

Physics 421 / PCSE 503 Lecture 12



THINGS ABOUT CANADIANS

① We do not say "oot"

loud		lout
proud	vs.	stout
cloud		clout

② Top 3 Most Important
"Events" in Canadian

History (SURVEY in 2000)

- ① Healthcare
- ② War of 1812
- ③ Defeating USA in
Olympic Hockey in 2002
- ④ Santa is Canadian



④ We are obsessed with the weather.

Weather ←

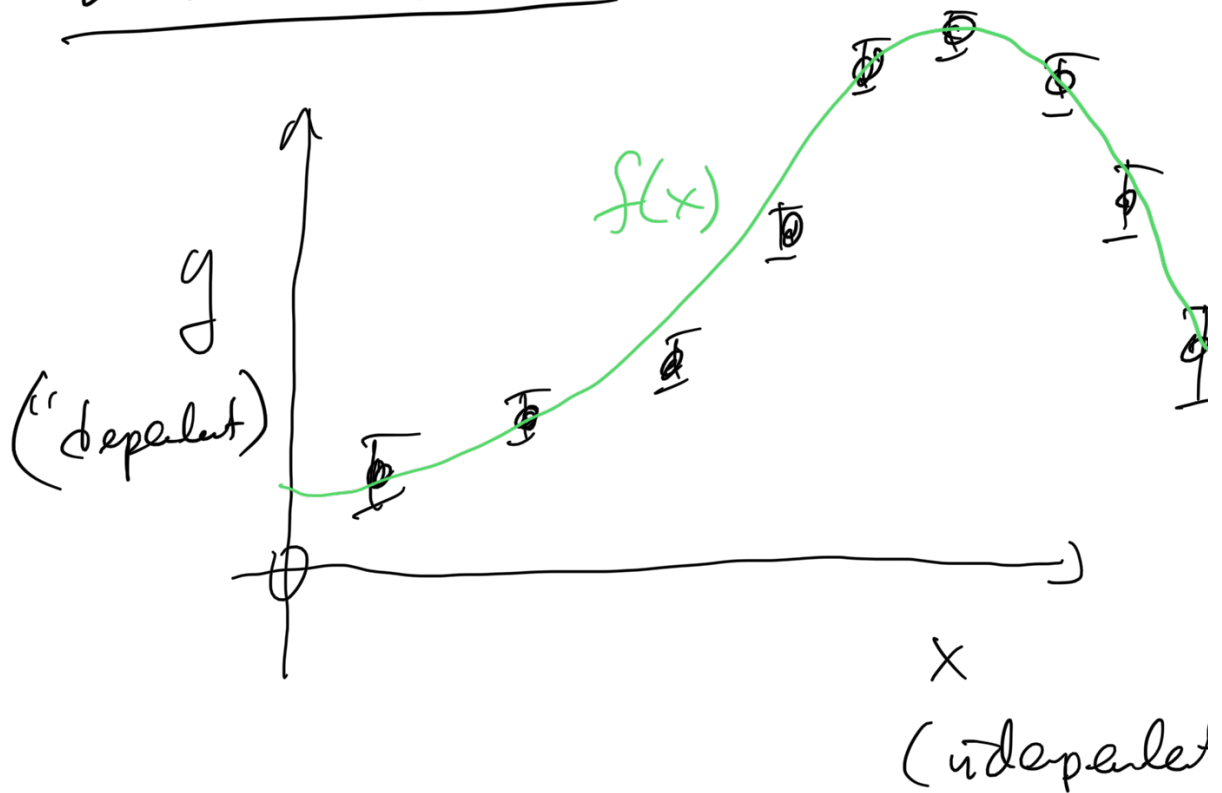
→ complex!

→ Navier-Stokes Equations

- ① Collect lots of Data
 - ② Mathematical Model
 - ③ Predictions
-

Weather Forecasting

Linear Regression.



Ordinary Least Squares.

$$\chi^2 = \sum_{i=1}^N \left(\frac{x_i - x_{fit}}{\sigma_i} \right)^2$$

1 - ... ~~non-linear~~

linear, ~~...~~

Linear Ordinary Least Squares
↑
Linear Regression

$$X_{\text{fit}} = \beta_0 + \beta_1 X$$

β_0, β_1 $\delta\beta_0, \delta\beta_1$

Complex Systems.

↳ dependent variable → y

MANY independent variables.

$x_1, x_2, x_3, x_4, \dots$

↑
wind
speed

↑
humidity

↑
pressure

↑
day length

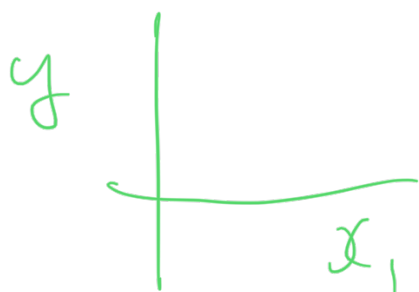
Multivariate ~~Linear~~ Regression.

$$y_{\text{fit}} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \beta_n x_n$$

$$\delta \beta_i \quad x_1^2, x_5^3,$$

METRIC

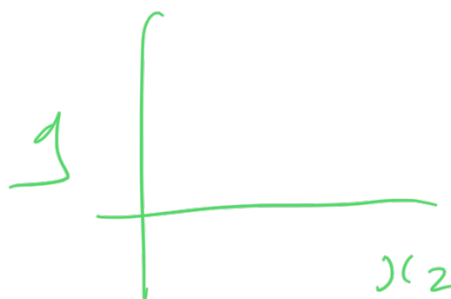
Ordinary
Least
Squares.



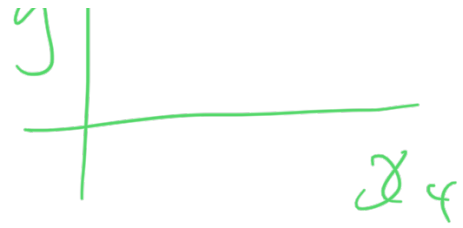
in

$\sin(x_3)$

$x_1 \circ x_2$
in
correlations.



in



Collected Data \rightarrow lots of it!

Controlled Experiments.

$\rightarrow x_2, x_3, x_4 = \text{constant}$

$\rightarrow y \text{ vs. } x_1$

Weather \rightarrow totally uncontrolled Experiments.

Weather Data

\rightarrow ~~free~~

\rightarrow \$\$\$

\rightarrow free (as in beer)

WVO \rightarrow free trial
(60 days)
 \rightarrow historical data

API

WVO_hist

retrieve_hist_data

\rightarrow www.csv

Common Weather Forecasting
Algorithms.

$$\rightarrow T(\text{tomorrow}) = T(\text{today})$$

(future.)

+ $p_3 \text{ temp} \rightarrow$

+
.
.
.
.