MODELS: are abstract^{n} / approximat^{n} + reality / absolute + mod / system / phenomena

model airplane ⟶ airplane

city street map ⟶ city street

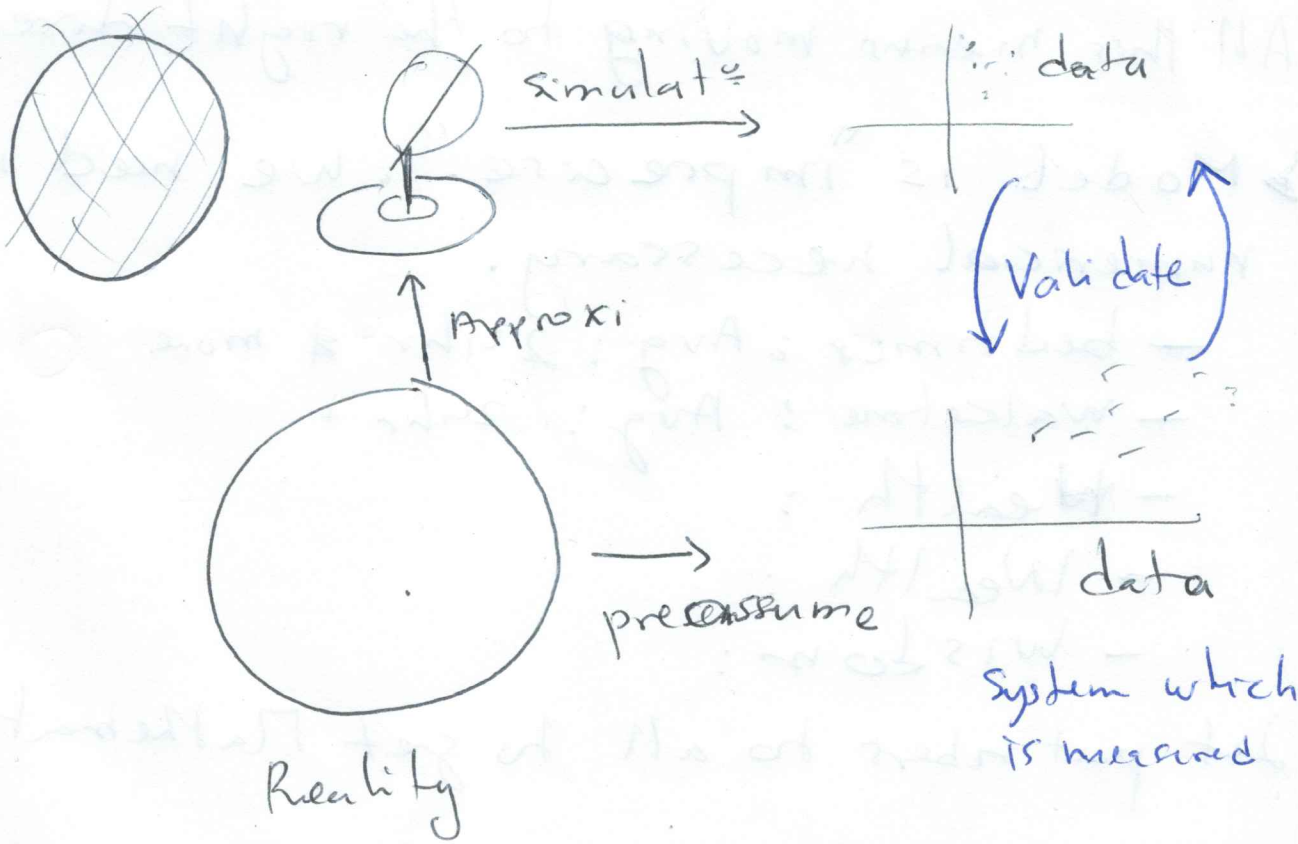
Wind tunnel ⟶ air flow.

All models are wrong but some are useful

not treating

useful b/c → ① predict^{n}: what happens in a certain situation

② Explanations: Tells about driving force.



Validation: Comparison of the measure data to the predicte. If they're "close"
=> the model is "good"
If not, we can rebuild the model, item and get close.

"Early to bed
early to rise
make a man
Holidays
reality
wise"

outputs

$$\begin{bmatrix} \text{Health} \\ \text{model} \\ \text{wisdom} \end{bmatrix} = f\left(\underbrace{\begin{matrix} \text{bedtime} \\ \text{waketime} \end{matrix}}_{\text{Input}}\right)$$

Every model has Input & Outpu

All this means moving to the right directi.

- Model is "imprecise". We need nber's and numerical necessary.
  - bedtimes : Avg : 24hr & more.
  - waketime : Avg : 24hr +.
  - Health :
  - Wealth :
  - Wisdom :

Let put nbers to all to get Mathematical model.

Mathematical Model (models)

have numeric inputs / outputs related by an equation.

For exple:

$$F = ma = f(m, a) \quad ; \quad E = mc^2$$

F: output; m, a: more inputs

Assumpt°: The universe is explicable with ~~model~~ mathematic

Assume time:

REALITY

$$y = t(z_1, z_2, \ldots, z_t)$$

→ Exact

y: output, response, outcome, endpoint, dependent variable

$z_1, z_2, \ldots, z_t$: causal input information

"time"

t: time relationship between the causal input & output.

Creditworthiness exple

$Y \in \{\text{Creditworthy}, \text{uncreditworthy}\}$

$y \in \{0, 1\} = Y$

output Space

True Causal inputs

z_1: has enough money at the time is due $\in \{0,$

z_2: "unforseen en. $\in \{0, 1\}$

z_3: Criminal makes.

$$Y = t(z_1, z_2, z_3) = z(1 - z_2)(1 - z_3)$$

Biggest Problem

$\{z_1, z_2, z_3\}$ are unobservable

not able to be measured, unassessible.

Smallest Problem: don't know "t".