In [1]:
```
import tensorflow as tf
import numpy as np
import pickle as pkl
from sklearn.manifold import TSNE
from flip_gradient import flip_gradient
from utils import *
from timeit import default_timer as timer
import numpy as np
from keras import backend as K
from keras.datasets import mnist
from keras.layers import Conv2D,Dense,MaxPool2D,Flatten, Dropout
from keras.models import Sequential
from sklearn.ensemble import ExtraTreesClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score
from keras_helper import NNWeightHelper
from snes import SNES
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score
import scipy.misc
```

```
/anaconda2/lib/python2.7/site-packages/h5py/__init__.py:36: FutureWarning: Conversi
on of the second argument of issubdtype from `float` to `np.floating` is deprecate
d. In future, it will be treated as `np.float64 == np.dtype(float).type`.
  from ._conv import register_converters as _register_converters
Using TensorFlow backend.
```

In [2]:
```

from tensorflow.examples.tutorials.mnist import input_data
mnist = input_data.read_data_sets('MNIST_data', one_hot=True)

# Process MNIST
mnist_train = (mnist.train.images > 0).reshape(55000, 28, 28, 1).astype(np.uint8) * 25
mnist_train = np.concatenate([mnist_train, mnist_train, mnist_train], 3)
mnist_test = (mnist.test.images > 0).reshape(10000, 28, 28, 1).astype(np.uint8) * 255
mnist_test = np.concatenate([mnist_test, mnist_test, mnist_test], 3)
mnist_valid = (mnist.validation.images > 0).reshape(mnist.validation.images.shape[0],2
mnist_valid= np.concatenate([mnist_valid,mnist_valid,mnist_valid],axis=3)


print(type(mnist_train[0]))

# Load MNIST-M
mnistm = pkl.load(open('mnistm_data.pkl', 'rb'))
mnistm_train = mnistm['train']
mnistm_test = mnistm['test']
mnistm_valid = mnistm['valid']

# Compute pixel mean for normalizing data
pixel_mean = np.vstack([mnist_train, mnistm_train]).mean((0, 1, 2))

# Create a mixed dataset for TSNE visualization
num_test = 500
combined_test_imgs = np.vstack([mnist_test[:num_test], mnistm_test[:num_test]])
combined_test_labels = np.vstack([mnist.test.labels[:num_test], mnist.test.labels[:num
combined_test_domain = np.vstack([np.tile([1., 0.], [num_test, 1]),
        np.tile([0., 1.], [num_test, 1])])
```

```
Extracting MNIST_data/train-images-idx3-ubyte.gz
Extracting MNIST_data/train-labels-idx1-ubyte.gz
Extracting MNIST_data/t10k-images-idx3-ubyte.gz
Extracting MNIST_data/t10k-labels-idx1-ubyte.gz
<type 'numpy.ndarray'>
```

In [4]:
```
imshow_grid(mnist_train)
imshow_grid(mnistm_train)
```

In [5]:
```
mnist_train_labels = mnist.train.labels
mnist_test_labels = mnist.test.labels
mnist_valid_labels = mnist.validation.labels
print (len(mnist_train_labels), len(mnist_test_labels))
```

```
(55000, 10000)
```

In [6]:
```
img_rows, img_cols = 28, 28
num_classes = 10
input_shape = (img_rows, img_cols, 3)
```

In [44]:
```
x_train, y_train = mnist_train , mnist_train_labels
x_valid, y_valid = mnist_valid, mnist_valid_labels
Mx_train, My_train = mnistm_train , mnist_train_labels
Mx_valid, My_valid = mnistm_valid, mnist_valid_labels
```

