
django-versatileimagefield Documentation

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1	In A Nutshell	3
2	Table of Contents	5
2.1	Installation	5
2.2	Model Integration	7
2.3	Specifying a Primary Point of Interest (PPOI)	12
2.4	Using Sizers and Filters	15
2.5	Writing Custom Sizers and Filters	17
2.6	Django REST Framework Integration	24
2.7	Improving Performance	27
3	Release Notes	29
3.1	0.4	29
3.2	0.3.1	29
3.3	0.3	29
3.4	0.2.1	29
3.5	0.2	29
3.6	0.1.5	30
3.7	0.1.4	30
3.8	0.1.3	30
3.9	0.1.2	30
3.10	0.1.1	30
3.11	0.1	30
4	Roadmap to v1.0	31

A drop-in replacement for django's ImageField that provides a flexible, intuitive and easily-extensible interface for quickly creating new images from the one assigned to your field.

In A Nutshell

- Creates images anywhere you need them: not just *in templates*.
- Non-destructive: Your original image is never modified.
- *Sizer and Filter framework*: enables you to quickly add new – or modify existing – ways to create new images:
 - **Sizers** create images with new sizes and/or aspect ratios
 - **Filters** change the appearance of an image
- *Sizers can be chained onto Filters*: Use case: give me a black-and-white, 400px by 400px square crop of this image.
- *Primary Point of Interest (PPOI) support*: provides a way to specify where the ‘primary point of interest’ of each individual image is – a value which is available to all Sizers and Filters. Use case: sometimes you want the ‘crop centerpoint’ to be somewhere other than the center of an image. Includes *a user-friendly formfield/widget for selecting PPOI* in the admin (or anywhere else you use ModelForms).
- Works with any storage: Stores the images it creates within the same storage class as your field . Works great with external storage (like Amazon S3).
- *Fully interchangeable* with ImageField: you can easily remove `VersatileImageField` from your project’s models whenever you’d like.
- Integrated caching: References to created images are stored in the cache, keeping your application running quickly and efficiently.
- *Django REST Framework support*: Serialize multiple image renditions from a single `VersatileImageField`.
- Flexible and fast: On-demand image creation can be toggled in your settings file allowing you to *turn it off* when you need your application to run as quickly as possible.

Table of Contents

2.1 Installation

Installation is easy with `pip`:

```
$ pip install django-versatileimagefield
```

2.1.1 Dependencies

- `django` $\geq 1.6.x$
- `Pillow` $\geq 2.4.x$

`django-versatileimagefield` depends on the excellent `Pillow` fork of `PIL`. If you already have `PIL` installed, it is recommended you uninstall it prior to installing `django-versatileimagefield`:

```
$ pip uninstall PIL
$ pip install django-versatileimagefield
```

Note: `django-versatileimagefield` will not install `django`.

2.1.2 Settings

After installation completes, add `'versatileimagefield'` to `INSTALLED_APPS`:

```
INSTALLED_APPS = (
    # All your other apps here
    'versatileimagefield',
)
```

VERSATILEIMAGEFIELD_SETTINGS

A dictionary that allows you to fine-tune how `django-versatileimagefield` works:

```
VERSATILEIMAGEFIELD_SETTINGS = {
    # The amount of time, in seconds, that references to created images
    # should be stored in the cache. Defaults to '2592000' (30 days)
    'cache_length': 2592000,
    # The name of the cache you'd like 'django-versatileimagefield' to use.
```

```
# Defaults to 'versatileimagefield_cache'. If no cache exists with the name
# provided, the 'default' cache will be used instead.
'cache_name': 'versatileimagefield_cache',
# The save quality of modified JPEG images. More info here:
# http://pillow.readthedocs.org/en/latest/handbook/image-file-formats.html#jpeg
# Defaults to 70
'jpeg_resize_quality': 70,
# The name of the top-level folder within storage classes to save all
# sized images. Defaults to '__sized__'
'sized_directory_name': '__sized__',
# The name of the directory to save all filtered images within.
# Defaults to '__filtered__':
'filtered_directory_name': '__filtered__',
# The name of the directory to save placeholder images within.
# Defaults to '__placeholder__':
'placeholder_directory_name': '__placeholder__',
# Whether or not to create new images on-the-fly. Set this to 'False' for
# speedy performance but don't forget to 'pre-warm' to ensure they're
# created and available at the appropriate URL.
'create_images_on_demand': True
}
```

VERSATILEIMAGEFIELD_USE_PLACEHOLDIT

A boolean that signifies whether optional (`blank=True`) `VersatileImageField` fields that do not *specify a placeholder image* should return `placeholder.it` URLs.

VERSATILEIMAGEFIELD_RENDITION_KEY_SETS

A dictionary used to specify ‘Rendition Key Sets’ that are used for both *serialization* or as a way to ‘warm’ *image files* so they don’t need to be created on demand (i.e. when `settings.VERSATILEIMAGEFIELD_SETTINGS['create_images_on_demand']` is set to `False`) which will greatly improve the overall performance of your app. Here’s an example:

```
VERSATILEIMAGEFIELD_RENDITION_KEY_SETS = {
    'image_gallery': [
        ('gallery_large', 'crop__800x450'),
        ('gallery_square_small', 'crop__50x50')
    ],
    'primary_image_detail': [
        ('hero', 'crop__600x283'),
        ('social', 'thumbnail__800x800')
    ],
    'primary_image_list': [
        ('list', 'crop__400x225'),
    ],
    'headshot': [
        ('headshot_small', 'crop__150x175'),
    ]
}
```

Each key in `VERSATILEIMAGEFIELD_RENDITION_KEY_SETS` signifies a ‘Rendition Key Set’, a list comprised of 2-tuples wherein the first position is a serialization-friendly name of an image rendition and the second position is a ‘Rendition Key’ (which dictates how the original image should be modified).

