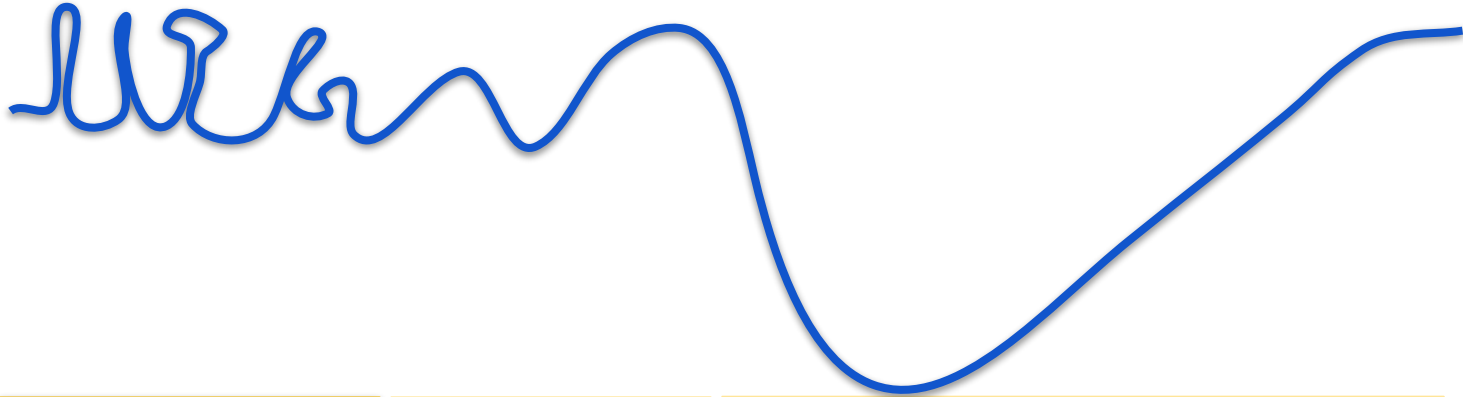# Computing with Signals

DA 623

Jan - May 2023   IIT Guwahati
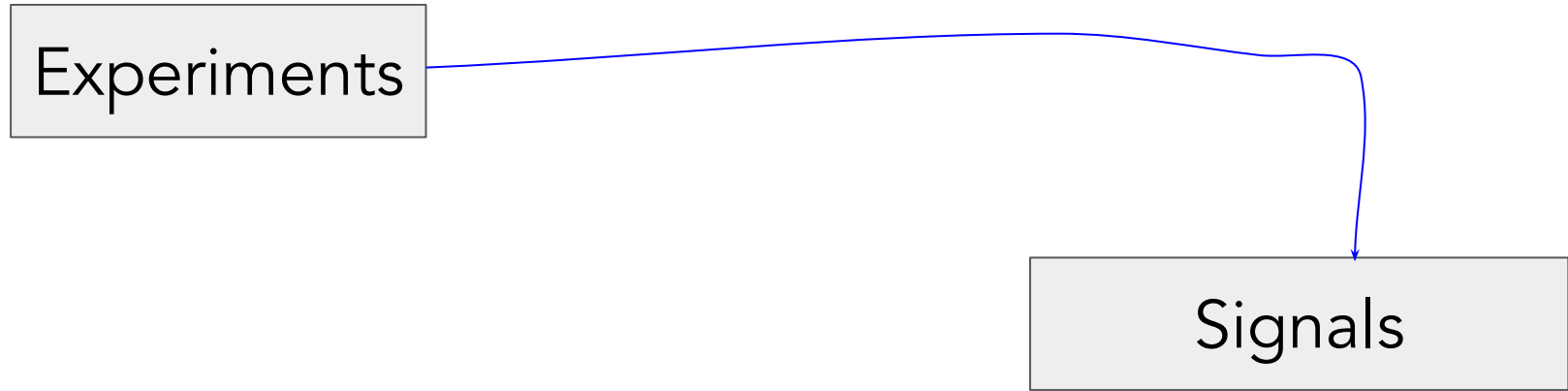
Instructors: Neeraj Sharma

