

Intro to Data-Driven Modeling: Analysis

Spring 2026 Course Info

LinkedIn

Github - All course materials

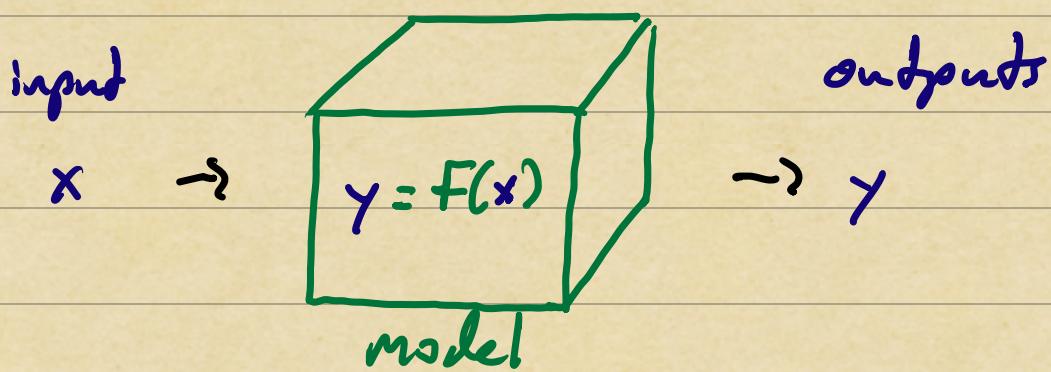
via

Piazza - Q&A, Discussion, Announce

LMS

Gradescope - Release/View/submit HW

Course Aim: use data to develop mathematical models of complex phenomena.



Challenges: In "real-world" applications

Data: too little/ too much data, noisy, corrupted, unlabeled

Model: Existence, Uniqueness, accuracy, insight, reliability

Mathematical Models

Math models form the "explanatory core" of quantitative scientific knowledge.

⇒ Newton's Laws

⇒ General Relativity

⇒ Quantum Mechanics

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Questions: What makes a "good" model?

⇒ Explanatory Power

⇒ Predictive Accuracy

⇒ Capacity to Generalize

⇒ Computability / Solvability

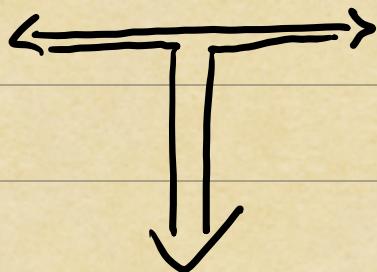
⇒ Interpretable / Actionable

Features are often in tension with each other!

⇒ Use mathematics to understand trade-offs.

Question: Where do models come from?

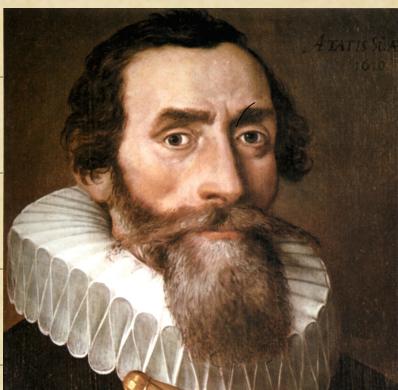
Rationalism
"logical reasoning"



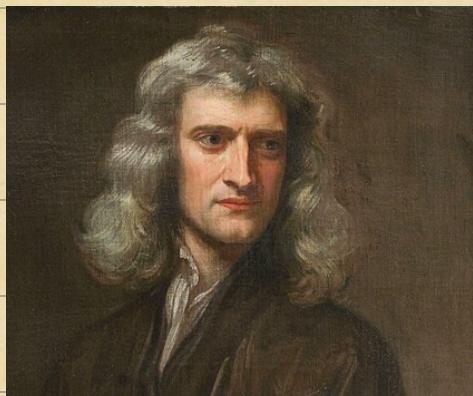
Empiricism
"real world observations"

Mathematical
Models

Tycho Brahe collects
data on planetary orbits



Johannes Kepler realizes
the orbits are elliptical and
proposes a new model.



Isaac Newton proposes
a more fundamental model
that "explains" Kepler's Law
and much much more.

Question: So, what's new?

- ⇒ Computational Power/Resources
- ⇒ Quantity of available data