In [68]:
```
model = Sequential()
model.add(Conv2D(32,kernel_size=(5,5),activation='relu',input_shape=input_shape))
model.add(MaxPool2D())
model.add((Conv2D(48,kernel_size=(3, 3), activation='relu')))
model.add(MaxPool2D())
model.add(Flatten())
model.add(Dropout(0.1))
model.add(Dense(20,activation='relu'))
model.compile(loss='mse',optimizer='adam')
model = model
model.summary()
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_21 (Conv2D)           (None, 24, 24, 32)        2432
_________________________________________________________________
max_pooling2d_11 (MaxPooling (None, 12, 12, 32)        0
_________________________________________________________________
conv2d_22 (Conv2D)           (None, 10, 10, 48)        13872
_________________________________________________________________
max_pooling2d_12 (MaxPooling (None, 5, 5, 48)          0
_________________________________________________________________
flatten_5 (Flatten)          (None, 1200)              0
_________________________________________________________________
dropout_11 (Dropout)         (None, 1200)              0
_________________________________________________________________
dense_6 (Dense)              (None, 20)                24020
=================================================================
Total params: 40,324
Trainable params: 40,324
Non-trainable params: 0
_________________________________________________________________
```

In [46]:
```
nnw = NNWeightHelper(model)
weights = nnw.get_weights()
```

In [47]:
```
SX=np.asarray(x_train)
SY=np.asarray(y_train)
SVX=np.asarray(x_valid)
SVY=np.asarray(y_valid)
input_shape=SX.shape[1:]

TX = np.asarray(Mx_train)
TY = np.asarray(My_train)
TVX = np.asarray(Mx_valid)
TVY = np.asarray(My_valid)

MX=np.concatenate((SX, TX), axis=0)
MY=np.concatenate((np.zeros(SX.shape[0]), np.ones(TX.shape[0])),axis=0)

MVX = np.concatenate((SVX, TVX),axis=0)
MVY = np.concatenate((np.zeros(SVX.shape[0]), np.ones(TVX.shape[0])),axis=0)

input_shape=SX.shape[1:]
```

In [48]:
```
def Train_classifier(x,y):
    x_features=model.predict(x)
    clf=RandomForestClassifier(n_estimators=18)
    clf=clf.fit(x_features, y)
    return clf

def Predict_from_clf(clf,x):
    x_features=model.predict(x)
    y=clf.predict(x_features)
    return y

def saveModel(filename):
    file=open(filename+'.json','w')
    file.write(model.to_json())
    model.save_weights(filename+'.h5')
    file.close()

def load_model(filename):
    file=open(filename+'.json')
    model=file.read()
    model=model_from_json(model)
    model.load_weight(filename+'.json')

def new_score_fun(label_accuracy,domain_accuray):
    return label_accuracy - (4*(np.square(domain_accuray-0.5)))
```

In [49]:
```
label_clf = RandomForestClassifier()
domain_clf = RandomForestClassifier()
```

In [50]:
```
RD_Indices = np.random.choice(a=list(range(MX.shape[0])),size=1024)
M_D_TX = MX[RD_Indices]
M_D_TY = MY[RD_Indices]

RS_Indices = np.random.choice(a=list(range(SX.shape[0])),size=1024)
S_TX = SX[RS_Indices]
S_TY = SY[RS_Indices]

RDV_indices = np.random.choice(a=list(range(MVX.shape[0])), size=1024)
M_D_VX = MVX[RDV_indices]
M_D_VY = MVY[RDV_indices]

SV_indices = np.random.choice(a=list((range(SVX.shape[0]))),size=1024)
validX = SVX[SV_indices]
validY = SVY[SV_indices]
```

In [67]:
```
label_clf = Train_classifier(SX,SY)
label_pred = Predict_from_clf(label_clf, validX)
label_accuracy = accuracy_score(validY,label_pred)
print ('label_accuracy',label_accuracy )

domain_clf = Train_classifier(M_D_TX, M_D_TY)
domain_pred = Predict_from_clf(domain_clf, M_D_VX)
domain_accuracy = accuracy_score(M_D_VY, domain_pred)
print ('domain_accuracy',domain_accuracy )

weight_modifier=NNWeightHelper(model)
weights=weight_modifier.get_weights()

print 'weights to evolve:',len(weights)
```

```
('label_accuracy', 0.3076171875)
('domain_accuracy', 0.939453125)
weights to evolve: 182964
```