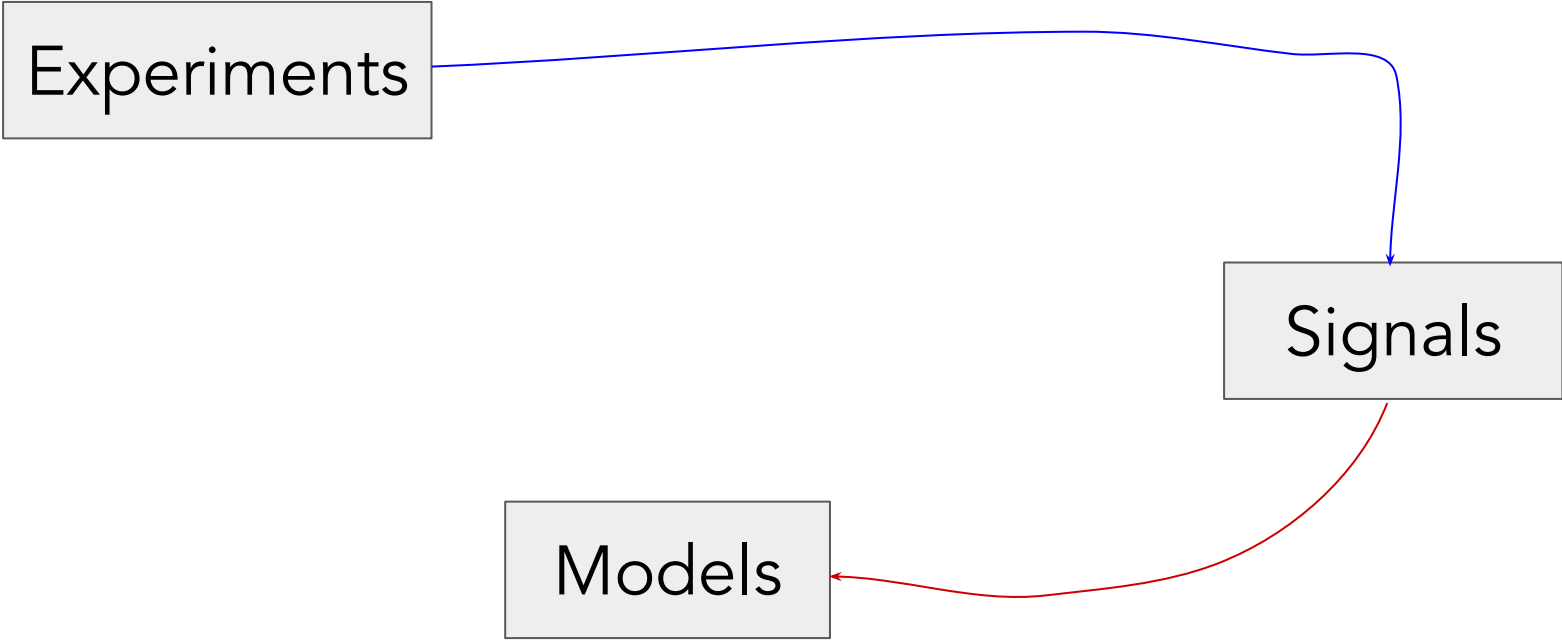Lecture-02

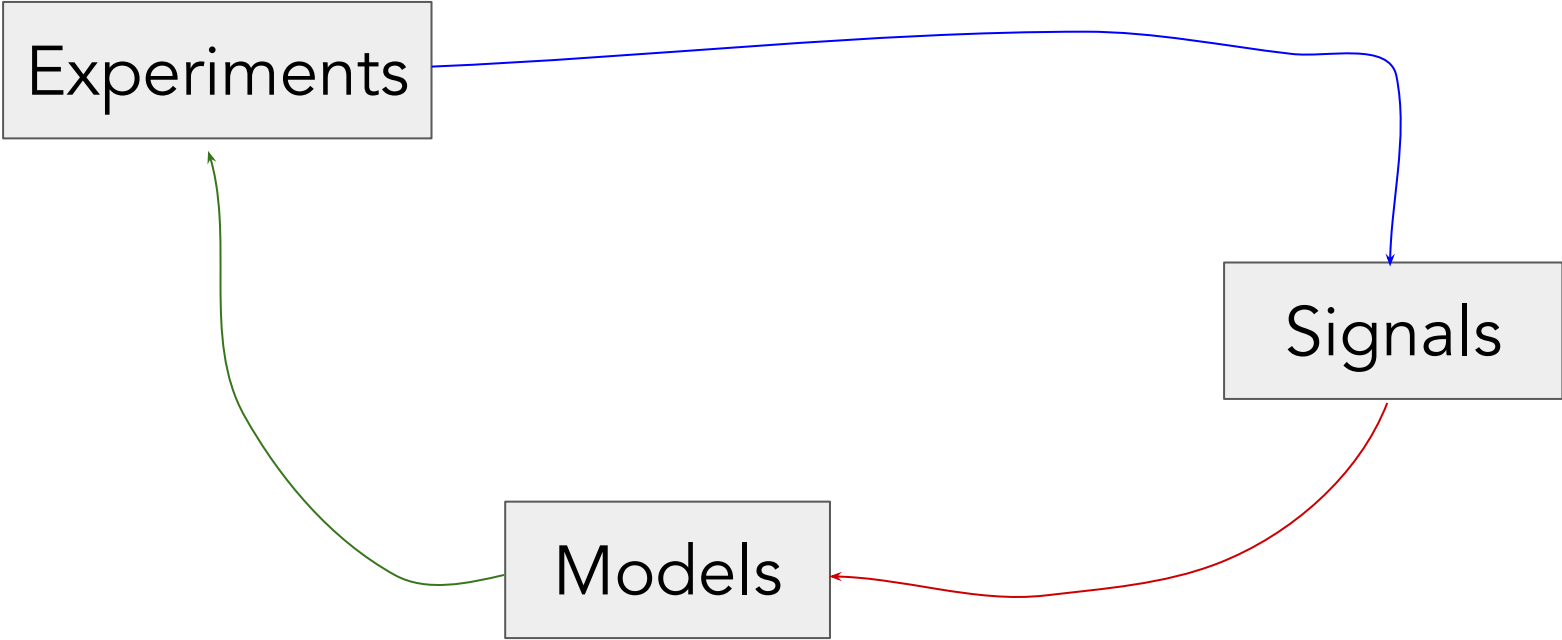# Real world

Experiments

Real world

Experiments → Signals

Real world

Real world

Experiment

Can you provide an estimate of this guy's?

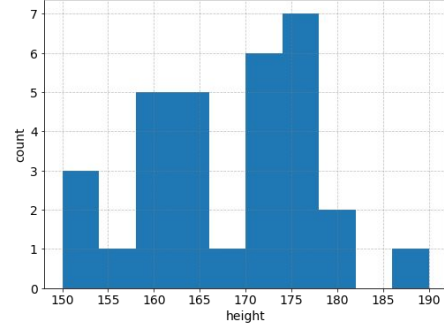