Writing Rendition Keys

Rendition Keys are intuitive and easy to write, simply swap out double-underscores for the dot-notated paths you'd use *in the shell* or *in templates*. Examples:

Intended image	As 'Rendition Key'	In the shell	In templates
400px by 400px Crop	'crop__400x400'	instance.image_field.crop	{{ instance.image_field.crop.url crop:400x400 }}
100px by 100px Thumbnail	'thumbnail__100x100'	instance.image_field.thumbnail	{{ instance.image_field.thumbnail.url thumbnail:100x100 }}
Inverted Image (Full Size)	'filters__invert'	instance.image_field.filters.invert	{{ instance.image_field.filters.invert.url filters.invert }}
Inverted Image, 50px by 50px crop	'filters__invert__crop_50x50'	instance.image_field.filters.invert.crop	{{ instance.image_field.filters.invert.crop.url filters.invert.crop:50x50 }}

Using Rendition Key Sets

Rendition Key sets are useful! Read up on how they can help you...

- ... *serializing VersatileImageField instances* within Django REST Framework.
- ... *'warm' images to improve performance*.

2.2 Model Integration

The centerpiece of django-versatileimagefield is its VersatileImageField which provides a simple, flexible interface for creating new images from the image you assign to it.

VersatileImageField extends django's ImageField and can be used as a drop-in replacement for it. Here's a simple example model that depicts a typical usage of django's ImageField:

```
# models.py with 'ImageField'
from django.db import models

class ImageExampleModel(models.Model):
    name = models.CharField(
        'Name',
        max_length=80
    )
    image = models.ImageField(
        'Image',
        upload_to='images/testimagemodel/',
        width_field='width',
        height_field='height'
    )
    height = models.PositiveIntegerField(
        'Image Height',
        blank=True,
        null=True
    )
```

```
width = models.PositiveIntegerField(
    'Image Width',
    blank=True,
    null=True
)

class Meta:
    verbose_name = 'Image Example'
    verbose_name_plural = 'Image Examples'
```

And here's that same model using `VersatileImageField` instead (see highlighted section in the code block below):

```
# models.py with 'VersatileImageField'
from django.db import models

from versatileimagefield.fields import VersatileImageField

class ImageExampleModel(models.Model):
    name = models.CharField(
        'Name',
        max_length=80
    )
    image = VersatileImageField(
        'Image',
        upload_to='images/testimagemodel/',
        width_field='width',
        height_field='height'
    )
    height = models.PositiveIntegerField(
        'Image Height',
        blank=True,
        null=True
    )
    width = models.PositiveIntegerField(
        'Image Width',
        blank=True,
        null=True
    )

    class Meta:
        verbose_name = 'Image Example'
        verbose_name_plural = 'Image Examples'
```

Note: `VersatileImageField` is fully interchangeable with `django.db.models.ImageField` which means you can revert back anytime you'd like. It's fully-compatible with `south` so migrate to your heart's content!

2.2.1 Specifying Placeholder Images

For `VersatileImageField` fields that are set to `blank=True` you can optionally specify a placeholder image to be used when its sizers and filters are accessed (like a generic silhouette for a non-existent user profile image, for instance).

You have two options for specifying placeholder images:

1. `OnDiscPlaceholderImage`: If you want to use an image stored on the same disc as your project's code-base.

2. OnStoragePlaceholderImage: If you want to use an image that can be accessed directly with a django storage class.

Note: All placeholder images are transferred-to and served-from the storage class of their associated field.

OnDiscPlaceholderImage

A placeholder image that is stored on the same disc as your project's codebase. Let's add a new, optional VersatileImageField to our example model to demonstrate:

```
# models.py
import os

from django.db import models

from versatileimagefield.fields import VersatileImageField
from versatileimagefield.placeholder import OnDiscPlaceholderImage

class ImageExampleModel(models.Model):
    name = models.CharField(
        'Name',
        max_length=80
    )
    image = VersatileImageField(
        'Image',
        upload_to='images/testimagemodel/',
        width_field='width',
        height_field='height'
    )
    height = models.PositiveIntegerField(
        'Image Height',
        blank=True,
        null=True
    )
    width = models.PositiveIntegerField(
        'Image Width',
        blank=True,
        null=True
    )
    optional_image = VersatileImageField(
        'Optional Image',
        upload_to='images/testimagemodel/optional/',
        blank=True,
        placeholder_image=OnDiscPlaceholderImage(
            path=os.path.join(
                os.path.dirname(os.path.abspath(__file__)),
                'placeholder.gif'
            )
        )
    )

class Meta:
    verbose_name = 'Image Example'
    verbose_name_plural = 'Image Examples'
```

Note: In the above example the `os` library was used to determine the on-disc path of an image (`placeholder.gif`) that was stored in the same directory as `models.py`.

Where OnDiscPlaceholderImage saves images to

All placeholder images are automatically saved into the same storage as the field they are associated with into a top-level-on-storage directory named by the `VERSATILEIMAGEFIELD_SETTINGS['placeholder_directory_name']` setting (defaults to `'__placeholder__ docs'`).

Placeholder images defined by `OnDiscPlaceholderImage` will simply be saved into the placeholder directory (defaults to `'__placeholder__ docs'`). The placeholder image defined in the example above would be saved to `'__placeholder__/placeholder.gif'`.

OnStoragePlaceholderImage

A placeholder image that can be accessed with a django storage class. Example:

```
# models.py
from django.db import models

from versatileimagefield.fields import VersatileImageField
from versatileimagefield.placeholder import OnStoragePlaceholderImage

class ImageExampleModel(models.Model):
    name = models.CharField(
        'Name',
        max_length=80
    )
    image = VersatileImageField(
        'Image',
        upload_to='images/testimagemodel/',
        width_field='width',
        height_field='height'
    )
    height = models.PositiveIntegerField(
        'Image Height',
        blank=True,
        null=True
    )
    width = models.PositiveIntegerField(
        'Image Width',
        blank=True,
        null=True
    )
    optional_image = VersatileImageField(
        'Optional Image',
        upload_to='images/testimagemodel/optional/',
        blank=True,
        placeholder_image=OnStoragePlaceholderImage(
            path='images/placeholder.gif'
        )
    )

class Meta:
    verbose_name = 'Image Example'
    verbose_name_plural = 'Image Examples'
```