In [52]:
```
snes=SNES(weights,1,20)
```

In [54]:
```
logscore = []
for i in range(60):
    start = timer()
    new_weights=snes.ask()

    complied_score = []
    domain_accuracys = []
    label_accuracys = []

    for w in new_weights:
        RD_Indices = np.random.choice(a=list(range(MX.shape[0])),size=1024)
        M_D_TX = MX[RD_Indices]
        M_D_TY = MY[RD_Indices]

        RS_Indices = np.random.choice(a=list(range(SX.shape[0])),size=1024)
        S_TX = SX[RS_Indices]
        S_TY = SY[RS_Indices]

        RDV_indices = np.random.choice(a=list(range(MVX.shape[0])), size=1024)
        M_D_VX = MVX[RDV_indices]
        M_D_VY = MVY[RDV_indices]

        SV_indices = np.random.choice(a=list((range(SVX.shape[0]))),size=1024)
        validX = SVX[SV_indices]
        validY = SVY[SV_indices]
        weight_modifier.set_weights(w)

        label_clf=Train_classifier(S_TX,S_TY)
        label_predictions = Predict_from_clf(label_clf, validX)
        label_accuracy=accuracy_score(validY,label_predictions)
#         print ('label_accuracy',label_accuracy )

        domain_clf = Train_classifier(M_D_TX,M_D_TY)
        domain_predictions=Predict_from_clf(domain_clf,M_D_VX)
        domain_accuracy=accuracy_score(M_D_VY,domain_predictions)
#         print ('domain_accuracy',domain_accuracy )


        new_score = new_score_fun(label_accuracy, domain_accuracy)
        complied_score.append(new_score)
        domain_accuracys.append(domain_accuracy)
        label_accuracys.append(label_accuracy)

    snes.tell(new_weights,complied_score)
    max_index=np.argmax(complied_score)
    end = timer()
    print("It took", end - start, "seconds to complete generation")
    print("the fit model has label_accuracy: %0.3f and domain_accuracy:%0.3f and compl
          %(label_accuracys[max_index], domain_accuracys[max_index], complied_score[ma

    logscore.append(complied_score[max_index])
```

```
('Step', 4, ':', -0.18674087524414062, 'best:', -0.18674087524414062, 20)
('It took', 21.010323762893677, 'seconds to complete generation')
the fit model has label_accuracy: 0.257 and domain_accuracy:0.833 and fitness_scor
e:-0.187
('Step', 5, ':', -0.19321060180664062, 'best:', -0.18674087524414062, 20)
('It took', 20.44001007080078, 'seconds to complete generation')
the fit model has label_accuracy: 0.293 and domain_accuracy:0.849 and fitness_scor
e:-0.193
('Step', 6, ':', -0.2868804931640625, 'best:', -0.18674087524414062, 20)
('It took', 20.697450876235962, 'seconds to complete generation')
the fit model has label_accuracy: 0.317 and domain_accuracy:0.889 and fitness_scor
e:-0.287
('Step', 7, ':', -0.1671295166015625, 'best:', -0.1671295166015625, 20)
('It took', 20.77871084213257, 'seconds to complete generation')
the fit model has label_accuracy: 0.378 and domain_accuracy:0.869 and fitness_scor
e:-0.167
('Step', 8, ':', -0.16141128540039062, 'best:', -0.16141128540039062, 20)
```

```
('It took', 20.372043132781982, 'seconds to complete generation')
the fit model has label_accuracy: 0.319 and domain_accuracy:0.847 and fitness_scor
e:-0.161
('Step', 9, ':', -0.219970703125, 'best:', -0.16141128540039062, 20)
('It took', 20.470659017562866, 'seconds to complete generation')
the fit model has label_accuracy: 0.366 and domain_accuracy:0.883 and fitness_scor
e:-0.220
('Step', 10, ':', -0.1179351806640625, 'best:', -0.1179351806640625, 20)
('It took', 20.48284888267517, 'seconds to complete generation')
the fit model has label_accuracy: 0.404 and domain_accuracy:0.861 and fitness_scor
e:-0.118
('Step', 11, ':', -0.20517349243164062, 'best:', -0.1179351806640625, 20)
('It took', 20.379755973815918, 'seconds to complete generation')
the fit model has label_accuracy: 0.343 and domain_accuracy:0.870 and fitness_scor
e:-0.205
('Step', 12, ':', -0.2175445556640625, 'best:', -0.1179351806640625, 20)
('It took', 20.421334981918335, 'seconds to complete generation')
