CS532 HW 3 Part 4B

# Python Code

**import** numpy **as** np  
**import** pandas **as** pd  
**import** scipy.linalg **as** linalg  
**import** matplotlib.pyplot **as** plt  
**import** matplotlib.patches **as** mpatches  
  
**def** question4():  
 degrees = [1, 2, 3]*#[1, 2, 3]* plotColors = [**'blue'**, **'green'**, **'red'**]  
 plotHandles = []  
  
 data = pd.read\_csv(**'./data.csv'**, header=**None**, names=[**'x'**, **'y'**])  
  
 plt.scatter(list(data.x), list(data.y))  
  
 *#Expand x into the polynomial data matrix.* **for** d **in** degrees:  
 A = np.ones((len(data.x), d + 1))  
 **for** rowInd **in** range(0, len(data.x)):  
 **for** col **in** range(1, len(A[0])):  
 A[rowInd, col] = data.iloc[rowInd][**'x'**]\*\*col  
  
 *#Find coeffecients.* coeff = linalg.solve(np.dot(A.T,A), np.dot(A.T, (data.y.values).reshape((len(data.y), 1))))  
 regressionFunctOutput = []  
 **for** i **in** np.linspace(min(list(data.x)), max(list(data.x))):  
 dataVect = np.ones((1, d+1))  
 **for** col **in** range(1, len(A[0])):  
 dataVect[0, col] = i\*\*col  
 regressionFunctOutput.append((i, (np.dot(dataVect, coeff)[0, 0])))  
 plt.plot(list(map(**lambda** item: item[0], regressionFunctOutput)), list(map(**lambda** item: item[1], regressionFunctOutput)), color=plotColors[d-1])  
 plotHandles.append(mpatches.Patch(color=plotColors[d-1], label=**'Degree '** + str(d)))  
 print(regressionFunctOutput)  
 plt.title(**'Polynomial Regression Curves'**)  
 plt.xlabel(**'X data'**)  
 plt.ylabel(**'Y data'**)  
 plt.legend(handles=plotHandles, loc=2)  
 plt.show()

# Plot

