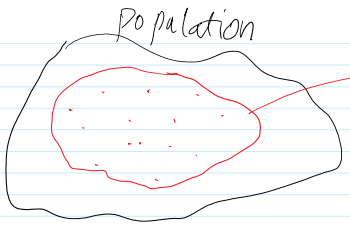
Mean and Variance



Sample
$\bar{x}$: mean of the sample
σ^2 : Variance of the sample
n : number of points in the sample

$$\text{mean}: \bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$\text{Variance}: \sigma^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

$$\sigma^2 = \frac{1}{n-1}\sum\left\{x_i^2 + \bar{x}^2 - 2\bar{x}x_i\right) = \frac{1}{n-1}\left\{\sum x_i^2 + \sum \bar{x}^2 - 2\sum \bar{x}x_i\right\}$$

$$= \frac{1}{n-1}\left\{\sum x_i^2 + n\bar{x}^2 - 2\bar{x}\sum x_i\right\} = \frac{1}{n-1}\left\{\sum x_i^2 + n\bar{x}^2 - 2n\bar{x}^2\right)$$

$\sum x_i = n\bar{x}$

$$S = \sum x_i^2$$

$$W = \sum x_i \Rightarrow W = n\bar{x}$$

$$\bar{x} = \frac{1}{n}\sum x_i \qquad \frac{W}{n} = \bar{x}$$

$$\sigma^2 = \frac{1}{n-1}\left\{S - n\cdot\frac{W^2}{n^2}\right) \Rightarrow$$

$$\boxed{\sigma^2 = \frac{1}{n-1}\left(S - \frac{W^2}{n}\right)}$$

Git remote

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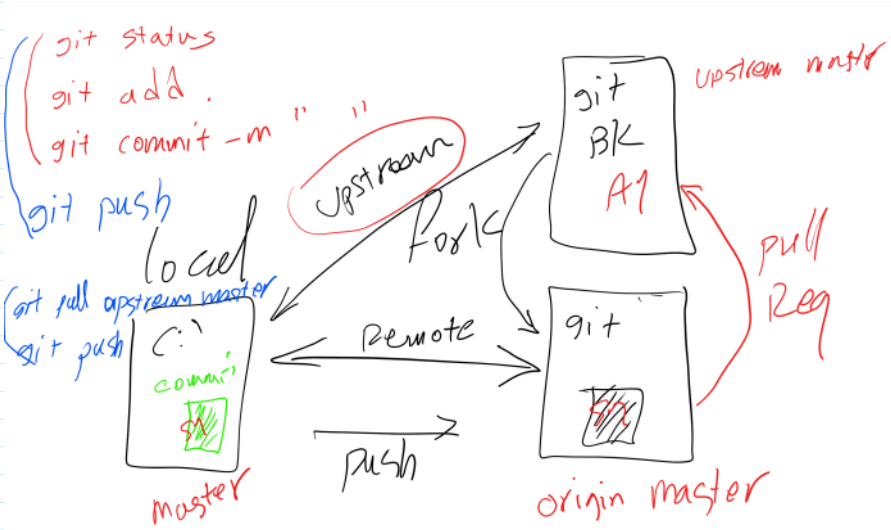

git clone http:// ...

git status

git add .

git commit -m "test"

git remote -v

git remote add 'name' http://

git pull "name of the remote" master

git push "name of the remote"

Assignment 06

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- calculate :

1 { $\frac{\pi}{4} = \sum_{i=1}^{n} \frac{(-1)^n}{2n+1} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} + \cdots + \frac{(-1)^n}{(2n+1)}$

$\frac{\pi^2}{6} = \sum_{i=1}^{n} \frac{1}{i^2}$

π two methods

2: $e = 1 + \sum_{i=1}^{n} \frac{x^i}{i!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!}$

two methods → - use recursive functions; - fast method

3: Maximize $\left(\frac{a}{x}\right)^x$ & plot

Verify by solving by hand

$e^x = 1 + \sum_{i=1}^{n} \frac{x^i}{i!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!}$

$y_1 = x$

$y_2 = y_1 \times \frac{x}{2} = \frac{x^2}{2!}$

$y_3 = y_2 \times \frac{x}{3} = \frac{x^3}{3!}$

$y_4 = y_3 \times \frac{x}{4} = \frac{x^4}{4!}$

$y_i = y_{i-1} \times \frac{x}{i}$

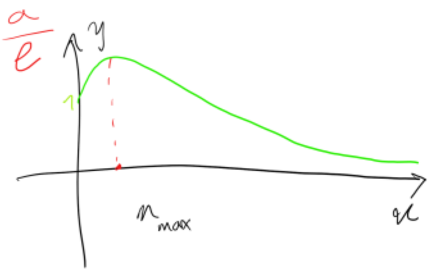
$\max \left(\frac{a}{x}\right)^x = \frac{a}{e}$

$a = 1$

$a = 2$

$a = 10$

$x = \frac{a}{e}$



Correlation coefficient

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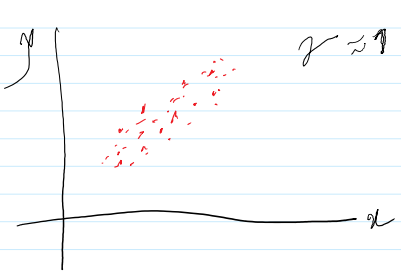

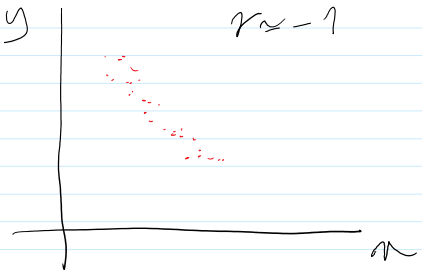

$$corr = S_{xy} / S_x \cdot S_y$$

$$S_{xy} = \frac{1}{n-1} \sum \left\{ (x_i - \bar{x})(y_i - \bar{y}) \right\}$$

$$S_x^2 = \frac{1}{n-1} \sum (x_i - \bar{x})^2$$

$$S_y^2 = \frac{1}{n-1} \sum (y_i - \bar{y})^2$$

$$\bar{x} = \frac{1}{n} \sum x_i \qquad \bar{y} = \frac{1}{n} \sum y_i$$