pytorch_cl_vae_MNIST_exmaple

September 17, 2018

In [480]:
```
from sklearn.datasets import fetch_mldata
from sklearn import preprocessing
from scipy.stats import norm
import numpy as np
import numpy.random as random
from src.pytorch_cl_vae.model import ClVaeModel
import matplotlib.pyplot as plt
import torch
%matplotlib inline
```

0.1 1 - Load the model

In [481]:
```
fname = '../data/models/cl_vae_mnist_09_17_2018_09_42_PM.pt'
model = ClVaeModel.load_from_ckpt(fname)
```

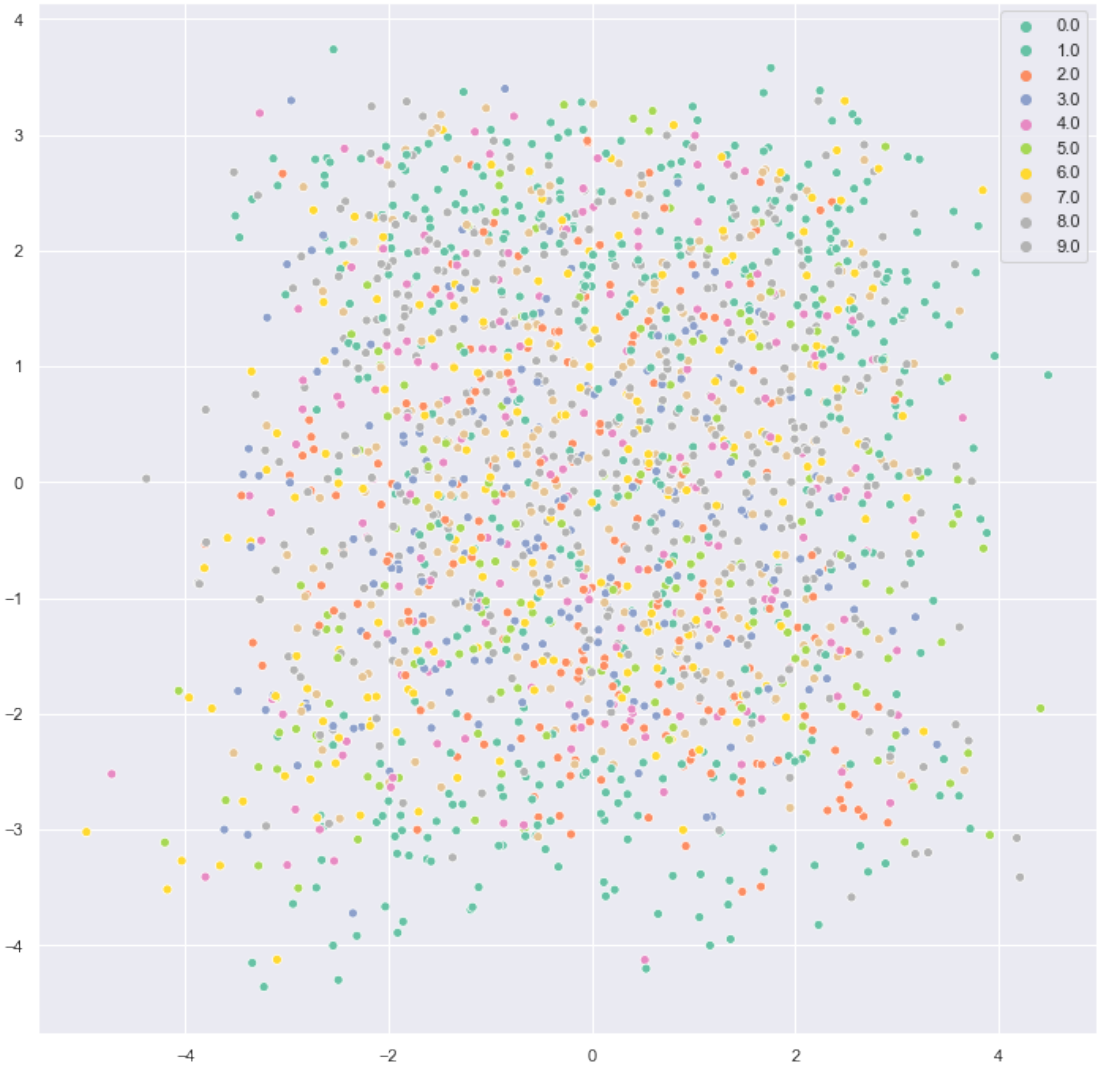
0.2 2 - Load MNIST

In [482]:
```
datadir = '../data'
mnist = fetch_mldata('MNIST original', data_home=datadir)
mnist.data = mnist.data / 255
num_samples, input_dim = mnist.data.shape
num_classes = len(np.unique(mnist.target))
lb = preprocessing.LabelBinarizer()
lb.fit(mnist.target)
