DLM_basic2_HPoutput

February 28, 2019

In [1]:
```
#%% IMPORT PACKAGES
import numpy as np
import pandas as pd
from matplotlib import rcParams  # next 3 lines set font family for plotting
rcParams['font.family'] = 'serif'
rcParams['font.sans-serif'] = ['TImes New Roman']
import matplotlib.pyplot as plt
plt.rcParams.update({'font.size': 18})
import os
import h5py
import pickle
import seaborn as sns

# set working directory (change the following path to match your directory structure)
main = 'C:\\Users\\Kathy_Breen\\Documents\\DL_Seminar\\Week3'
os.chdir(main)  # make sure the Spyder is pointing to the correct
```

In [2]:
```
#%% Read in *.hdf5 data sets

with h5py.File('X.hdf5','r') as f:
    X_test = np.array(f["X_test"])

with h5py.File('Y.hdf5','r') as f:
    Y_test = np.array(f["Y_test"])
```

In [3]:
```
#%% load, read output

hparams = pd.read_csv('h_tuning.txt',sep='\t')
rundict = pickle.load( open( "HyperParamOut.pkl", "rb" ))
Ymse_MLP = []

for run in rundict.keys():
    Ymse_MLP.append(rundict[run]['Y_mse'])
    print(rundict[run]['Y_mse'])
```

```
# find minimum loss for each permutation of parameters and plot
loss_min = np.min(Ymse_MLP)
min_idx = np.argmin(Ymse_MLP)

# define temporary histdict for plotting using the "best" run for each modeltype
histdict = rundict[min_idx]['histdict']
```

```
2.1912402266130595
0.0005592641259709909
0.00014763628014974285
0.00012109783016172384
0.00014975153299554456
0.0007583016096143587
0.00021291794942361193
0.0002451881957300616
0.00034594098956065286
0.0002581212206096743
2.191073500861349
2.1912138805437835
2.1905858078781426
0.0003896286039025265
0.00028278177610453536
2.1913964698421173
2.191295594577944
2.191314588483679
0.0009593100661892775
0.0017419185111640656
2.191156884632089
2.191210458568173
0.0022508669541735256
0.0018423189387635147
2.191382201967397
0.00035438796061327686
0.00013629605068918578
0.0002094344827652709
0.00027369714164061183
6.264332595788443e-05
0.0004733379895782292
0.0002655854207772202
0.0002905879722509894
0.0002592931090640633
0.00015667247128839083
2.1913018887338818
0.00044197535523968467
0.00044933189267954505
0.0004583337159174129
0.000509410029103438
```

2.1912614733592513
2.19131633650556
2.191205912516667
0.000973297630347594
0.0007556170202782221
0.003632643399204923
0.001556870781618824
0.0022730533312332233
0.0010198997228137272
0.0018052080130620599
0.00010630879820954893
0.00012228649907562603
0.00016178004281352693
0.00015100778426642279
0.00016331975705133377
2.191261460732652
0.00017909341712241686
0.0003005751375527235
0.0004395532029106722
0.00034716391871726686
0.00039471069937600296
2.1910079687772566
0.0006094023321934521
0.0004163461645124893
0.0011624522485661815
2.1910710942590756
0.0014625754549503014
0.0014678152939210825
0.0012507623477920205
0.0008179797139716065
0.002092519592174212
2.190679919104975
0.0017001105523215597
0.003718993685227784
0.001817202261327439
0.00022494765789050967
1.866909161990304e-05
2.191278990066443
0.0001428658588539623
0.0002385850106649866
0.00033253081984340176
0.0001896390900570331
0.0002506137820443088
5.332787839163229e-05
2.1914599912068056
2.1911227341042046
2.1911415187848333
0.00020255946548579474