By default, `OnStoragePlaceholderImage` will look for this image in your default storage class (as determined by `default_storage`) but you can explicitly specify a custom storage class with the optional keyword argument `storage`:

```
# models.py
from django.db import models

from versatileimagefield.fields import VersatileImageField
from versatileimagefield.placeholder import OnStoragePlaceholderImage

from .storage import CustomStorageCls

class ImageExampleModel(models.Model):
    name = models.CharField(
        'Name',
        max_length=80
    )
    image = VersatileImageField(
        'Image',
        upload_to='images/testimagemodel/',
        width_field='width',
        height_field='height'
    )
    height = models.PositiveIntegerField(
        'Image Height',
        blank=True,
        null=True
    )
    width = models.PositiveIntegerField(
        'Image Width',
        blank=True,
        null=True
    )
    optional_image = VersatileImageField(
        'Optional Image',
        upload_to='images/testimagemodel/optional/',
        blank=True,
        placeholder_image=OnStoragePlaceholderImage(
            path='images/placeholder.gif',
            storage=CustomStorageCls()
        )
    )

    class Meta:
        verbose_name = 'Image Example'
        verbose_name_plural = 'Image Examples'
```

Where `OnStoragePlaceholderImage` saves images to

Placeholder images defined by `OnStoragePlaceholderImage` will be saved into the placeholder directory (defaults to `'__placeholder__'` docs) within the same folder heirarchy as their original storage class. The placeholder image used in the example above would be saved to `'__placeholder__/image/placeholder.gif'`.

2.3 Specifying a Primary Point of Interest (PPOI)

The *crop Sizer* is super-useful for creating images at a specific size/aspect-ratio however, sometimes you want the ‘crop centerpoint’ to be somewhere other than the center of a particular image. In fact, the initial inspiration for `django-versatileimagefield` came as a result of tackling this very problem.

The *crop Sizer*’s core functionality (located in the `versatileimagefield.versatileimagefield.CroppedImage.crop` method) was inspired by PIL’s `ImageOps.fit` function (by [Kevin Cazabon](#)) which takes an optional keyword argument, `centering`, that expects a 2-tuple comprised of floats which are greater than or equal to 0 and less than or equal to 1. These two values together form a cartesian coordinate system that dictates what percentage of pixels to ‘trim’ off each of the long sides (i.e. left/right or top/bottom, depending on the aspect ratio of the cropped size vs. the original size):

	Left	Center	Right
Top	(0.0, 0.0)	(0.0, 0.5)	(0.0, 1.0)
Middle	(0.5, 0.0)	(0.5, 0.5)	(0.5, 1.0)
Bottom	(1.0, 0.0)	(1.0, 0.5)	(1.0, 1.0)

The *crop Sizer* works in a similar way but converts the 2-tuple into an exact (x, y) pixel coordinate which is then used as the ‘centerpoint’ of the crop. This approach gives significantly more accurate results than using `ImageOps.fit`, especially when dealing with PPOI values located near the edges of an image *or* aspect ratios that differ significantly from the original image.

Note: Even though the PPOI value is used as a crop ‘centerpoint’, the pixel it corresponds to won’t necessarily be in the center of the cropped image, especially if its near the edges of the original image.

Note: At present, only the *crop Sizer* changes how it creates images based on PPOI but a `VersatileImageField` makes its PPOI value available to ALL its attached `Filters` and `Sizers`. Get creative!

2.3.1 The PPOIField

Each image managed by a `VersatileImageField` can store its own, unique PPOI in the database via the easy-to-use `PPOIField`. Here’s how to integrate it into our example model (relevant lines highlighted in the code block below):

```
# models.py with 'VersatileImageField' & 'PPOIField'
from django.db import models

from versatileimagefield.fields import VersatileImageField, \
    PPOIField

class ImageExampleModel(models.Model):
    name = models.CharField(
        'Name',
        max_length=80
    )
    image = VersatileImageField(
        'Image',
        upload_to='images/testimagemodel/',
        width_field='width',
        height_field='height',
        ppoi_field='ppoi'
    )
    height = models.PositiveIntegerField()
```



```

        'Image Height',
        blank=True,
        null=True
    )
    width = models.PositiveIntegerField(
        'Image Width',
        blank=True,
        null=True
    )
    ppoi = PPOIField(
        'Image PPOI'
    )

    class Meta:
        verbose_name = 'Image Example'
        verbose_name_plural = 'Image Examples'

```

As you can see, you'll need to add a new PPOIField field to your model and then include the name of that field in the VersatileImageField's ppoi_field keyword argument. That's it!

Note: PPOIField is fully-compatible with `south` so migrate to your heart's content!

How PPOI is Stored in the Database

The **Primary Point of Interest** is stored in the database as a string with the x and y coordinates limited to two decimal places and separated by an 'x' (for instance: '0.5x0.5' or '0.62x0.28').

2.3.2 Setting PPOI

PPOI is set via the ppoi attribute on a VersatileImageField. You should **always** set an image's PPOI here (as opposed to directly on a PPOIField attribute) since a VersatileImageField will ensure updated values are passed-down to all its attached Filters & Sizers.

When you save a model instance, VersatileImageField will ensure its currently-assigned PPOI value is 'sent' to the PPOIField associated with it (if any) prior to writing to the database.

Via The Shell

```

# Importing our example Model
>>> from someapp.models import ImageExampleModel
# Retrieving a model instance
>>> example = ImageExampleModel.objects.all()[0]
# Retrieving the current PPOI value associated with the image field
# A 'VersatileImageField's PPOI value is ALWAYS associated with the 'ppoi'
# attribute, irregardless of what you named the 'PPOIField' attribute on your model
>>> example.image.ppoi
(0.5, 0.5)
# Creating a cropped image
>>> example.image.crop['400x400'].url
u'/media/___sized___/images/testimagemodel/test-image-crop-c0-5__0-5-400x400.jpg'
# Changing the PPOI value
>>> example.image.ppoi = (1, 1)
# Creating a new cropped image with the new PPOI value
>>> example.image.crop['400x400'].url

```

```
u'/media/___sized___/images/testimagemodel/test-image-crop-c1__1-400x400.jpg'
# PPOI values can be set as either a tuple or a string
>>> example.image.ppoi = '0.1x0.55'
>>> example.image.ppoi
(0.1, 0.55)
>>> example.image.ppoi = (0.75, 0.25)
>>> example.image.crop['400x400'].url
u'/media/___sized___/images/testimagemodel/test-image-crop-c0-75__0-25-400x400.jpg'
# u'0.75x0.25' is written to the database in the 'ppoi' column associated with
# our example model
>>> example.save()
```

As you can see, changing an image’s PPOI changes the filename of the cropped image. This ensures updates to a `VersatileImageField`’s PPOI value will result in unique cache entries for each unique image it creates.