print('MNIST db has been successfully loaded, stored in the: "{}"'.format(datadir +
```

```
MNIST db has been successfully loaded, stored in the: "../data/mldata"
```

In [483]:
```
num_examples = 2000
idxs = random.randint(0, num_samples-1, num_examples)
x = mnist.data[idxs]
y = mnist.target[idxs]
y_probs = lb.transform(y)
x_batch = torch.from_numpy(x).float()
ws_batch = [torch.from_numpy(y_probs).float()]

z, _, _ = model.encode(x_batch, ws_batch)
```

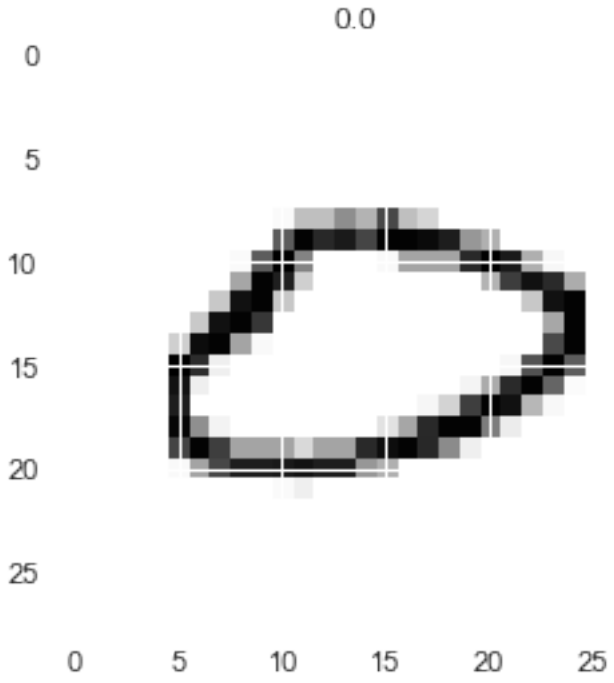
```
import src.pytorch_cl_vae.utils as utils
plt.figure(figsize=(12,12))
utils.plot_latent(z.detach().numpy(), y)
```



0.3 3 - Get some examples to work with

In [503]:
```
num_examples = 2
idxs = random.randint(0, num_samples-1, num_examples)
x = mnist.data[idxs]
y = mnist.target[idxs]
y_probs = lb.transform(y)
for i in range(x.shape[0]):
    plt.figure()
```

