M9-L1-P2

November 11, 2023

0.1 M9-L1 Problem 2

Recall the von Mises stress prediction problem from the module 6 homework. In this problem, you will compute the R^2 score for a few model predictions for a single shape in this dataset. You will also plot the predicted-vs-actual stress for each model.

[ ]:

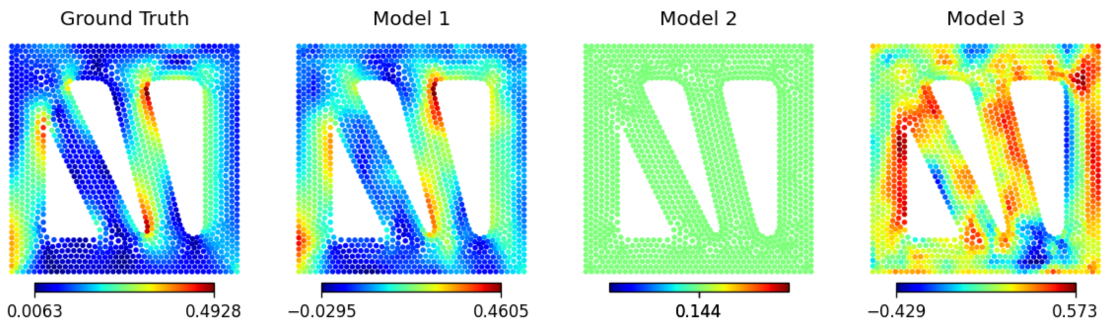
```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import r2_score

float32 = np.float32
```

[ ]:

-
-
-
-

[ ]:

```
def plot_shape(x, y, stress, lims=None):

    if lims is None:
        lims = [min(stress),max(stress)]

    plt.scatter(x,y,s=5,c=stress,cmap="jet",vmin=lims[0],vmax=lims[1])
    plt.colorbar(orientation="horizontal", shrink=.75, pad=0,ticks=lims)
    plt.axis("off")
    plt.axis("equal")

def plot_all(x, y, gt, model1, model2, model3):
    plt.figure(figsize=[12,3.2], dpi=120)
    plt.subplot(141)
    plot_shape(x, y, gt)
    plt.title("Ground Truth")

    plt.subplot(142)
    plot_shape(x, y, model1)
    plt.title("Model 1")

    plt.subplot(143)
    plot_shape(x, y, model2)
    plt.title("Model 2")

    plt.subplot(144)
    plot_shape(x, y, model3)
    plt.title("Model 3")

    plt.show()

plot_all(xs, ys, gt, model1, model2, model3)
```

