

1. Given a set of 50 input data and output data, please find the ideal linear regression model! (40%)
(code 部份參考 HW5-1.py，執行結果可以參考 5-1_ans.xls)

```

steven@steven-GL552VW: ~/Desktop/Homework5/test
~/Desktop/Homework5/test INSERT 17:41:34
python HW5-1.py
=====
optimal x that minimize the cost of linear regression model Y = Ax:
[[0.2]
 [0.3]]

```

將資料讀入後並且轉成矩陣格式，接著套用 Linear optimization 的公式 $X = (A^T A)^{-1} A^T Y$ 得到 X 值後再將其輸出至 excel 格式，所得出的結果是 $x_1 = 0.2$ ， $x_2 = 0.3$ 。

2. Given the Inertial frame and body-fixed frame on a UAV with their axes initially aligned, where their z axes are pointing upward (opposite to the direction of the gravity), please find the attitude trajectory of the UAV (i.e., \hat{q}_E^S) given the measurement of the accelerometer of SI unit stored in the excel file. The magnitude of the gravity is 9.8 m/s^2 pointing to -z axis of the inertial frame. (60%) (code 部份參考 HW5-2.py，執行結果可以參考 5-2_ans.xls)

將資料讀入後轉為矩陣格式，並且設定一些參數比如說 iteration 的次數還有 learning rate，接著透過 gradient descent 的方式不斷去更新每一筆資料，可以看到 cost 從一開始很高到最後收斂為 0，所得到的即為所求，再將結果輸出為 excel 格式。

```

steven@steven-GL552VW: ~/Desktop/
epoch: 0, cost: 1240
epoch: 1, cost: 1239
epoch: 2, cost: 1237
epoch: 3, cost: 1235
epoch: 4, cost: 1233
epoch: 5, cost: 1232
epoch: 6, cost: 1230
epoch: 7, cost: 1228
epoch: 8, cost: 1226
epoch: 9, cost: 1224
epoch: 10, cost: 1222
epoch: 11, cost: 1220
epoch: 12, cost: 1218
epoch: 13, cost: 1216
epoch: 14, cost: 1213
epoch: 15, cost: 1211
epoch: 16, cost: 1209
epoch: 17, cost: 1206
epoch: 18, cost: 1204

steven@steven-GL552VW: ~/Desktop/
epoch: 49981, cost: 0
epoch: 49982, cost: 0
epoch: 49983, cost: 0
epoch: 49984, cost: 0
epoch: 49985, cost: 0
epoch: 49986, cost: 0
epoch: 49987, cost: 0
epoch: 49988, cost: 0
epoch: 49989, cost: 0
epoch: 49990, cost: 0
epoch: 49991, cost: 0
epoch: 49992, cost: 0
epoch: 49993, cost: 0
epoch: 49994, cost: 0
epoch: 49995, cost: 0
epoch: 49996, cost: 0
epoch: 49997, cost: 0
epoch: 49998, cost: 0
epoch: 49999, cost: 0
===== gradient descent finished =====

```