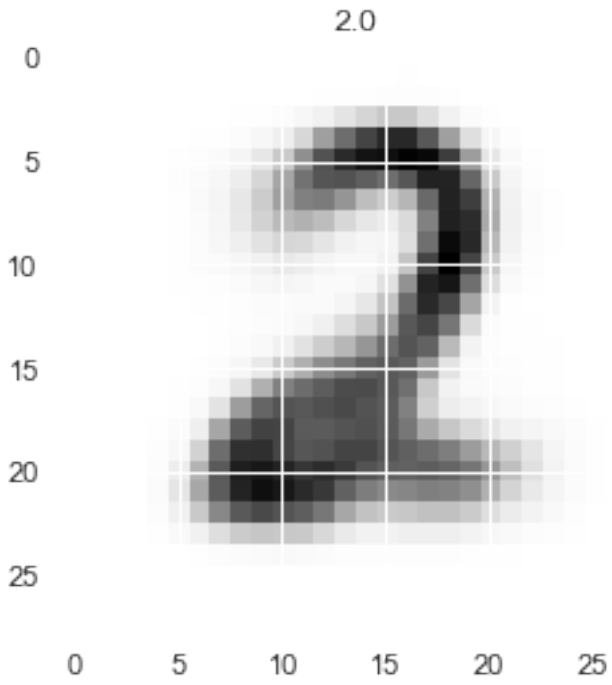
```
    img = x[i].reshape([int(np.sqrt(x.shape[-1]))]*2)
    plt.title(y[i])
    plt.imshow(img, cmap='Greys')

plt.show()
```



