

Math 842w Lecture 1

"Models" are approximations / abstractions to reality, truth, systems, or phenomena

Phenomenon - Anything that you find interesting in the real world, that can be measured.

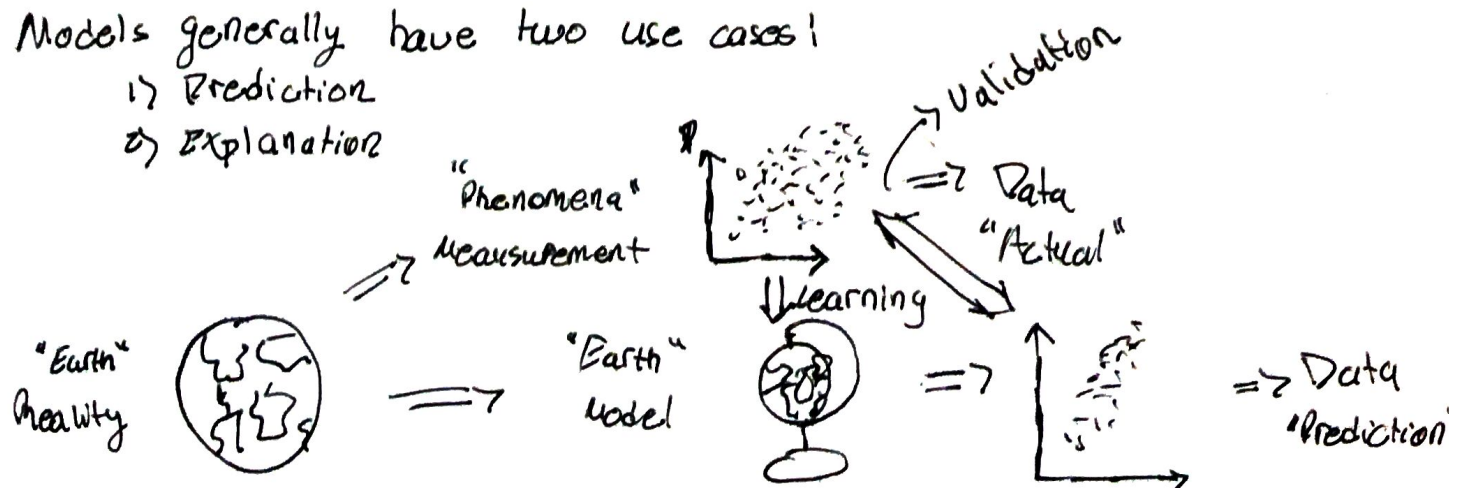
Model	Reality
Model Airplane	Airplane
Street Maps	Road System
Wind Tunnel	Wind

"All models are wrong, but some are useful"

↳ By definitions, they are approximations, but if "error" is low enough they can actually be used.

Models generally have two use cases!

- 1) Prediction
- 2) Explanation



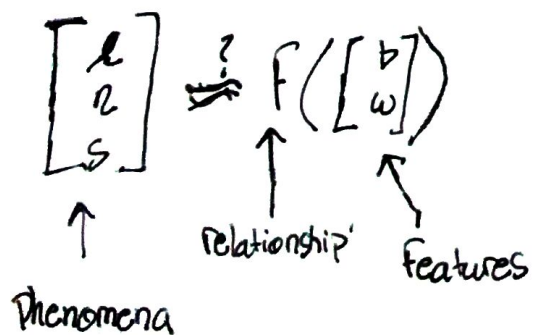
How can we make this model unambiguous?

- 1) Quantifiers (using #'s)
- 2) Establish Metrics for each phenomena and feature

Metrics - A means of measurement

Ex!

Phenomena & Feature	Metric	Symbol
'early to bed'	Avg bedtime since 5pm (18-65)	b
'early to rise'	w
health	longevity	l
wealth	net worth (18-65)	e
wisdom	test	s



\Rightarrow F is called a mathematical model
takes input and produces output

Assume the phenomena can be completely explained by

$$y = f(z_1, z_2, \dots, z_c)$$

metric true function Causal Inputs

Example:

$y = \text{payback Loan?}$

$y \in [0, 1] = \bar{y} \rightarrow \text{Output space}$