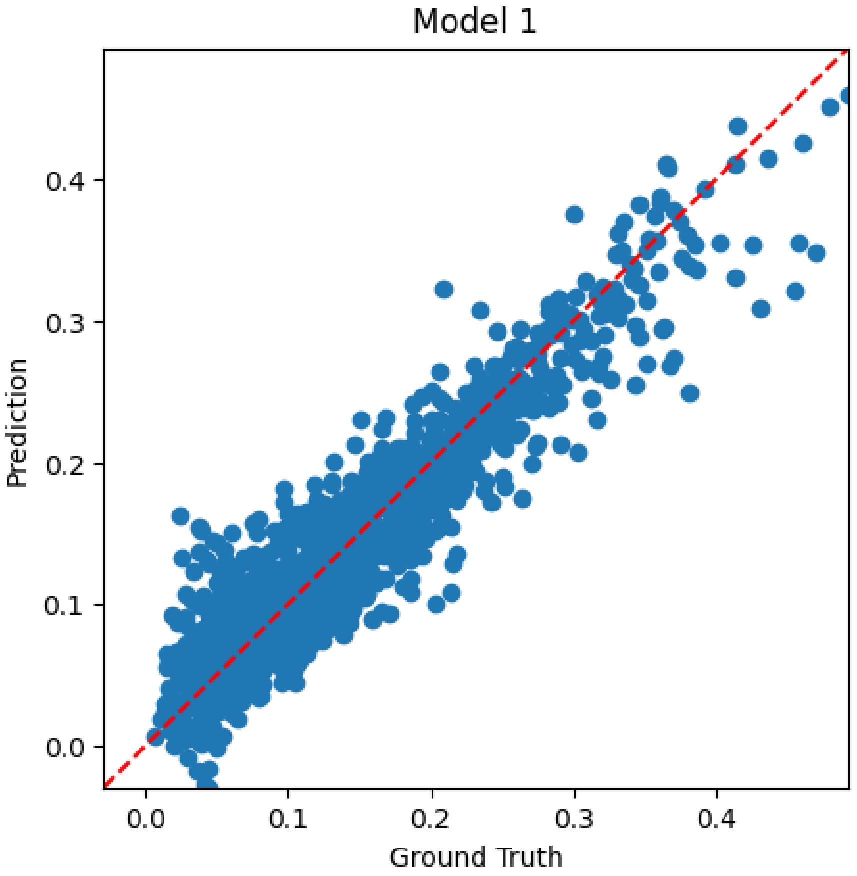


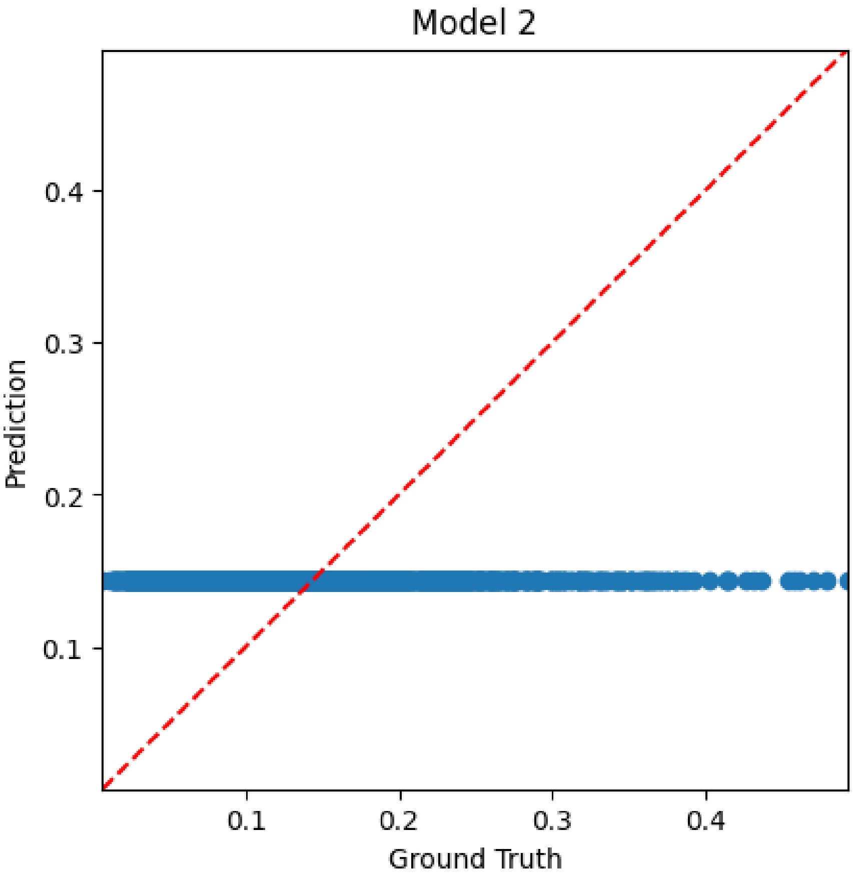
[ ]:

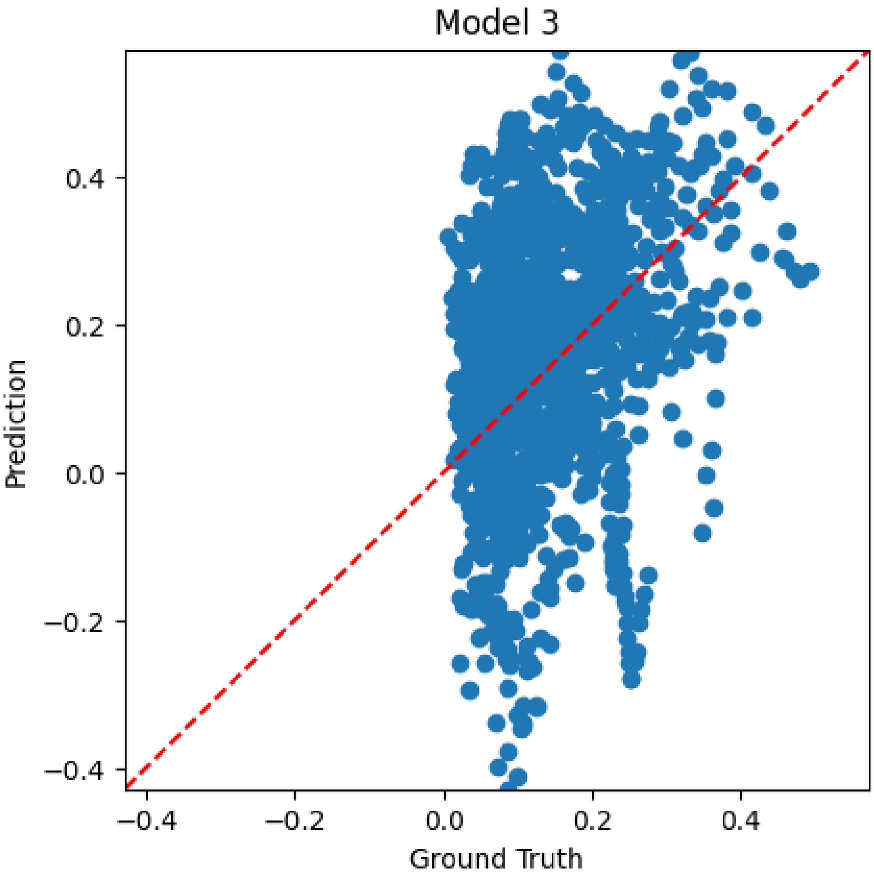
```
def R_Squared(y_gt, y_pred):
    RSS = np.sum(np.power((y_gt - y_pred), 2))
    TSS = np.sum(np.power((y_gt - np.mean(y_gt)),2))
    return 1 - RSS/TSS

model1_r_squared = R_Squared(gt, model1)
model2_r_squared = R_Squared(gt, model2)
model3_r_squared = R_Squared(gt, model3)

print(f"Model 1 R^2: {model1_r_squared}")
print(f"Model 2 R^2: {model2_r_squared}")
print(f"Model 3 R^2: {model3_r_squared}")
```

[ ]:

```
def plot_r2(gt, pred, title):
    plt.figure(figsize=[5,5])

    plt.scatter(gt, pred)

    plt.plot([-1000,1000], [-1000,1000],"r--")

    all = np.concatenate([gt, pred])
    plt.xlim(np.min(all), np.max(all))
    plt.ylim(np.min(all), np.max(all))
    plt.xlabel("Ground Truth")
    plt.ylabel("Prediction")
    plt.title(title)
    plt.show()

plot_r2(gt, model1,"Model 1")
plot_r2(gt, model2,"Model 2")
plot_r2(gt, model3,"Model 3")
```




Model 2
Prediction
0.4
0.3
0.2
0.1
0.1
0.2
0.3
0.4
Ground Truth



1.

2.