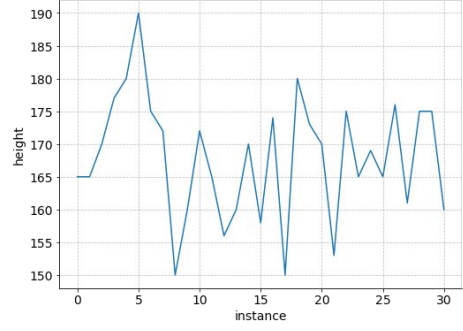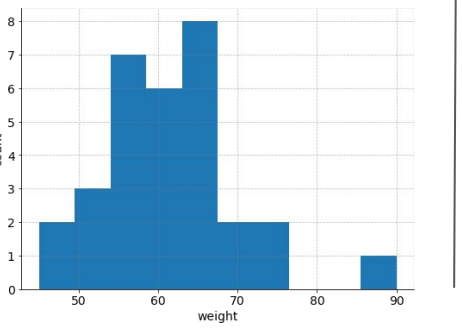- Height
- Weight
- Age

www.shorturl.at/qANOY

(note the CAPS)
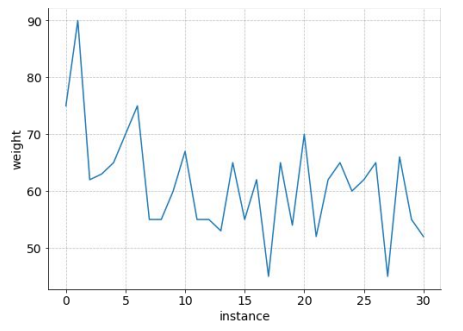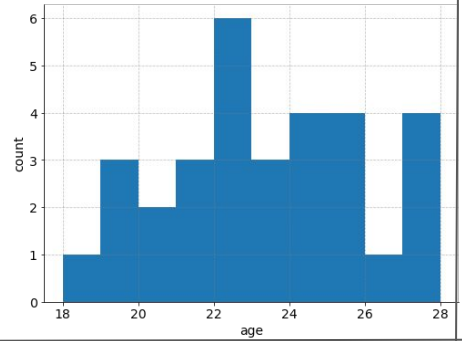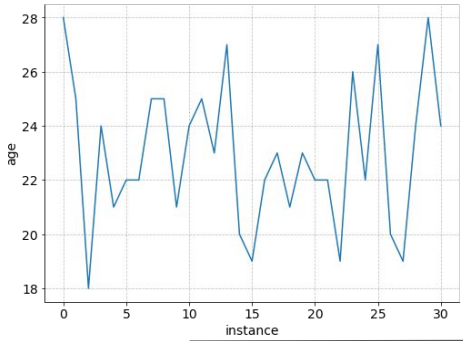
Experiment