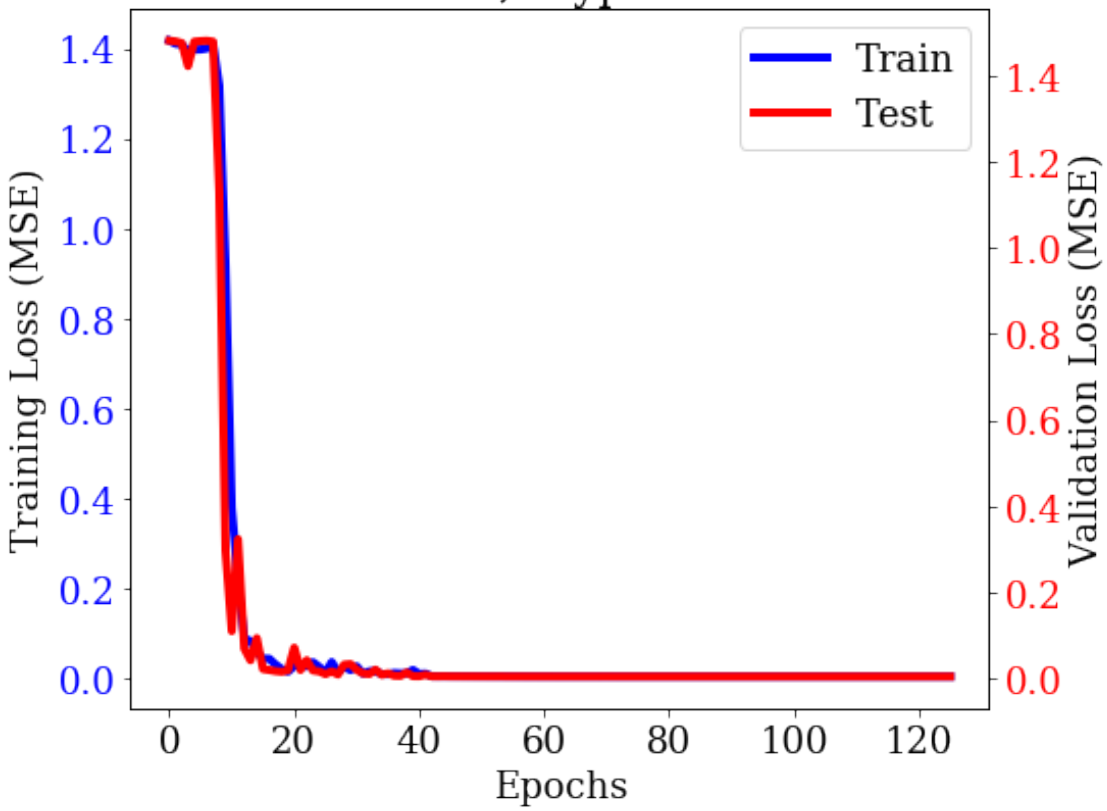
```
0.0006165650927608066
0.0004493625919094006
2.1909945137832563
2.1872171118796166
2.1906183633096252
0.0007954004435568191
0.0014693407418011415
2.1912083792392205
0.0017851351619967506
0.0032271741645880907
0.0021576907508974634
0.001339623747870038
```