Note: Each time a field’s PPOI is set, its attached Filters & Sizers will be immediately updated with the new value.

2.3.3 FormField/Admin Integration

It’s pretty hard to accurately set a particular image’s PPOI when working in the Python shell so `django-versatileimagefield` ships with an admin-ready formfield. Simply add an image, click ‘Save and continue editing’, click where you’d like the PPOI to be and then save your model instance again. A helpful translucent red square will indicate where the PPOI value is currently set to on the image:

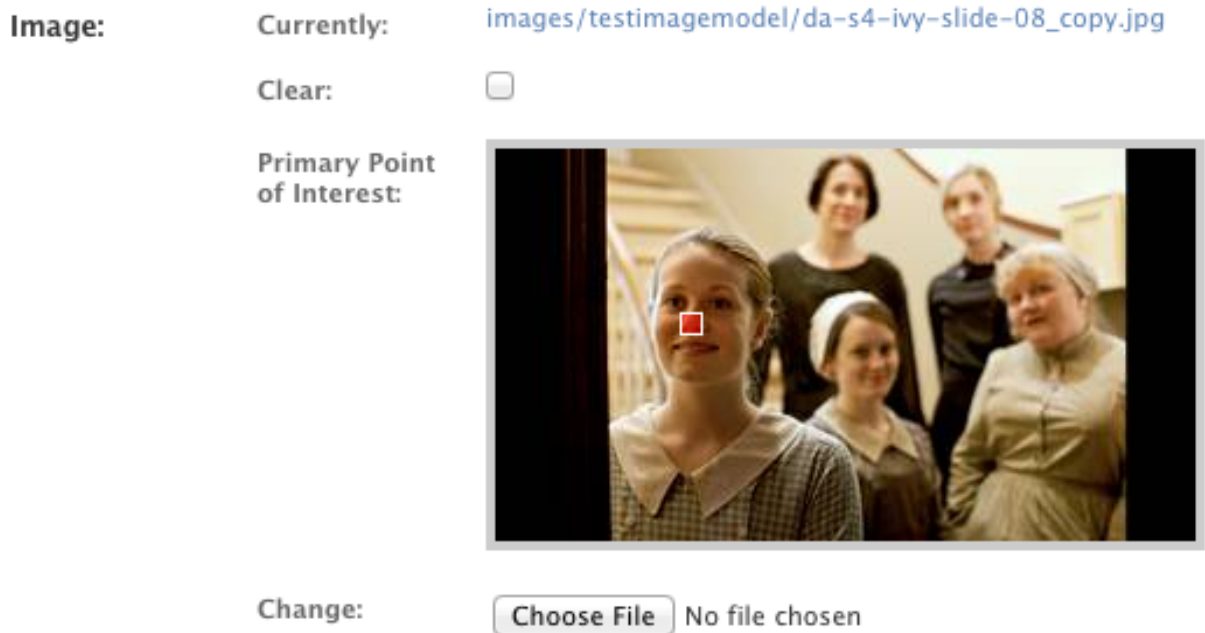


Figure 2.1: `django-versatileimagefield` PPOI admin widget example

2.4 Using Sizers and Filters

Where `VersatileImageField` shines is in its ability to create new images on the fly via its `Sizer` & `Filter` framework.

2.4.1 Sizers

Sizers provide a way to create new images of differing sizes from the one assigned to the field. `VersatileImageField` ships with two Sizers, `thumbnail` and `crop`.

Each `Sizer` registered to the `Sizer registry` is available as an attribute on each `VersatileImageField`. Sizers are `dict` subclasses that only accept precisely formatted keys comprised of two integers – representing width and height, respectively – separated by an ‘x’ (i.e. `['400x400']`). If you send a malformed/invalid key to a `Sizer`, a `MalformedSizedImageKey` exception will raise.

Included Sizers

thumbnail

Here’s how you would create a thumbnail image that would be constrained to fit within a 400px by 400px area:

```
# Importing our example Model
>>> from someapp.models import ImageExampleModel
# Retrieving a model instance
>>> example = ImageExampleModel.objects.all()[0]
# Displaying the path-on-storage of the image currently assigned to the field
>>> example.image.name
u'images/testimagemodel/test-image.jpg'
# Retrieving the path on the field's storage class to a 400px wide
# by 400px tall constrained thumbnail of the image.
>>> example.image.thumbnail['400x400'].name
u'__sized__/images/testimagemodel/test-image-thumbnail-400x400.jpg'
# Retrieving the URL to the 400px wide by 400px tall thumbnail
>>> example.image.thumbnail['400x400'].url
u'/media/__sized__/images/testimagemodel/test-image-thumbnail-400x400.jpg'
```

Note: Images are created on-demand. If no image had yet existed at the location required – by either the path (`.name`) or URL (`.url`) shown in the highlighted lines above – one would have been created directly before returning it.

Here’s how you’d open the thumbnail image we just created as an image file directly in the shell:

```
>>> thumbnail_image = example.image.field.storage.open(
...     example.image.thumbnail['400x400'].name
... )
```

crop

To create images cropped to a specific size, use the `crop` `Sizer`:

```
# Retrieving the URL to a 400px wide by 400px tall crop of the image
>>> example.image.crop['400x400'].url
u'/media/__sized__/images/testimagemodel/test-image-crop-c0-5__0-5-400x400.jpg'
```

The `crop` Sizer will first scale an image down to its longest side and then crop/trim inwards, centered on the **Primary Point of Interest** (PPOI, for short). For more info about what PPOI is and how it's used see the *Specifying a Primary Point of Interest (PPOI)* section.

How Sized Image Files are Named/Stored All Sizers subclass from `versatileimagefield.datastructures.sizedimage` which uses a unique-to-size-specified string – provided via its `get_filename_key()` method – that is included in the filename of each image it creates.