Cool! let's visualize the data we collected in 5 mins

Murali Sreeshankar
Indian Athlete (Long Jump),
National record of 8.36 mts (2022)
Height = 180 cms

Modelling

Can we fit a model between "weight" and "height"?
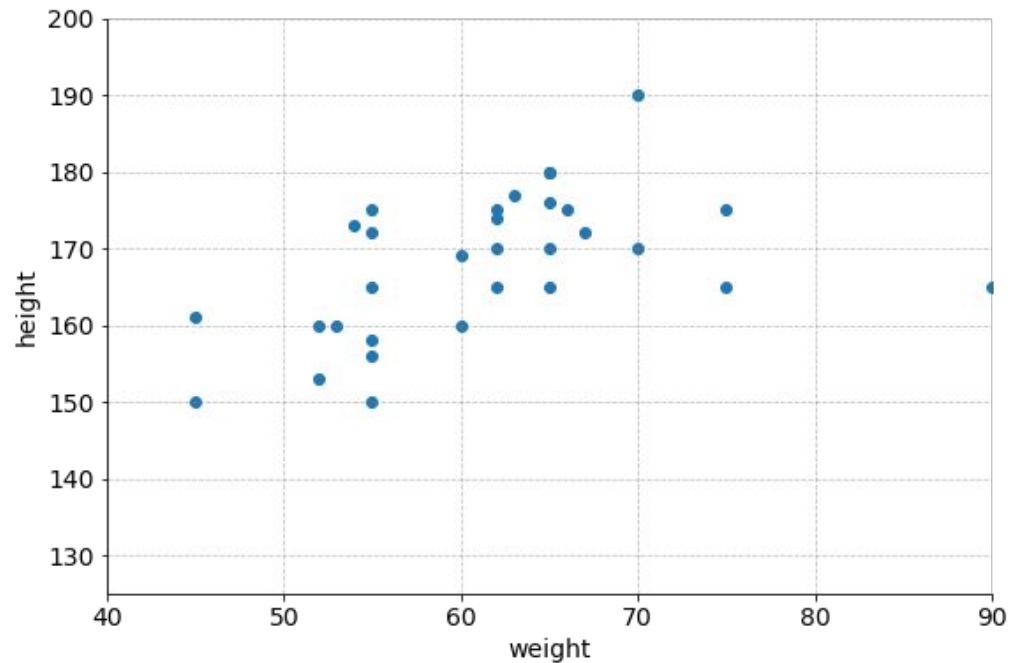
Modelling

Can we propose a model for relationship between "weight" and "height"?