0.4 4 - Reconstruction check

In [504]:
```
# Encode
x_batch = torch.from_numpy(x).float()
ws_batch = [torch.from_numpy(y_probs).float()]

z, z_mean, z_log_var = model.encode(x_batch, ws_batch)
print("{}\n{}\n{}".format(z, z_mean, z_log_var.exp().sqrt()))
x_decoded = model.decode(z, ws_batch)

x_decoded = x_decoded.detach().numpy()

for i in range(x_decoded.shape[0]):
    plt.figure()
    img = x_decoded[i].reshape([int(np.sqrt(x_decoded.shape[-1]))]*2)
    plt.title(y[i])
    plt.imshow(img, cmap='Greys')

plt.show()
```

```
tensor([[ 0.8415,  0.1187],
        [ 0.2283, -2.5479]])
tensor([[ 1.0088,  0.4755],
        [ 0.1887, -2.4020]])
tensor([[0.3665, 0.3624],
        [0.2314, 0.1293]])
```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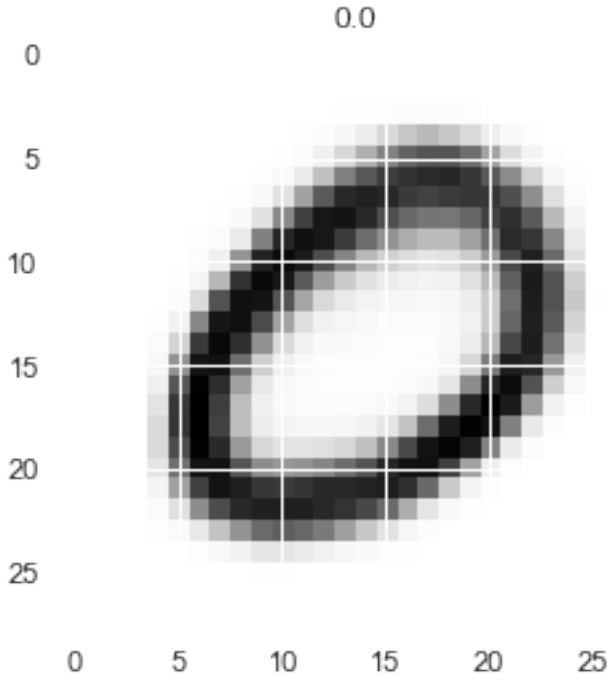
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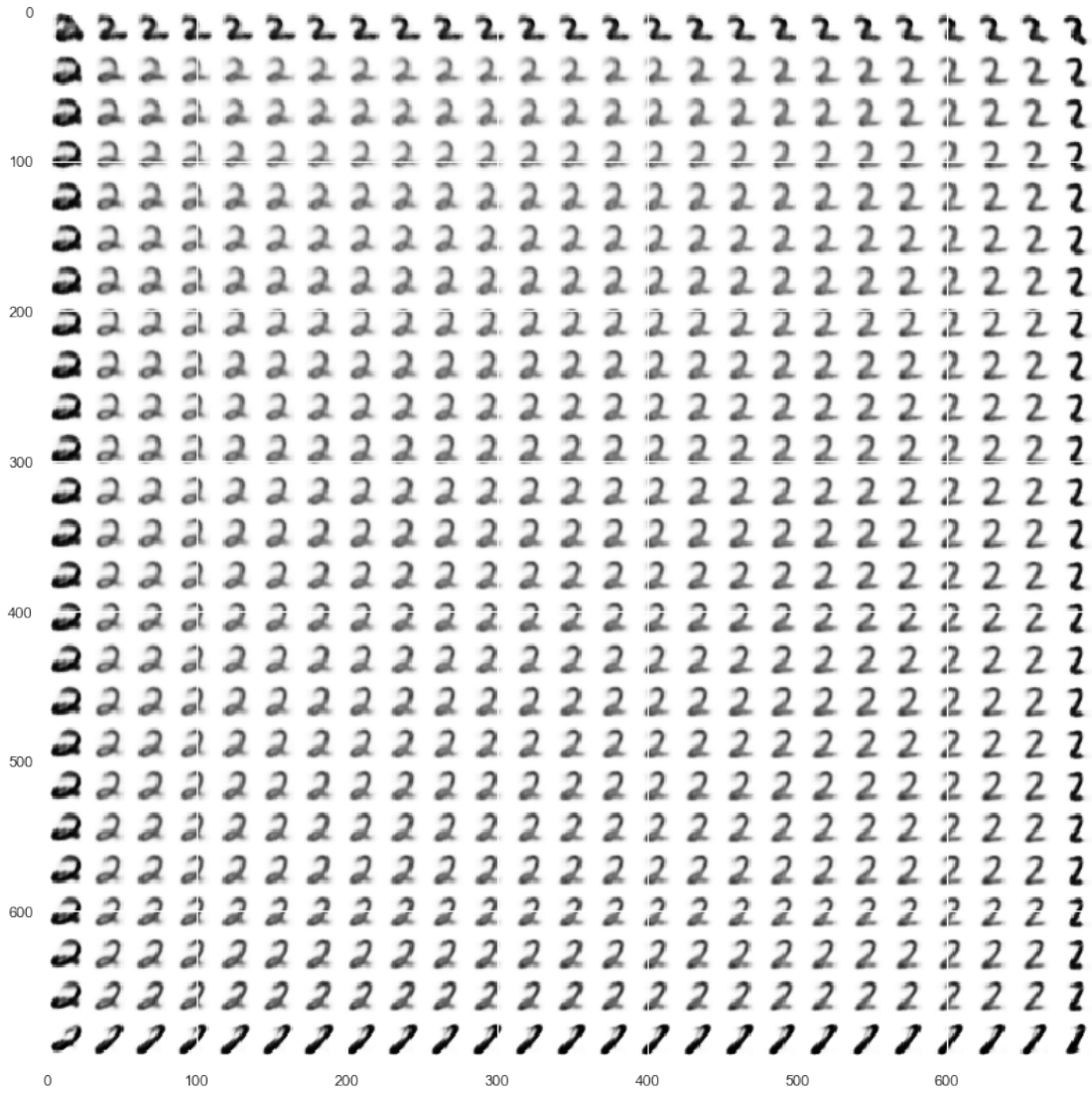
0.5 5 - Generate with fixed ws