Note: The `thumbnail` Sizer simply combines `'thumbnail'` with the size key passed (i.e. `'400x400'`) while the `crop` Sizer combines `'crop'`, the field's PPOI value (as a string) and the size key passed; all Sizer 'filename keys' begin and end with dashes `'-'` for readability.

All images created by a Sizer are stored within the field's storage class in a top-level folder named `'__sized__'`, maintaining the same descendant folder structure as the original image. If you'd like to change the name of this folder to something other than `'__sized__'`, adjust the value of `VERSATILEIMAGEFIELD_SETTINGS['sized_directory_name']` within your settings file.

Sizers are quick and easy to write, for more information about how it's done, see the *Writing a Custom Sizer* section.

2.4.2 Filters

Filters create new images that are the same size and aspect ratio as the original image.

Included Filters

invert

The `invert` filter will invert the color palette of an image:

```
# Importing our example Model
>>> from someapp.models import ImageExampleModel
# Retrieving a model instance
>>> example = ImageExampleModel.objects.all()[0]
# Returning the path-on-storage to the image currently assigned to the field
>>> example.image.name
u'images/testimagemodel/test-image.jpg'
# Displaying the path (within the field's storage class) to an image
# with an inverted color pallete from that of the original image
>>> example.image.filters.invert.name
u'images/testimagemodel/__filtered__/test-image__invert__.jpg'
# Displaying the URL to the inverted image
>>> example.image.filters.invert.url
u'/media/images/testimagemodel/__filtered__/test-image__invert__.jpg'
```

As you can see, there's a `filters` attribute available on each `VersatileImageField` which contains all filters currently registered to the Filter registry.

Using Sizers with Filters

What makes Filters extra-useful is that they have access to all registered Sizers:

```
# Creating a thumbnail of a filtered image
>>> example.image.filters.invert.thumbnail['400x400'].url
u'/media/___sized___/images/testimagemodel/___filtered___/test-image___invert___-thumbnail-400x400.jpg'
# Creating a crop from a filtered image
>>> example.image.filters.invert.crop['400x400'].url
u'/media/___sized___/images/testimagemodel/___filtered___/test-image___invert___-c0-5__0-5-400x400.jpg'
```

Note: Filtered images are created the first time they are directly accessed (by either evaluating their `name/url` attributes or by accessing a `Sizer` attached to it). Once created, a reference is stored in the cache for each created image which makes for speedy subsequent retrievals.

How Filtered Image Files are Named/Stored

All Filters subclass from `versatileimagefield.datastructures.filteredimage.FilteredImage` which provides a `get_filename_key()` method that returns a unique-to-filter-specified string – surrounded by double underscores, i.e. `'__invert__'` – which is appended to the filename of each image it creates.

All images created by a Filter are stored within a folder named `___filtered___` that sits in the same directory as the original image. If you'd like to change the name of this folder to something other than **'filtered'**, adjust the value of `VERSATILEIMAGEFIELD_SETTINGS['filtered_directory_name']` within your settings file.

Filters are quick and easy to write, for more information about creating your own, see the *Writing a Custom Filter* section.

2.4.3 Using Sizers / Filters in Templates

Template usage is straight forward and easy since both attributes and dictionary keys can be accessed via dot-notation; no crufty `templatetags` necessary:

```
<!-- Sizers -->



<!-- Filters -->


<!-- Filters + Sizers -->


```

Note: Using the `url` attribute on Sizers is optional in templates. Why? All Sizers return an instance of `versatileimagefield.datastructures.sizedimage.SizedImageInstance` which provides the sized image's URL via the `__unicode__()` method (which django's templating engine looks for when asked to render class instances directly).

2.5 Writing Custom Sizers and Filters

It's quick and easy to create new Sizers and Filters for use on your project's `VersatileImageField` fields or *modify already-registered Sizers and Filters*.

Both Sizers and Filters subclass from `versatileimagefield.datastructures.base.ProcessedImage` which provides a *preprocessing API* as well as all the business logic necessary to retrieve and save images.

The ‘meat’ of each Sizer & Filter – a.k.a what actually modifies the original image – takes place within the `process_image` method which all subclasses must define (not doing so will raise a `NotImplementedError`). Sizers and Filters expect slightly different keyword arguments (Sizers required `width` and `height`, for example) see below for specifics:

2.5.1 Writing a Custom Sizer

All Sizers should subclass `versatileimagefield.datastructures.sizedimage.SizedImage` and, at a minimum, **MUST** do two things:

1. Define either the `filename_key` attribute or override the `get_filename_key()` method which is necessary for creating unique-to-Sizer-and-size-specified filenames. If neither of the aforementioned is done a `NotImplementedError` exception will be raised.
2. Define a `process_image` method that accepts the following arguments:
 - `image`: a PIL Image instance
 - `image_format`: A valid image mime type (e.g. `‘image/jpeg’`). This is provided by the `create_resized_image` method (which calls `process_image`).
 - `save_kwargs`: A dict of any keyword arguments needed by PIL’s `Image.save` method (initially provided by the pre-processing API).
 - `width`: An integer representing the width specified by the user in the size key.
 - `height`: An integer representing the height specified by the user in the size key.

For an example, let’s take a look at the `thumbnail` Sizer (`versatileimagefield.versatileimagefield.ThumbnailImage`):

```
import StringIO

from PIL import Image

from .datastructures import SizedImage

class ThumbnailImage(SizedImage):
    """
    Sizes an image down to fit within a bounding box

    See the 'process_image()' method for more information
    """

    filename_key = 'thumbnail'

    def process_image(self, image, image_format, save_kwargs,
                     width, height):
        """
        Returns a StringIO instance of 'image' that will fit
        within a bounding box as specified by 'width'x'height'
        """
        imagefile = StringIO.StringIO()
        image.thumbnail(
            (width, height),
            Image.ANTIALIAS
        )
        image.save(
            imagefile,
            **save_kwargs
```

```
)  
    return imagefile
```

Important: `process_image` should *always* return a `StringIO` instance. See [What process_image should return](#) for more information.