- Some relationship in the scatter!
- What model will be good to start with?
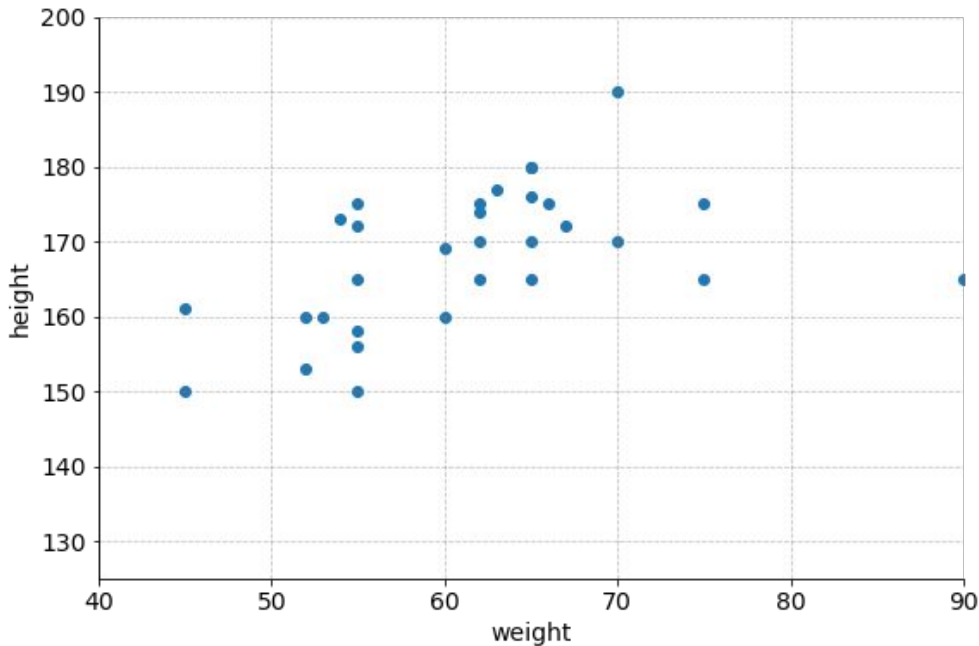
Modelling

Can we propose a model for relationship between "weight" and "height"?

- Some relationship in the scatter!
- What model will be good to start with?

$$f(x) = ?$$

where,
- x := weight
- y := height
- $f(x)$:= model

Linear model:

$$f(x) = a\, x$$

linear?

Modelling
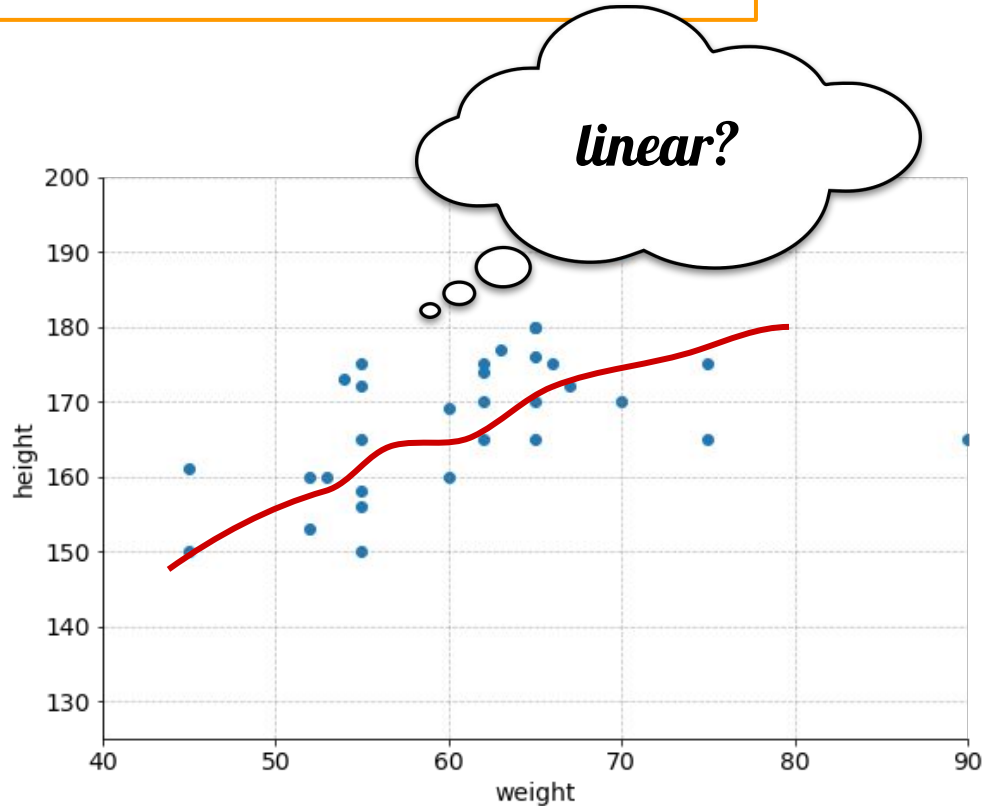
How do we estimate the model parameter here?