the fit model has label_accuracy: 0.305 and domain_accuracy:0.861 and fitness_scor
e:-0.218
('Step', 13, ':', -0.177734375, 'best:', -0.1179351806640625, 20)
('It took', 20.425585985183716, 'seconds to complete generation')
the fit model has label_accuracy: 0.295 and domain_accuracy:0.844 and fitness_scor
e:-0.178
('Step', 14, ':', -0.1229400634765625, 'best:', -0.1179351806640625, 20)
('It took', 20.48204803466797, 'seconds to complete generation')
the fit model has label_accuracy: 0.323 and domain_accuracy:0.834 and fitness_scor
e:-0.123
('Step', 15, ':', -0.1837310791015625, 'best:', -0.1179351806640625, 20)
('It took', 20.38723397254944, 'seconds to complete generation')
the fit model has label_accuracy: 0.396 and domain_accuracy:0.881 and fitness_scor
e:-0.184
('Step', 16, ':', -0.19070816040039062, 'best:', -0.1179351806640625, 20)
('It took', 20.38606309890747, 'seconds to complete generation')
the fit model has label_accuracy: 0.290 and domain_accuracy:0.847 and fitness_scor
e:-0.191
('Step', 17, ':', -0.1484527587890625, 'best:', -0.1179351806640625, 20)
('It took', 20.38874387741089, 'seconds to complete generation')
the fit model has label_accuracy: 0.247 and domain_accuracy:0.814 and fitness_scor
e:-0.148
('Step', 18, ':', -0.16333389282226562, 'best:', -0.1179351806640625, 20)
('It took', 20.407166004180908, 'seconds to complete generation')
the fit model has label_accuracy: 0.307 and domain_accuracy:0.843 and fitness_scor
e:-0.163
('Step', 19, ':', -0.0853424072265625, 'best:', -0.0853424072265625, 20)
('It took', 20.61590600013733, 'seconds to complete generation')
the fit model has label_accuracy: 0.185 and domain_accuracy:0.760 and fitness_scor
e:-0.085
('Step', 20, ':', -0.0337066650390625, 'best:', -0.0337066650390625, 20)
('It took', 20.364332914352417, 'seconds to complete generation')
the fit model has label_accuracy: 0.287 and domain_accuracy:0.783 and fitness_scor
e:-0.034
('Step', 21, ':', -0.034030914306640625, 'best:', -0.0337066650390625, 20)
('It took', 20.12174892425537, 'seconds to complete generation')
the fit model has label_accuracy: 0.271 and domain_accuracy:0.776 and fitness_scor
e:-0.034
('Step', 22, ':', -0.046207427978515625, 'best:', -0.0337066650390625, 20)
('It took', 20.111008167266846, 'seconds to complete generation')
the fit model has label_accuracy: 0.187 and domain_accuracy:0.741 and fitness_scor
e:-0.046
('Step', 23, ':', 0.09743881225585938, 'best:', 0.09743881225585938, 20)
('It took', 20.255900859832764, 'seconds to complete generation')
the fit model has label_accuracy: 0.209 and domain_accuracy:0.667 and fitness_scor
e:0.097
('Step', 24, ':', 0.028469085693359375, 'best:', 0.09743881225585938, 20)
('It took', 20.246381998062134, 'seconds to complete generation')
the fit model has label_accuracy: 0.229 and domain_accuracy:0.724 and fitness_scor
e:0.028
('Step', 25, ':', 0.11126708984375, 'best:', 0.11126708984375, 20)
('It took', 20.198132038116455, 'seconds to complete generation')
the fit model has label_accuracy: 0.369 and domain_accuracy:0.754 and fitness_scor
```

```
e:0.111
('Step', 26, ':', 0.09045028686523438, 'best:', 0.11126708984375, 20)
('It took', 20.155201196670532, 'seconds to complete generation')
the fit model has label_accuracy: 0.210 and domain_accuracy:0.673 and fitness_scor
e:0.090
('Step', 27, ':', 0.11880111694335938, 'best:', 0.11880111694335938, 20)
('It took', 20.185484886169434, 'seconds to complete generation')
the fit model has label_accuracy: 0.223 and domain_accuracy:0.661 and fitness_scor
e:0.119
('Step', 28, ':', 0.103515625, 'best:', 0.11880111694335938, 20)
('It took', 20.200455904006958, 'seconds to complete generation')
the fit model has label_accuracy: 0.222 and domain_accuracy:0.672 and fitness_scor
e:0.104
('Step', 29, ':', 0.1547698974609375, 'best:', 0.1547698974609375, 20)
('It took', 20.2651150226593, 'seconds to complete generation')