2.5.2 Writing a Custom Filter

All Filters should subclass `versatileimagefield.datastructures.filteredimage.FilteredImage` and only need to define a `process_filter` method with following arguments:

- `image`: a PIL Image instance
- `image_format`: A valid image mime type (e.g. `'image/jpeg'`). This is provided by the `create_resized_image()` method (which calls `process_image`).
- `save_kwargs`: A dict of any keyword arguments needed by PIL's `Image.save` method (initially provided by the pre-processing API).

For an example, let's take a look at the `invert` Filter (`versatileimagefield.versatileimagefield.InvertImage`):

```
import StringIO  
  
from PIL import ImageOps  
  
from .datastructures import FilteredImage  
  
class InvertImage(FilteredImage):  
    """  
    Inverts the colors of an image.  
  
    See the 'process_image()' for more specifics  
    """  
  
    def process_image(self, image, image_format, save_kwargs={}):  
        """  
        Returns a StringIO instance of 'image' with inverted colors  
        """  
        imagefile = StringIO.StringIO()  
        inv_image = ImageOps.invert(image)  
        inv_image.save(  
            imagefile,  
            **save_kwargs  
        )  
        return imagefile
```

Important: `process_image` should **always** return a `StringIO` instance. See [What process_image should return](#) for more information.

2.5.3 What process_image should return

Any `process_image` method you write should *always* return a `StringIO` instance comprised of raw image data. The actual image file will be written to your field's storage class via the `save_image` method. Note how `save_kwargs` is passed into PIL's `Image.save` method in the examples above, this ensures PIL knows how to write this data (based on mime type or any other per-filetype specific options provided by the *preprocessing API*).

2.5.4 The Pre-processing API

Both Sizers and Filters have access to a pre-processing API that provides hooks for doing any per-mime-type processing. This allows your Sizers and Filters to do one thing for JPEGs and another for GIFs, for instance. One example of this is in how Sizers ‘know’ how to preserve transparency for GIFs or save JPEGs as RGB (at the user-defined quality):

```
# versatileimagefield/datastructures/sizedimage.py
class SizedImage(ProcessedImage, dict):
    "<a bunch of ommited code here>"

    def preprocess_GIF(self, image, **kwargs):
        """
        Receives a PIL Image instance of a GIF and returns 2-tuple:
        * [0]: Original Image instance (passed to 'image')
        * [1]: Dict with a transparency key (to GIF transparency layer)
        """
        return (image, {'transparency': image.info['transparency']})

    def preprocess_JPEG(self, image, **kwargs):
        """
        Receives a PIL Image instance of a JPEG and returns 2-tuple:
        * [0]: Image instance, converted to RGB
        * [1]: Dict with a quality key (mapped to the value of 'QUAL' as
            defined by the 'VERSATILEIMAGEFIELD_JPEG_RESIZE_QUALITY'
            setting)
        """
        if image.mode != 'RGB':
            image = image.convert('RGB')
        return (image, {'quality': QUAL})
```

All pre-processors should accept one required argument `image` (A PIL Image instance) and `**kwargs` (for easy extension by subclasses) and return a 2-tuple of the image and a dict of any additional keyword arguments to pass along to PIL’s `Image.save` method.

Pre-processor Naming Convention

In order for preprocessor methods to run, they need to be named correctly via this simple naming convention: `preprocess_FILETYPE`. Here’s a list of all currently-supported file types:

- BMP
- DCX
- EPS
- GIF
- JPEG
- PCD
- PCX
- PDF
- PNG
- PPM
- PSD
- TIFF

- XBM
- XPM

So, if you'd want to write a PNG-specific preprocessor, your Sizer or Filter would need to define a method named `preprocess_PNG`.

Note: I've only tested `VersatileImageField` with PNG, GIF and JPEG files; the list above is what PIL supports, for more information about per filetype support in PIL [visit here](#).

2.5.5 Registering Sizers and Filters

Registering Sizers and Filters is easy and straight-forward; if you've ever registered a model with django's admin you'll feel right at home.

django-versatileimagefield finds Sizers & Filters within modules named `versatileimagefield-` (i.e. `versatileimagefield.py`) that are available at the 'top level' of each app on `INSTALLED_APPS`.

Here's an example:

```
somedjangoapp/  
  __init__.py  
  models.py           # Models  
  admin.py           # Admin config  
  versatileimagefield.py # Custom Sizers and Filters here
```

After defining your Sizers and Filters you'll need to register them with the `versatileimagefield_registry`. Here's how the `ThumbnailSizer` is registered (see the highlighted lines in the following code block for the relevant bits):

```
# versatileimagefield/versatileimagefield.py  
import StringIO  
  
from PIL import Image  
  
from .datastructures import SizedImage  
from .registry import versatileimagefield_registry  
  
class ThumbnailImage(SizedImage):  
    """  
    Sizes an image down to fit within a bounding box  
  
    See the 'process_image()' method for more information  
    """  
  
    filename_key = 'thumbnail'  
  
    def process_image(self, image, image_format, save_kwargs,  
                    width, height):  
        """  
        Returns a StringIO instance of 'image' that will fit  
        within a bounding box as specified by 'width'x'height'  
        """  
        imagefile = StringIO.StringIO()  
        image.thumbnail(  
            (width, height),  
            Image.ANTIALIAS
```

```
)
image.save(
    imagefile,
    **save_kwargs
)
return imagefile

# Registering the ThumbnailSizer to be available on VersatileImageField
# via the 'thumbnail' attribute
versatileimagefield_registry.register_sizer('thumbnail', ThumbnailImage)]
```

All Sizers are registered via the `versatileimagefield_registry.register_sizer` method. The first argument is the attribute you want to make the Sizer available at and the second is the `SizedImage` subclass.

Filters are just as easy. Here's how the `InvertImage` filter is registered (see the highlighted lines in the following code block for the relevant bits):

```
import StringIO

from PIL import ImageOps

from .datastructures import FilteredImage
from .registry import versatileimagefield_registry

class InvertImage(FilteredImage):
    """
    Inverts the colors of an image.

    See the 'process_image()' for more specifics
    """

    def process_image(self, image, image_format, save_kwargs={}):
        """
        Returns a StringIO instance of 'image' with inverted colors
        """
        imagefile = StringIO.StringIO()
        inv_image = ImageOps.invert(image)
        inv_image.save(
            imagefile,
            **save_kwargs
        )
        return imagefile

versatileimagefield_registry.register_filter('invert', InvertImage)
```

All Filters are registered via the `versatileimagefield_registry.register_filter` method. The first argument is the attribute you want to make the Filter available at and the second is the `FilteredImage` subclass.