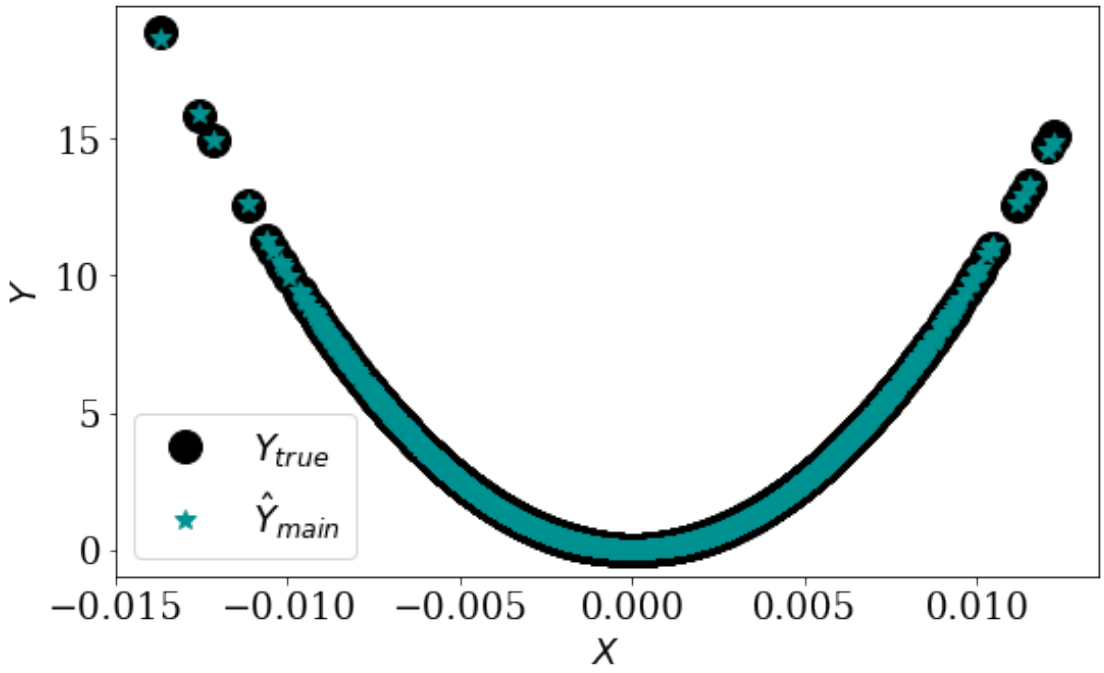
In [4]:

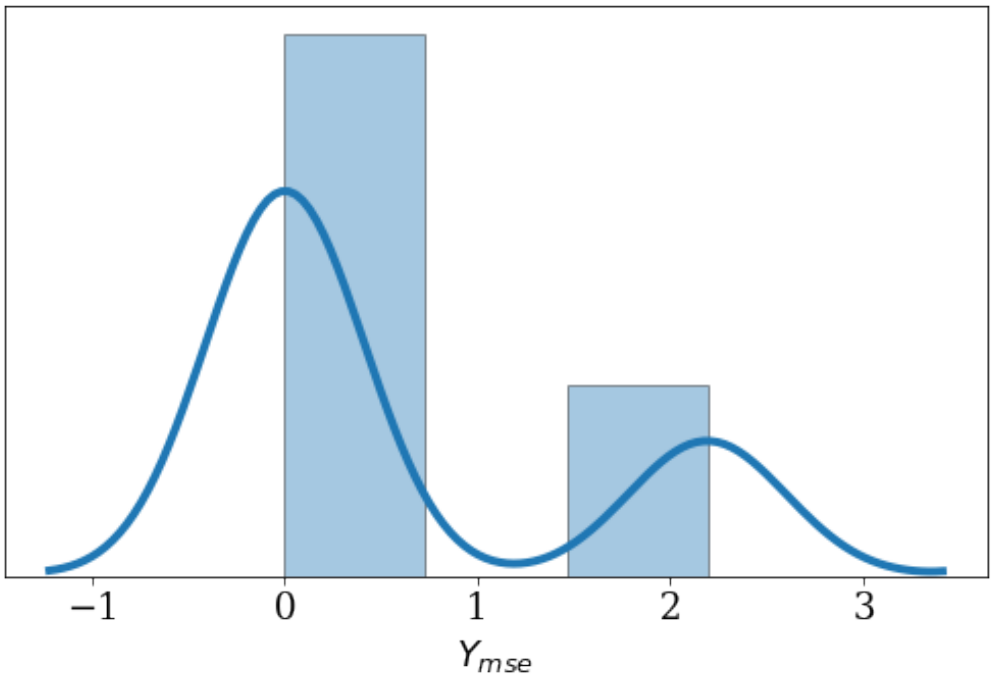
```
#%% PLOT OUTPUT

# define datasets to plot
loss_train = histdict['loss']
loss_test = histdict['val_loss']
xplot = list(range(len(loss_train)))
Ymse_MLP = np.array(Ymse_MLP)  # change to numpy array

# plot
fig = plt.figure(num=1, figsize=(8,6))
ax1 = fig.add_subplot(111)
train = ax1.plot(xplot,np.sqrt(loss_train),'b-', label='Train', linewidth=4)
ax1.set_xlabel('Epochs')
ax1.set_ylabel('Training Loss (MSE)')
for tl in ax1.get_yticklabels():
    tl.set_color('b')
ax2 = ax1.twinx()
test = ax2.plot(xplot,np.sqrt(loss_test),'r-',label='Test',linewidth=4)
ax2.set_xlabel('Epochs')
ax2.set_ylabel('Validation Loss (MSE)')
for tl in ax2.get_yticklabels():
    tl.set_color('r')
curves = train + test
labels = [c.get_label() for c in curves]
ax1.legend(curves, labels, loc=0)
plt.tight_layout()
plt.title(str(hparams.loc[min_idx,:]))
plt.savefig('HP_best_loss.png')
plt.show()

fig = plt.figure(num=2, figsize=(8,10))
ax1 = fig.add_subplot(211)
y_true = ax1.plot(X_test,Y_test,'ko',markersize=16,label=r'$Y_{true}$')
```

