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

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

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

General Polynomial Regression (degree 2) $y = a_0 + a_1 X_1 + a_2 x_2 + a_3 X_1^2 + a_4 X_1 X_2 + a_5 X_2^2 + e$

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.

Exercice 1 - bis

Based on each dataset, right down the correct matrix X for a polynomial model with the degree associated.

How many points (at least) do we need to find the estimator a ?

a) Degree 2

x	-3	1	7
f(x)	0	-1	12

b) Degree 3

x	-1	1	7	12
f(x)	0	-1	12	6

c) Degree 4

x	1	7	8
f(x)	8	7	1

d) Degree 2

x	0	0.5	1	5	20
f(x)	13	2	76	0	0