Unallowed Sizer & Filter Names

Sizer and Filter names cannot begin with an underscore as it would prevent them from being accessible within the template layer. Additionally, since Sizers are available for use directly on a `VersatileImageField`, there are some Sizer names that are unallowed; trying to register a Sizer with one of the following names will result in a `UnallowedSizerName` exception:

- `build_filters_and_sizers`

- chunks
- close
- closed
- create_on_demand
- delete
- encoding
- field
- file
- fileno
- filters
- flush
- height
- instance
- isatty
- multiple_chunks
- name
- newlines
- open
- path
- ppoi
- read
- readinto
- readline
- readlines
- save
- seek
- size
- softspace
- storage
- tell
- truncate
- url
- validate_ppoi
- width
- write
- writelines

- xreadlines

2.5.6 Overriding an existing Sizer or Filter

If you try to register a Sizer or Filter with an attribute name that's already in use (like `crop` or `thumbnail` or `invert`), an `AlreadyRegistered` exception will raise.

Caution: A Sizer can have the same name as a Filter (since names are only required to be unique per type) however it's **not** recommended.

If you'd like to override an already-registered Sizer or Filter just use either the `unregister_sizer` or `unregister_filter` methods of `versatileimagefield_registry`. Here's how you could 'override' the `crop` Sizer:

```
from versatileimagefield.registry import versatileimagefield_registry

# Unregistering the 'crop' Sizer
versatileimagefield_registry.unregister_sizer('crop')
# Registering a custom 'crop' Sizer
versatileimagefield_registry.register_sizer('crop', SomeCustomSizedImageCls)
```

The order that Sizers and Filters register corresponds to their containing app's position on `INSTALLED_APPS`. This means that if you want to override one of the default Sizers or Filters your app needs to be included after 'versatileimagefield':

```
# settings.py
INSTALLED_APPS = (
    'versatileimagefield',
    'yourcustomapp' # This app can override the default Sizers and Filters
)
```

2.6 Django REST Framework Integration

If you've got an API powered by Tom Christie's excellent Django REST Framework and want to serve images in multiple sizes/renditions `django-versatileimagefield` has you covered with its `VersatileImageFieldSerializer`.

2.6.1 Example

To demonstrate how it works we'll use this simple model:

```
# myproject/person/models.py

from django.db import models

from versatileimagefield.fields import VersatileImageField, PPOIField

class Person(models.Model):
    """Represents a person."""
    name_first = models.CharField('First Name', max_length=80)
    name_last = models.CharField('Last Name', max_length=100)
    headshot = VersatileImageField()
```

```

        'Headshot',
        upload_to='headshots/',
        ppoi_field='headshot_ppoi'
    )
    headshot_ppoi = PPOIField()

    class Meta:
        verbose_name = 'Person'
        verbose_name_plural = 'People'

```

OK, let's write a simple ModelSerializer subclass to serialize Person instances:

```

# myproject/person/serializers.py

from rest_framework import serializers

from versatileimagefield.serializers import VersatileImageFieldSerializer

from .models import Person

class PersonSerializer(serializers.ModelSerializer):
    """Serializes Person instances"""
    headshot = VersatileImageFieldSerializer(
        sizes=[
            ('full_size', 'url'),
            ('thumbnail', 'thumbnail__100x100'),
            ('medium_square_crop', 'crop__400x400'),
            ('small_square_crop', 'crop__50x50')
        ]
    )

    class Meta:
        model = Person
        fields = (
            'name_first',
            'name_last',
            'headshot'
        )

```

And here's what it would look like serialized:

```

>>> from myproject.person.models import Person
>>> john_doe = Person.objects.create(
...     name_first='John',
...     name_last='Doe',
...     headshot='headshots/john_doe_headshot.jpg'
... )
>>> john_doe.save()
>>> from myproject.person.serializers import PersonSerializer
>>> john_doe_serialized = PersonSerializer(john_doe)
>>> john_doe_serialized.data
{
  'name_first': 'John',
  'name_last': 'Doe',
  'headshot': {
    'full_size': '/media/headshots/john_doe_headshot.jpg',
    'thumbnail': '/media/headshots/john_doe_headshot-thumbnail-400x400.jpg',
    'medium_square_crop': '/media/headshots/john_doe_headshot-crop-c0-5__0-5-400x400.jpg',

```

```
        'small_square_crop': '/media/headshots/john_doe_headshot-crop-c0-5__0-5-50x50.jpg',
    }
}
```

As you can see, the `sizes` argument on `VersatileImageFieldSerializer` simply unpacks the list of 2-tuples using the value in the first position as the attribute of the image and the second position as a 'Rendition Key' which dictates how the original image should be modified.

Reusing Rendition Key Sets

It's common to want to re-use similar sets of images across models and fields so `django-versatileimagefield` provides a setting, `VERSATILEIMAGEFIELD_RENDITION_KEY_SETS` for defining them (*docs*).

Let's move the Rendition Key Set we used above into our settings file:

```
# myproject/settings.py

VERSATILEIMAGEFIELD_RENDITION_KEY_SETS = {
    'person_headshot': [
        ('full_size', 'url'),
        ('thumbnail', 'thumbnail__100x100'),
        ('medium_square_crop', 'crop__400x400'),
        ('small_square_crop', 'crop__50x50')
    ]
}
```

Now, let's update our serializer to use it:

```
# myproject/person/serializers.py

from rest_framework import serializers

from versatileimagefield.serializers import VersatileImageFieldSerializer

from .models import Person

class PersonSerializer(serializers.ModelSerializer):
    """Serializes Person instances"""
    headshot = VersatileImageFieldSerializer(
        sizes='person_headshot'
    )

    class Meta:
        model = Person
        fields = (
            'name_first',
            'name_last',
            'headshot'
        )
```

That's it! Now that you know how to define Rendition Key Sets, leverage them to *improve performance*!