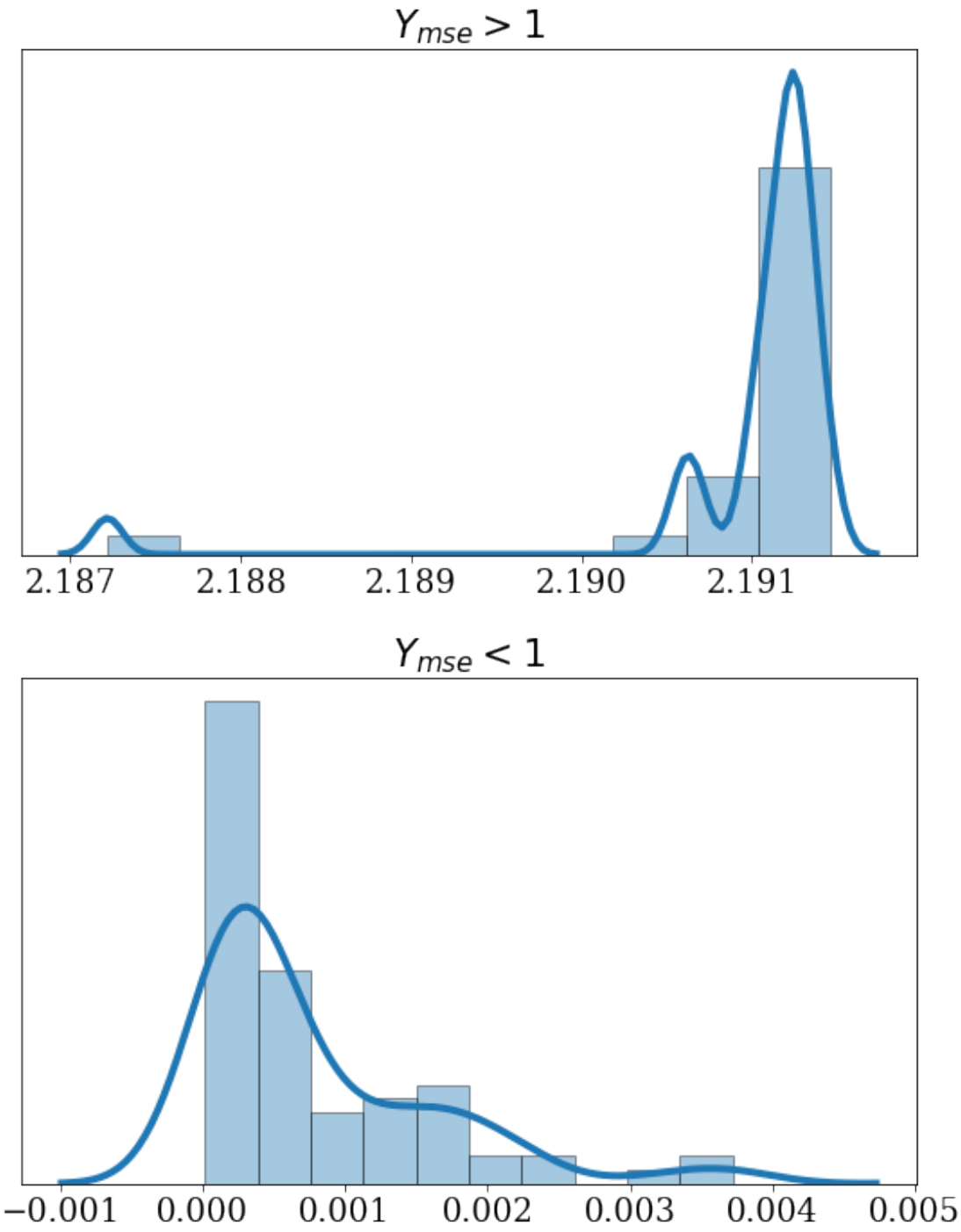
```
y_pred = ax1.plot(X_test,rundict[min_idx]['predict'],'*',color='#009191',markersize=10,
    label=r'$\hat{Y}_{main}$')
curves = y_true+y_pred
labels = [c.get_label() for c in curves]
ax1.legend(curves, labels, loc=0)
ax1.set_xlabel(r'$X$')
ax1.set_ylabel(r'$Y$')
ax2 = fig.add_subplot(212)
sns.distplot(Ymse_MLP,  # data to plot
             hist=True,  # plot histogram
             kde=True,   # overlay kernel density function (PDF)
             ax=ax2,  # plot on the existing axis object created for this figure
             hist_kws={'edgecolor':'black'},  # set color to outline hist bins
             kde_kws={'linewidth': 4}  # use a thick line for the kde
             )
ax2.set_xlabel(r'$Y_{mse}$')
ax2.get_yaxis().set_visible(False)
plt.tight_layout()
plt.savefig('HP_best_yyhat.png')
plt.show()

fig = plt.figure(num=3, figsize=(8,10))
ax1 = fig.add_subplot(211)
sns.distplot(Ymse_MLP[Ymse_MLP > 1],  # data to plot
             hist=True,  # plot histogram
             bins=10,  # number of bins to use in histogram
             kde=True,   # overlay kernel density function (PDF)
