DBRefs change the *dbref* flag to True

```
class Person(Document):
    groups = ListField(ReferenceField(Group, dbref=True))
```

To migrate to using strings instead of DBRefs you will have to manually migrate

```
# Step 1 - Migrate the model definition
class Group(Document):
    author = ReferenceField(User, dbref=False)
    members = ListField(ReferenceField(User, dbref=False))

# Step 2 - Migrate the data
for g in Group.objects():
    g.author = g.author
    g.members = g.members
    g.save()
```

## item\_frequencies

In the 0.6 series we added support for null / zero / false values in *item\_frequencies*. A side effect was to return keys in the value they are stored in rather than as string representations. Your code may need to be updated to handle native types rather than strings keys for the results of *item frequency* queries.

## BinaryFields

Binary fields have been updated so that they are native binary types. If you previously were doing *str* comparisons with binary field values you will have to update and wrap the value in a *str*.

### 4.5.6 0.5 to 0.6

Embedded Documents - if you had a *pk* field you will have to rename it from *\_id* to *pk* as *pk* is no longer a property of Embedded Documents.

Reverse Delete Rules in Embedded Documents, MapFields and DictFields now throw an *InvalidDocument* error as they aren't currently supported.

*Document.\_get\_subclasses* - Is no longer used and the class method has been removed.

*Document.objects.with\_id* - now raises an *InvalidQueryError* if used with a filter.

*FutureWarning* - A future warning has been added to all inherited classes that don't define *allow\_inheritance* in their meta.

You may need to update *pyMongo* to 2.0 for use with Sharding.

### 4.5.7 0.4 to 0.5

There have been the following backwards incompatibilities from 0.4 to 0.5. The main areas of changed are: choices in fields, *map\_reduce* and collection names.

### Choice options:

Are now expected to be an iterable of tuples, with the first element in each tuple being the actual value to be stored. The second element is the human-readable name for the option.

### PyMongo / MongoDB

map reduce now requires pymongo 1.11+- The pymongo *merge\_output* and *reduce\_output* parameters, have been deprecated.

More methods now use map\_reduce as db.eval is not supported for sharding as such the following have been changed:

- `sum()`
- `average()`
- `item_frequencies()`

### Default collection naming

Previously it was just lowercase, it's now much more pythonic and readable as it's lowercase and underscores, previously

```
class MyAceDocument (Document) :  
    pass  
  
MyAceDocument._meta['collection'] == myacedocument
```

In 0.5 this will change to

```
class MyAceDocument (Document) :  
    pass  
  
MyAceDocument._get_collection_name() == my_ace_document
```

To upgrade use a Mixin class to set meta like so

```
class BaseMixin(object) :  
    meta = {  
        'collection': lambda c: c.__name__.lower()  
    }  
  
class MyAceDocument (Document, BaseMixin) :  
    pass  
  
MyAceDocument._get_collection_name() == "myacedocument"
```

Alternatively, you can rename your collections eg

```
from mongoengine.connection import _get_db  
from mongoengine.base import _document_registry  
  
def rename_collections() :  
    db = _get_db()  
  
    failure = False  
  
    collection_names = [d._get_collection_name()  
                        for d in _document_registry.values()]  
  
    for new_style_name in collection_names:
```

```
if not new_style_name: # embedded documents don't have collections
    continue
old_style_name = new_style_name.replace('_', '')

if old_style_name == new_style_name:
    continue # Nothing to do

existing = db.collection_names()
if old_style_name in existing:
    if new_style_name in existing:
        failure = True
        print "FAILED to rename: %s to %s (already exists)" % (
            old_style_name, new_style_name)
    else:
        db[old_style_name].rename(new_style_name)
        print "Renamed: %s to %s" % (old_style_name,
            new_style_name)

if failure:
    print "Upgrading collection names failed"
else:
    print "Upgraded collection names"
```

### mongod 1.8 > 2.0 +

It's been reported that indexes may need to be recreated to the newer version of indexes. To do this drop indexes and call `ensure_indexes` on each model.

## 4.6 Django Support

---

**Note:** Django support has been split from the main MongoEngine repository. The *legacy* Django extension may be found bundled with the 0.9 release of MongoEngine.

---

### 4.6.1 Help Wanted!

The MongoEngine team is looking for help contributing and maintaining a new Django extension for MongoEngine! If you have Django experience and would like to help contribute to the project, please get in touch on the [mailing list](#) or by simply contributing on [GitHub](#).



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