In [505]:
```
n = 25
w_fixed = ws_batch[0].detach().numpy()
print(w_fixed.shape)
w_fixed = np.tile(y_probs[0][:], (n**2, 1))

print(w_fixed.shape)
z_random = random.normal(size=(z[0].shape))
z1 = norm.ppf(np.linspace(0.00001, 0.99999, n))
zx, zy = np.meshgrid(z1, z1)
z_random = np.stack((zx, zy), axis=-1).reshape((-1, 2))
print(z_random.shape)

z_random = torch.from_numpy(z_random).float()
w_fixed = [torch.from_numpy(w_fixed).float()]

x_decoded = model.decode(z_random, w_fixed)

x_decoded = x_decoded.detach().numpy()

final_img = np.zeros((n*int(np.sqrt(x_decoded.shape[-1])), n*int(np.sqrt(x_decoded.sh

img_size = int(np.sqrt(x_decoded.shape[-1]))
plt.figure(figsize=(14,14))
for i in range(x_decoded.shape[0]):
#
    img = x_decoded[i].reshape([int(np.sqrt(x_decoded.shape[-1]))]*2)
    final_img[(i % n) * img_size : (i % n + 1) * img_size, (i // n) * img_size : (i /
#     plt.title(w_fixed[0][i].max(0)[1].detach().numpy())
plt.imshow(final_img, cmap='Greys')

plt.show()
```