             ax=ax1,  # plot on the existing axis object created for this figure
             hist_kws={'edgecolor':'black'},  # set color to outline hist bins
             kde_kws={'linewidth': 4}  # use a thick line for the kde
             )
ax1.set_title(r'$Y_{mse} > 1$')
ax1.get_yaxis().set_visible(False)
ax2 = fig.add_subplot(212)
sns.distplot(Ymse_MLP[Ymse_MLP < 1],  # data to plot
             hist=True,  # plot histogram
             bins=10,  # number of bins to use in histogram
             kde=True,   # overlay kernel density function (PDF)
             ax=ax2,  # plot on the existing axis object created for this figure
             hist_kws={'edgecolor':'black'},  # set color to outline hist bins
             kde_kws={'linewidth': 4}  # use a thick line for the kde
             )
ax2.set_title(r'$Y_{mse} < 1$')
ax2.get_yaxis().set_visible(False)
plt.tight_layout()
plt.savefig('HP_best_dist.png')
plt.show()
```

batch_size 500.0
do 0.2
Nlyr 8.0
Nnodes 75.0
Name: 76, dtype: float64




15
10
5
0
Y
Y_{true}
$\hat{Y}_{main}$
−0.015
−0.010
−0.005
0.000
0.005
0.010
X


−1
0
1
2
3
Y_{mse}


$Y_{mse} > 1$
2.187
2.188
2.189
2.190
2.191
$Y_{mse} < 1$
−0.001
0.000
0.001
0.002
0.003
0.004
0.005