the fit model has label_accuracy: 0.188 and domain_accuracy:0.592 and fitness_scor
e:0.155
('Step', 30, ':', 0.1847991943359375, 'best:', 0.1847991943359375, 20)
('It took', 20.263319969177246, 'seconds to complete generation')
the fit model has label_accuracy: 0.208 and domain_accuracy:0.576 and fitness_scor
e:0.185
('Step', 31, ':', 0.19488143920898438, 'best:', 0.19488143920898438, 20)
('It took', 20.363693952560425, 'seconds to complete generation')
the fit model has label_accuracy: 0.235 and domain_accuracy:0.601 and fitness_scor
e:0.195
('Step', 32, ':', 0.18987655639648438, 'best:', 0.19488143920898438, 20)
('It took', 20.198741912841797, 'seconds to complete generation')
the fit model has label_accuracy: 0.219 and domain_accuracy:0.585 and fitness_scor
e:0.190
('Step', 33, ':', 0.18450546264648438, 'best:', 0.19488143920898438, 20)
('It took', 20.297303915023804, 'seconds to complete generation')
the fit model has label_accuracy: 0.271 and domain_accuracy:0.647 and fitness_scor
e:0.185
('Step', 34, ':', 0.18999862670898438, 'best:', 0.19488143920898438, 20)
('It took', 20.22662901878357, 'seconds to complete generation')
the fit model has label_accuracy: 0.279 and domain_accuracy:0.649 and fitness_scor
e:0.190
('Step', 35, ':', 0.1491546630859375, 'best:', 0.19488143920898438, 20)
('It took', 20.263245105743408, 'seconds to complete generation')
the fit model has label_accuracy: 0.175 and domain_accuracy:0.580 and fitness_scor
e:0.149
('Step', 36, ':', 0.1807708740234375, 'best:', 0.19488143920898438, 20)
('It took', 20.49049401283264, 'seconds to complete generation')
the fit model has label_accuracy: 0.209 and domain_accuracy:0.584 and fitness_scor
e:0.181
('Step', 37, ':', 0.22661972045898438, 'best:', 0.22661972045898438, 20)
('It took', 20.384830951690674, 'seconds to complete generation')
the fit model has label_accuracy: 0.257 and domain_accuracy:0.587 and fitness_scor
e:0.227
('Step', 38, ':', 0.1799163818359375, 'best:', 0.22661972045898438, 20)
('It took', 20.206723928451538, 'seconds to complete generation')
the fit model has label_accuracy: 0.203 and domain_accuracy:0.576 and fitness_scor
e:0.180
('Step', 39, ':', 0.17623519897460938, 'best:', 0.22661972045898438, 20)
('It took', 20.37071394920349, 'seconds to complete generation')
the fit model has label_accuracy: 0.190 and domain_accuracy:0.560 and fitness_scor
e:0.176

('Step', 40, ':', 0.20708847045898438, 'best:', 0.22661972045898438, 20)
('It took', 20.325758934020996, 'seconds to complete generation')
the fit model has label_accuracy: 0.237 and domain_accuracy:0.587 and fitness_scor
e:0.207
('Step', 41, ':', 0.1748046875, 'best:', 0.22661972045898438, 20)
('It took', 20.31946611404419, 'seconds to complete generation')
the fit model has label_accuracy: 0.223 and domain_accuracy:0.609 and fitness_scor
e:0.175
('Step', 42, ':', 0.1851654052734375, 'best:', 0.22661972045898438, 20)
('It took', 20.347121953964233, 'seconds to complete generation')
the fit model has label_accuracy: 0.196 and domain_accuracy:0.553 and fitness_scor
e:0.185
```

```
('Step', 43, ':', 0.2070159912109375, 'best:', 0.22661972045898438, 20)
('It took', 20.83852505683899, 'seconds to complete generation')
the fit model has label_accuracy: 0.268 and domain_accuracy:0.623 and fitness_scor
e:0.207
('Step', 44, ':', 0.1865081787109375, 'best:', 0.22661972045898438, 20)
('It took', 20.357177019119263, 'seconds to complete generation')
the fit model has label_accuracy: 0.247 and domain_accuracy:0.623 and fitness_scor
e:0.187
('Step', 45, ':', 0.24047470092773438, 'best:', 0.24047470092773438, 20)
('It took', 20.980760097503662, 'seconds to complete generation')
the fit model has label_accuracy: 0.276 and domain_accuracy:0.595 and fitness_scor
e:0.240
('Step', 46, ':', 0.22179794311523438, 'best:', 0.24047470092773438, 20)
('It took', 21.347738027572632, 'seconds to complete generation')
the fit model has label_accuracy: 0.271 and domain_accuracy:0.610 and fitness_scor