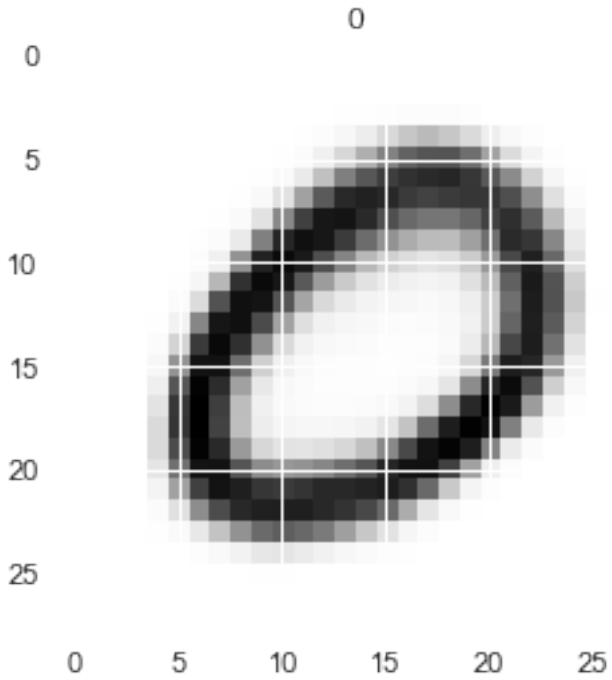
```
(2, 10)
(625, 10)
(625, 2)
```

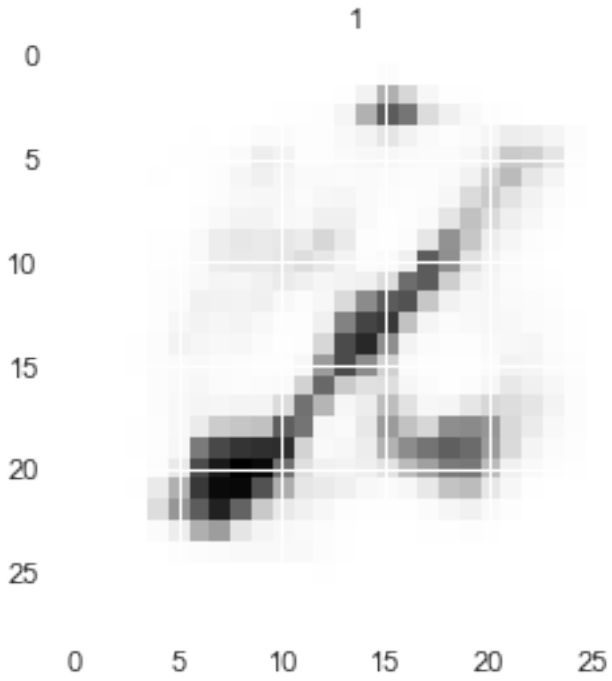


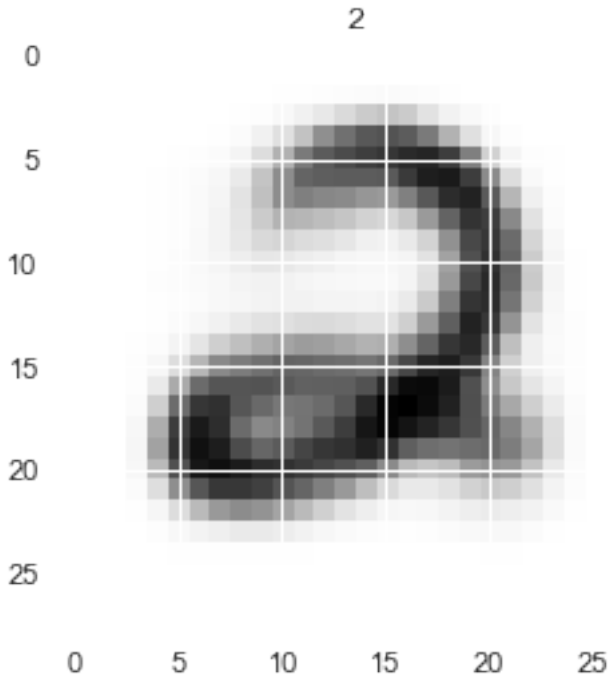
0.6 6 - Generate with fixed z

```
In [506]: ws_random = np.identity(ws_batch[0].shape[-1])
          z_fixed = np.tile(z[1], (ws_random.shape[0], 1))

          ws_random = [torch.from_numpy(ws_random).float()]
          z_fixed = torch.from_numpy(z_fixed).float()
          x_decoded = model.decode(z_fixed, ws_random)
          x_decoded = x_decoded.detach().numpy()

          for i in range(x_decoded.shape[0]):
              plt.figure()
              img = x_decoded[i].reshape([int(np.sqrt(x_decoded.shape[-1]))]*2)
```

```
    plt.title(i)
    plt.imshow(img, cmap='Greys')

plt.show()
```



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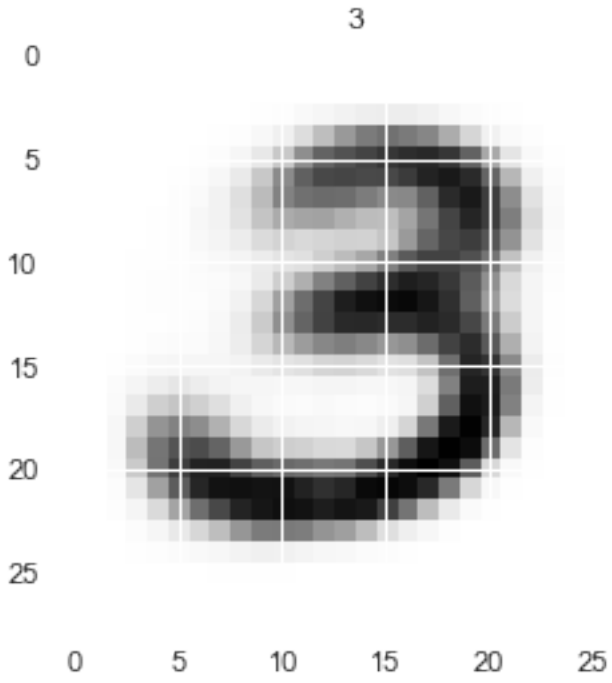
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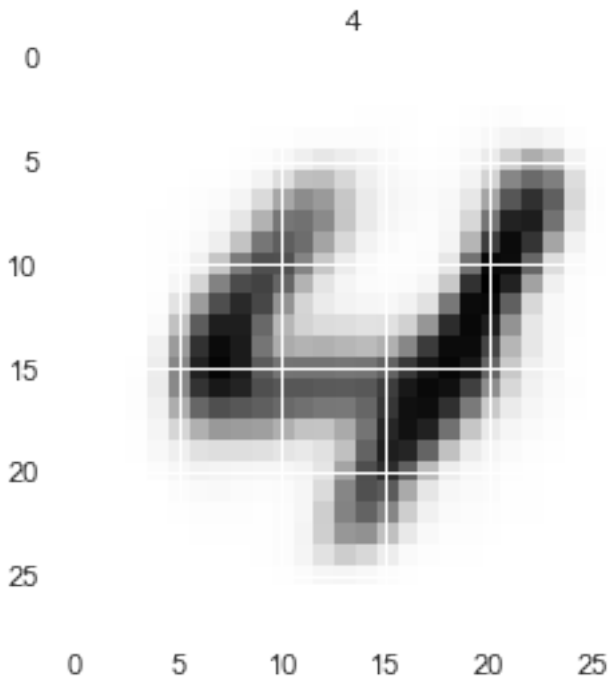
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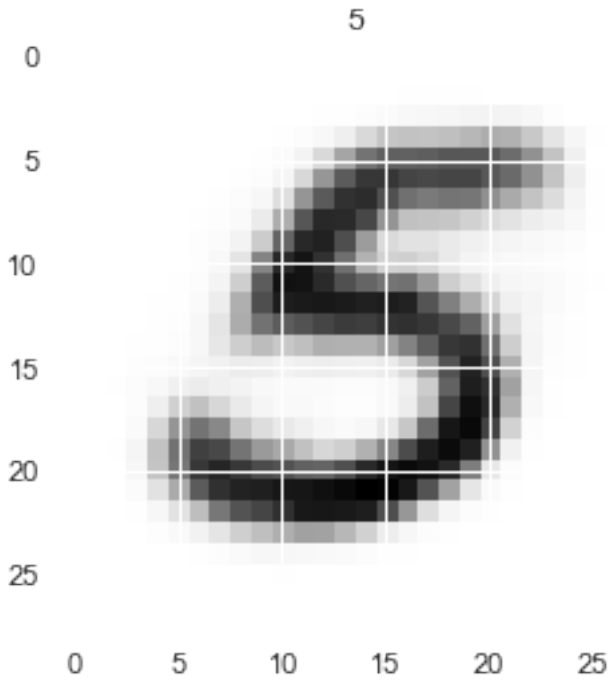
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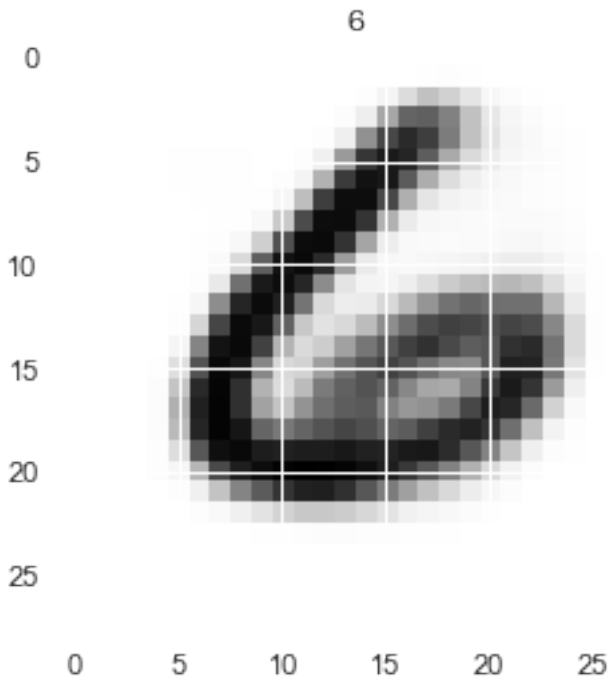
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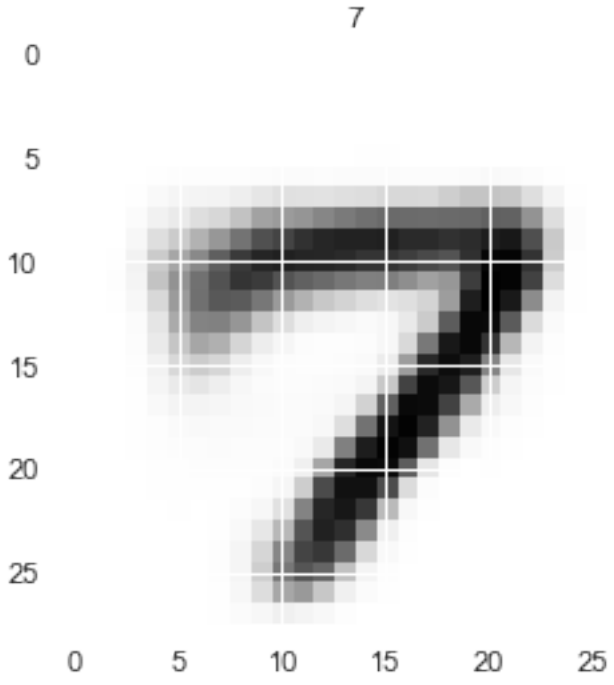
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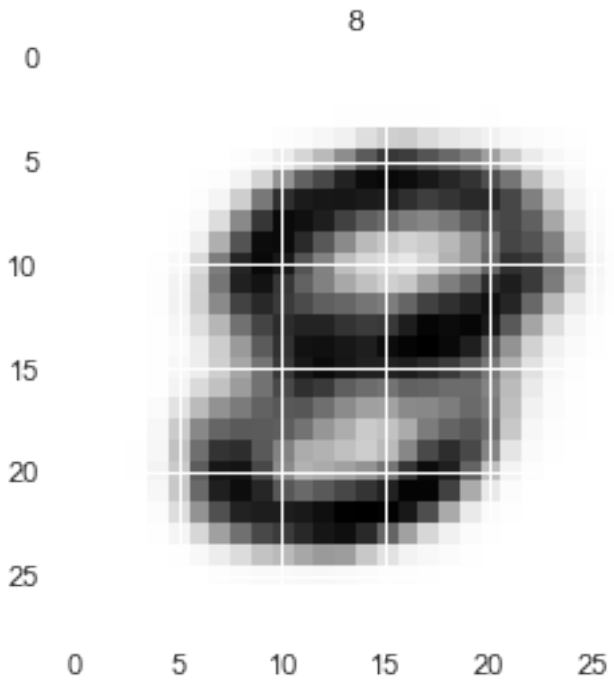
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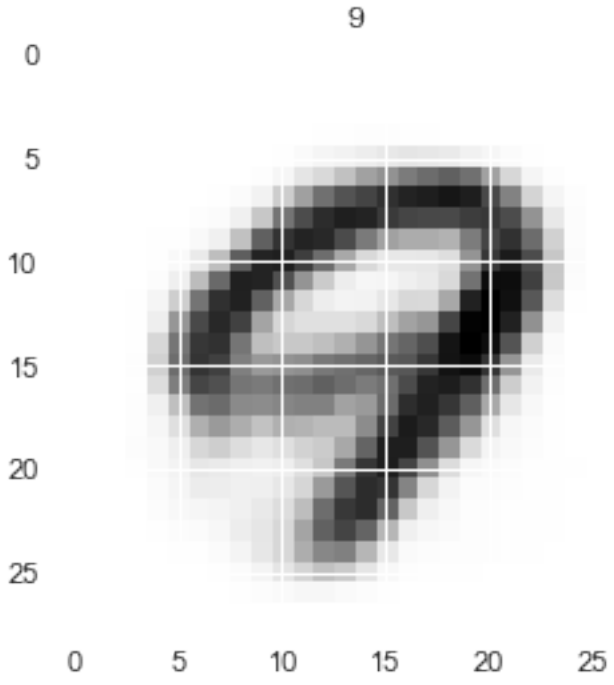
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