2.7 Improving Performance

During development, `VersatileImageField`'s *on-demand image creation* enables you to quickly iterate but, once your application is deployed, this convenience adds a small bit of overhead that you'll probably want to turn off once your app is in production.

2.7.1 Turning off on-demand image creation

To turn off on-demand image creation just set the `'create_images_on_demand'` key of the `VERSATILEIMAGEFIELD_SETTINGS` setting to `False` (*docs*). Now your `VersatileImageField` fields will return URLs to images without first checking to see if they've actually been created yet.

Note: Once an image has been created by a `VersatileImageField`, a reference to it is stored in the cache which makes for speedy subsequent retrievals. Setting `VERSATILEIMAGEFIELD_SETTINGS['create_images_on_demand']` to `False` bypasses this entirely making `VersatileImageField` perform even faster (*docs*).

2.7.2 Ensuring images are created

This boost in performance is great but now you'll need to ensure that the images your application links to actually exist. Luckily, `VersatileImageFieldWarmer` will help you do just that. Here's an example in the Python shell using the *example model* from the Django REST Framework serialization example:

```
>>> from myproject.person.models import Person
>>> from versatileimagefield.image_warmer import VersatileImageFieldWarmer
>>> person_img_warmer = VersatileImageFieldWarmer(
...     instance_or_queryset=Person.objects.all(),
...     rendition_key_set='person_headshot',
...     image_attr='headshot',
...     verbose=True
... )
>>> num_created, failed_to_create = person_img_warmer.warm()
```

`num_created` will be an integer of how many images were successfully created and `failed_to_create` will be a list of paths to images (on the field's storage class) that could not be created (due to a `PIL/Pillow` error, for example).

This technique is useful if you've recently converted your project's `models.ImageField` fields to use `VersatileImageField` or if you want to 'pre warm' images as part of a `Fabric` script.

Note: The above example would create a set of images (as dictated by the `'person_headshot'` *Rendition Key Set*) for the `headshot` field of each `Person` instance. `rendition_key_set` also accepts a valid *Rendition Key Set* directly:

```
>>> person_img_warmer = VersatileImageFieldWarmer(
...     instance_or_queryset=Person.objects.all(),
...     rendition_key_set=[
...         ('large_horiz_crop', '1200x600'),
...         ('large_vert_crop', '600x1200'),
...     ],
...     image_attr='headshot',
...     verbose=True
... )
```

Note: Setting `verbose=True` when instantiating a `VersatileImageFieldWarmer` will display a yum-style progress bar showing the image warming progress:

```
>>> num_created, failed_to_create = person_img_warmer.warm()
[#####-----] 20/100 (20%)
```

Note: The `image_attr` argument can be dot-notated in order to follow `ForeignKey` and `OneToOneField` relationships. Example: `'related_model.headshot'`.

Auto-creating sets of images on `post_save`

You also might want to create new images immediately after model instances are saved. Here's how we'd do it with our example model (see highlighted lines below):

```
# myproject/person/models.py

from django.db import models
from django.dispatch import receiver

from versatileimagefield.fields import VersatileImageField, PPOIField
from versatileimagefield.image_warmer import VersatileImageFieldWarmer

class Person(models.Model):
    """Represents a person."""
    name_first = models.CharField('First Name', max_length=80)
    name_last = models.CharField('Last Name', max_length=100)
    headshot = VersatileImageField(
        'Headshot',
        upload_to='headshots/',
        ppoi_field='headshot_ppoi'
    )
    headshot_ppoi = PPOIField()

    class Meta:
        verbose_name = 'Person'
        verbose_name_plural = 'People'

@receiver(models.signals.post_save, sender=Person)
def warm_person_headshot_images(sender, instance, **kwargs):
    """Ensures Person head shots are created post-save"""
    person_img_warmer = VersatileImageFieldWarmer(
        instance_or_queryset=instance,
        rendition_key_set='person_headshot',
        image_attr='headshot'
    )
    num_created, failed_to_create = person_img_warmer.warm()
```

Release Notes

3.1 0.4

- Dropped support for Django 1.5.x
- Introducing per-field *placeholder image* support! (Note: global placeholder support has been deprecated.)
- Added the `VERSATILEIMAGEFIELD_USE_PLACEHOLDIT` setting (*docs*)

3.2 0.3.1

- Squashed a pip installation bug.

3.3 0.3

- Added a test suite with `Travis CI` and `coveralls` integration.
- Introduced support for *Django REST Framework 3.0* serialization.

3.4 0.2.1

- Ensuring `admin` `widget`-dependent thumbnail images are created even if `VERSATILEIMAGEFIELD_SETTINGS['create_on_demand']` is set to `False`

3.5 0.2

- Introduced *Django REST Framework support!*
- Added ability to turn off on-demand image creation and pre-warm images to *improve performance*.

3.6 0.1.5

- Squashed `CroppedImage` bug that was causing black stripes to appear on crops of images with PPOI values that were to the right and/or bottom of center (greater-than 0.5).

3.7 0.1.4

- Overhauled how `CroppedImage` processes PPOI value when creating cropped images. This new approach yields significantly more accurate results than using the previously utilized `ImageOps.fit` function, especially when dealing with PPOI values located near the edges of an image *or* aspect ratios that differ significantly from the original image.
- Improved PPOI validation
- Squashed unset `VERSATILEIMAGEFIELD_SETTINGS['global_placeholder_image']` bug.
- Set `crop` Sizer default `resample` to `PIL.Image.ANTIALIAS`

3.8 0.1.3

- Added support for auto-rotation during pre-processing as dictated by 'Orientation' EXIF data, if available.
- Added release notes to docs

3.9 0.1.2

- Removed redundant javascript from ppoi 'click' widget (thanks, @skumar!)

3.10 0.1.1

- Converted giant README into Sphinx-friendly RST
- Docs added to readthedocs

3.11 0.1

- Initial open source release

Roadmap to v1.0

- Python 3 support
- Custom placeholder image docs
- Programmatically delete images created by `VersatileImageField` (including clearing their connected cache keys)