e:0.222
('Step', 47, ':', 0.20412826538085938, 'best:', 0.24047470092773438, 20)
('It took', 20.57223391532898, 'seconds to complete generation')
the fit model has label_accuracy: 0.226 and domain_accuracy:0.573 and fitness_scor
e:0.204
('Step', 48, ':', 0.2119140625, 'best:', 0.24047470092773438, 20)
('It took', 20.555355072021484, 'seconds to complete generation')
the fit model has label_accuracy: 0.236 and domain_accuracy:0.578 and fitness_scor
e:0.212
('Step', 49, ':', 0.21331787109375, 'best:', 0.24047470092773438, 20)
('It took', 20.571165084838867, 'seconds to complete generation')
the fit model has label_accuracy: 0.288 and domain_accuracy:0.637 and fitness_scor
e:0.213
('Step', 50, ':', 0.2231292724609375, 'best:', 0.24047470092773438, 20)
('It took', 20.423042058944702, 'seconds to complete generation')
the fit model has label_accuracy: 0.260 and domain_accuracy:0.596 and fitness_scor
e:0.223
('Step', 51, ':', 0.2297210693359375, 'best:', 0.24047470092773438, 20)
('It took', 20.390281915664673, 'seconds to complete generation')
the fit model has label_accuracy: 0.279 and domain_accuracy:0.611 and fitness_scor
e:0.230
('Step', 52, ':', 0.21837997436523438, 'best:', 0.24047470092773438, 20)
('It took', 20.522415161132812, 'seconds to complete generation')
the fit model has label_accuracy: 0.228 and domain_accuracy:0.548 and fitness_scor
e:0.218
('Step', 53, ':', 0.22301864624023438, 'best:', 0.24047470092773438, 20)
('It took', 20.303848028182983, 'seconds to complete generation')
the fit model has label_accuracy: 0.248 and domain_accuracy:0.579 and fitness_scor
e:0.223
('Step', 54, ':', 0.2327728271484375, 'best:', 0.24047470092773438, 20)
('It took', 20.538686990737915, 'seconds to complete generation')
the fit model has label_accuracy: 0.323 and domain_accuracy:0.650 and fitness_scor
e:0.233
('Step', 55, ':', 0.2552757263183594, 'best:', 0.2552757263183594, 20)
('It took', 20.67593288421631, 'seconds to complete generation')
the fit model has label_accuracy: 0.269 and domain_accuracy:0.558 and fitness_scor
e:0.255
('Step', 56, ':', 0.24010848999023438, 'best:', 0.2552757263183594, 20)
('It took', 20.336989879608154, 'seconds to complete generation')
the fit model has label_accuracy: 0.287 and domain_accuracy:0.608 and fitness_scor
e:0.240
('Step', 57, ':', 0.2737884521484375, 'best:', 0.2737884521484375, 20)
('It took', 20.406694173812866, 'seconds to complete generation')
the fit model has label_accuracy: 0.313 and domain_accuracy:0.600 and fitness_scor
e:0.274
('Step', 58, ':', 0.2500877380371094, 'best:', 0.2737884521484375, 20)
('It took', 20.349339962005615, 'seconds to complete generation')
the fit model has label_accuracy: 0.276 and domain_accuracy:0.581 and fitness_scor
e:0.250
('Step', 59, ':', 0.3173789978027344, 'best:', 0.3173789978027344, 20)
('It took', 20.465909004211426, 'seconds to complete generation')
the fit model has label_accuracy: 0.379 and domain_accuracy:0.624 and fitness_scor
e:0.317
('Step', 60, ':', 0.2380218505859375, 'best:', 0.3173789978027344, 20)
('It took', 20.43181300163269, 'seconds to complete generation')
```

```
the fit model has label_accuracy: 0.319 and domain_accuracy:0.643 and fitness_scor
e:0.238
('Step', 61, ':', 0.275146484375, 'best:', 0.3173789978027344, 20)
('It took', 20.548513889312744, 'seconds to complete generation')
the fit model has label_accuracy: 0.346 and domain_accuracy:0.633 and fitness_scor
e:0.275
('Step', 62, ':', 0.2825584411621094, 'best:', 0.3173789978027344, 20)
('It took', 21.252085208892822, 'seconds to complete generation')
the fit model has label_accuracy: 0.333 and domain_accuracy:0.612 and fitness_scor
e:0.283
('Step', 63, ':', 0.24319076538085938, 'best:', 0.3173789978027344, 20)
('It took', 21.047274112701416, 'seconds to complete generation')
the fit model has label_accuracy: 0.265 and domain_accuracy:0.573 and fitness_scor
e:0.243
```