Linear model:

- f(x) = a x

  where,

  x := weight
  y := height
  f(x):= model

- $e_i = f(x_i) - y_i = ax_i - y_i$
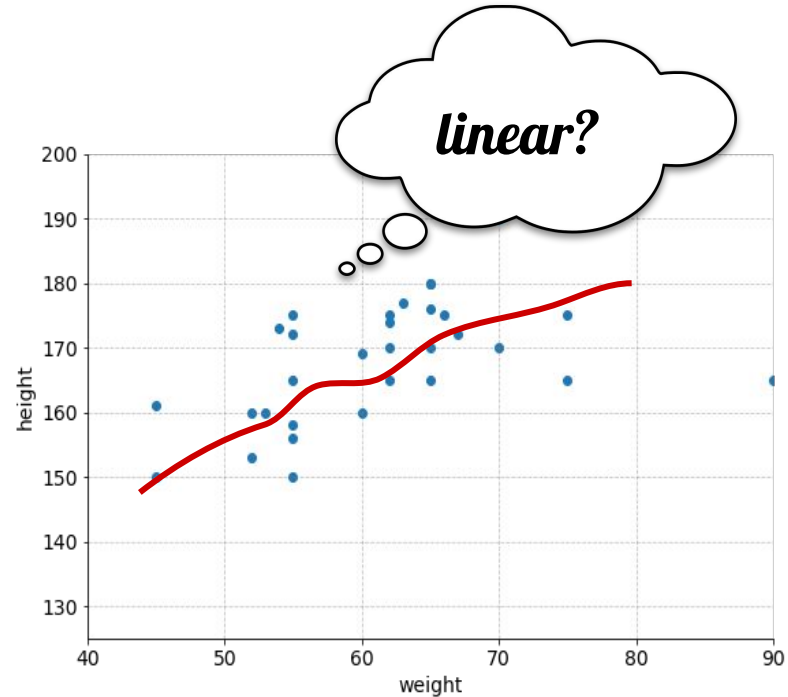
  where,

  e := error

- Minimize error or some function of error over all data points

Data points

x	y
x_1	y_1
x_2	y_2
x_3	y_3
.	.
.	.
.	.
x_N	y_N

linear?

Remember that, like art …

"We all know that art is not truth. <mark>Art is a lie that makes us realize truth, at least the truth that is given us to understand</mark>. The artist must know the manner whereby to convince others of the truthfulness of his lies. If he only shows in his work that he has searched, and re-searched, for the way to put over his lies, he would never accomplish anything."

Pablo Picasso (1927)
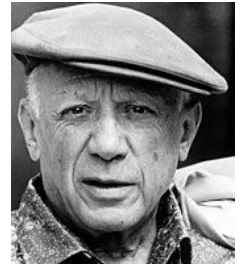
Remember that, like art, model …

"We all know that art is not truth. Art is a lie that makes us realize truth, at least the truth that is given us to understand. The artist must know the manner whereby to convince others of the truthfulness of his lies. If he only shows in his work that he has searched, and re-searched, for the way to put over his lies, he would never accomplish anything."

model *Model* *modeller*

Models - useful?

- Knowledge synthesis

- Test hypotheses and discover unknowns

- Model predictions can serve as as interventions

- Guide newer, useful experiments

- Develop new technologies / applications
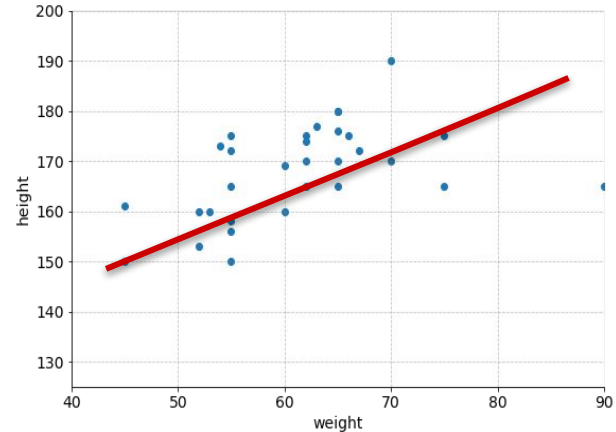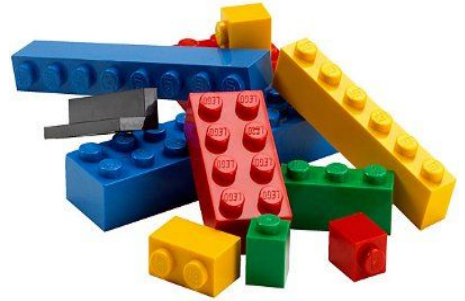
Next lecture we will continue ...
modeling

Thank you