ACS234
Maths and Data Modelling

Tutorial 5
Wednesday 1pm online

https://github.com/ineskris/ACS234/tree/master/Tutorial5

Done in Lecture (week 5/6)

- Polynomial Regression
- General Linear Models

Polynomial Regression

Polynomial Model $y = a_0 + a_1 x + a_2 x^2 + \ldots + a_m x^m + e$

Estimation (least squares method) $Y = \hat{\theta} X + e \qquad \hat{\theta} = (X'X)^{-1} X'Y$

General Polynomial Regression - 2 dimension $y = a_0 + a_1 X_1 + a_2 x_2 + a_3 X_1^2 + a_4 X_1 X_2 + a_5 X_2^2 + e$

Exercice 1

x	0	1	2	3
f(x)	2	7	14	23

Based on the data above, estimate the parameters a0,a1,a2 of the **polynomial regression model**. Calculate the MSE error.

Exercice 2

X1	0	1	2	3
X2	12	12.3	12.6	12.9
f(x)	2	-3.3	-3.2	2.3

Based on the data above, estimate the parameters a0,a1,a2, a3, a4, a5 of the **general polynomial regression** model. Calculate the MSE error.

General Linear Models

There are three components to any GLM:

- *Random Component* : noise model or error model. e
- *Systematic Component* - the linear predictor $\eta = X\beta$
- *Link Function, η or g(μ)* - specifies the link between random and systematic components. $E[Y] = g^{-1}(X\beta)$

G*eneral linear model* (GLM) includes multiple linear regression.

Example - logistic regression

$$X\beta = ln(\frac{\mu}{1-\mu}) \qquad \mu = E[Y]$$