In [55]:
```
Save_Model('mnistmodeltestD_new')
import pandas as pd
scorelog = pd.DataFrame(logscore)
scorelog.to_csv('logscore.csv', header=None)
```

In [56]:
```
weight_modifier.set_weights(snes.center)
```

In [57]:
```
label_clf = Train_classifier(mnist_train,mnist_train_labels)
sourcePredictions = Predict_from_clf(label_clf, mnist_test)
sourceAccuray = accuracy_score(mnist_test_labels,sourcePredictions)
print  "label predicitions on MNIST %0.3f" % (sourceAccuray)

targetPredictions = Predict_from_clf(label_clf, mnistm_test)
targetAccuracy = accuracy_score(targetPredictions, mnist_test_labels)
print "label predicitons on MNISTM %0.3f" %(targetAccuracy)
```

```
label predicitions on MNIST 0.320
label predicitons on MNISTM 0.125
```

In [58]:
```
R_MT_INDEX = np.random.choice(a=list(range(MX.shape[0])), size=MY.shape[0])
TM_X = MX[R_MT_INDEX]
TM_Y = MY[R_MT_INDEX]

TEST_MX = np.concatenate([mnist_test, mnistm_test], axis=0)
TEST_MY = np.concatenate([np.zeros(mnist_test.shape[0]), np.ones(mnistm_test.shape[0])
```

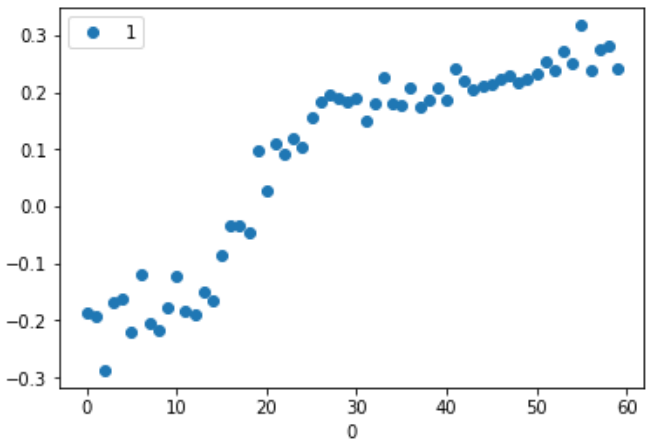
In [59]:
```
domain_clf = Train_classifier(TM_X, TM_Y)
domain_pred = Predict_from_clf(domain_clf, TEST_MX)
domain_accuracy= accuracy_score(TEST_MY, domain_pred)
print("domain predicitions accuracy: %0.3f" %(domain_accuracy))
```

```
domain predicitions accuracy: 0.581
```

In [60]:
```
log = pd.read_csv('logscore.csv', header=None)
```

In [61]:
```
log.plot(x=0, y=1, style='o')
```

Out[61]: <matplotlib.axes._subplots.AxesSubplot at 0x1c24c7d390>



In [ ]: