# We Are Modelers, Pressing Our Models

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# We Are Modelers, Pressing Our Models

***How*** do we model?

***To what extent***
can we model?

***Why*** do we model?

What are the ***long-term consequences***
of our modeling?

# The First Modelers

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**Goal: Food!**

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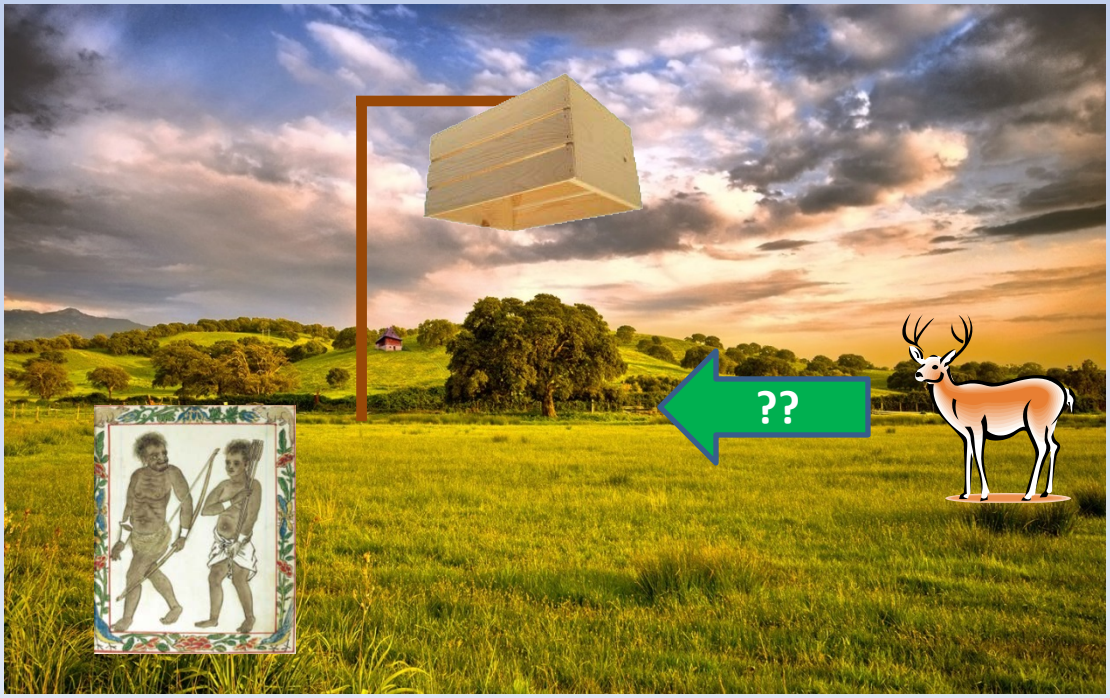

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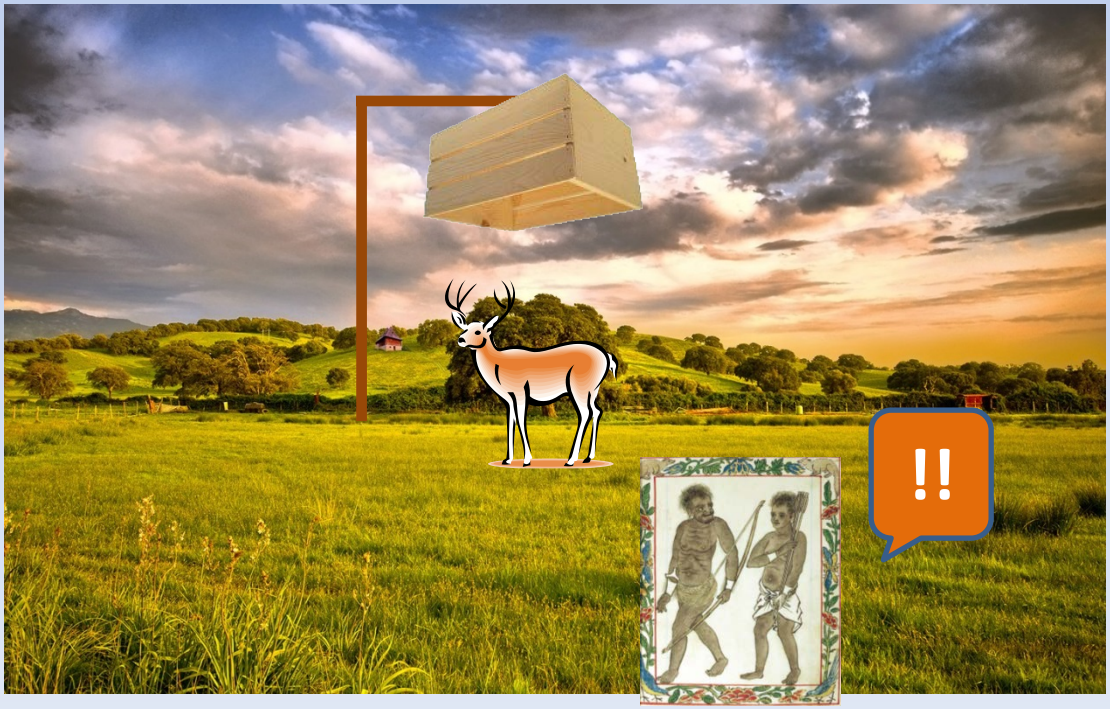

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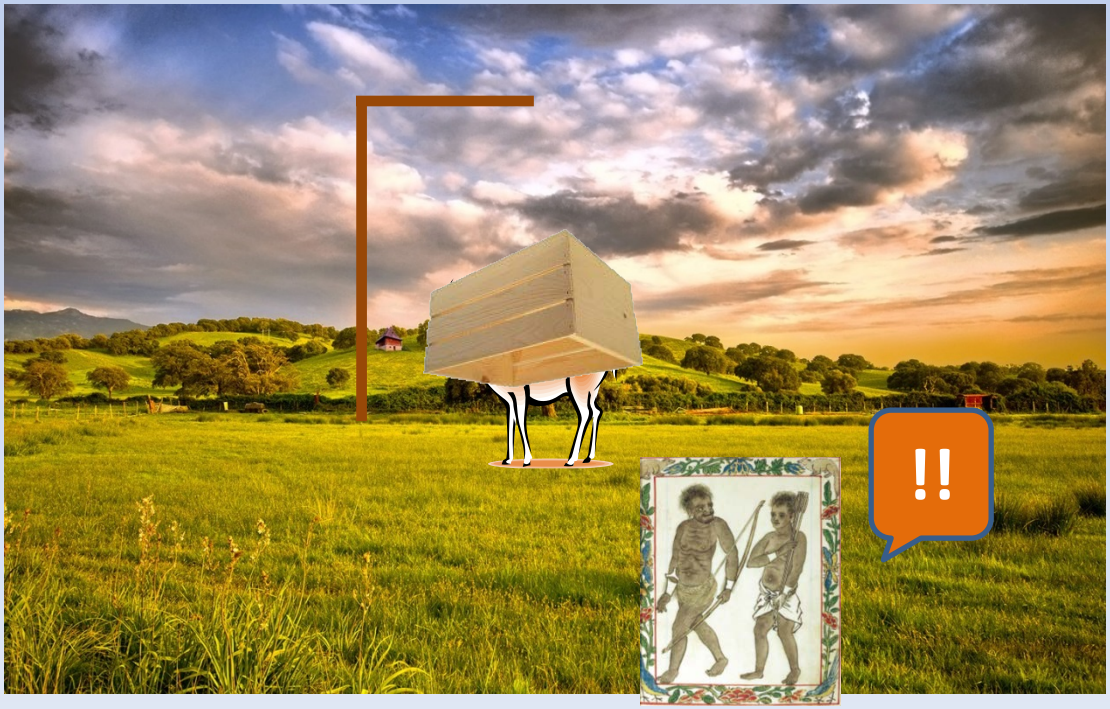

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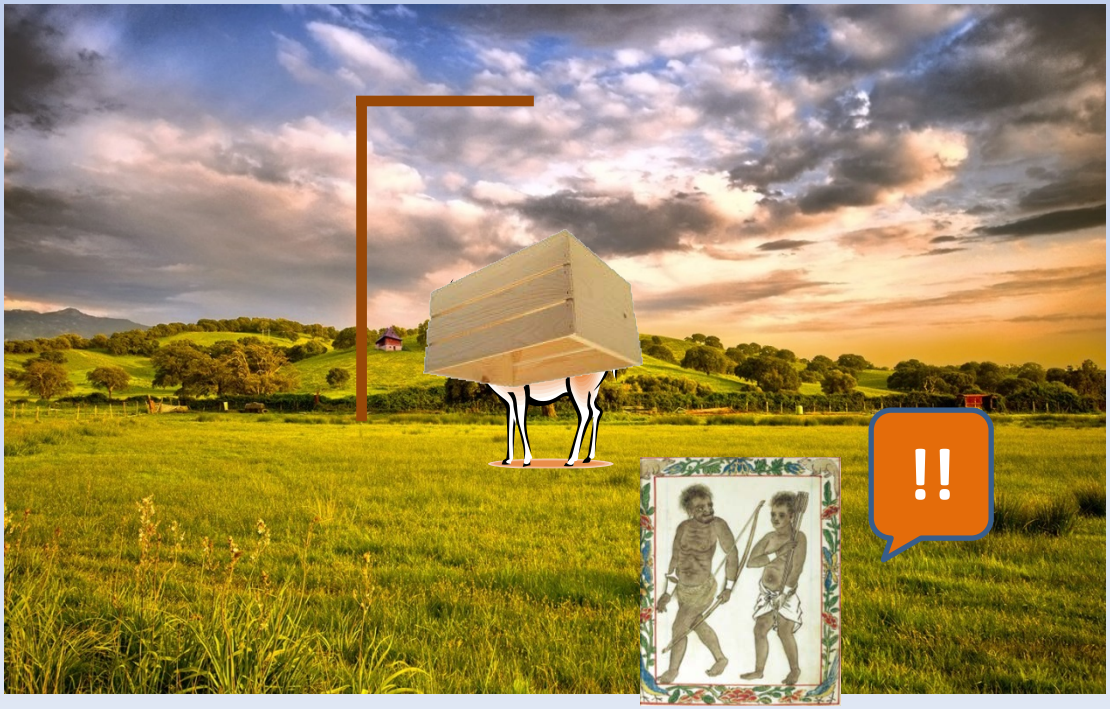

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➢ **Explanation**

$$P(y|x) = ?$$
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$$\underset{x}{\text{argmax}}\,[P(y|x) = z] = ?$$
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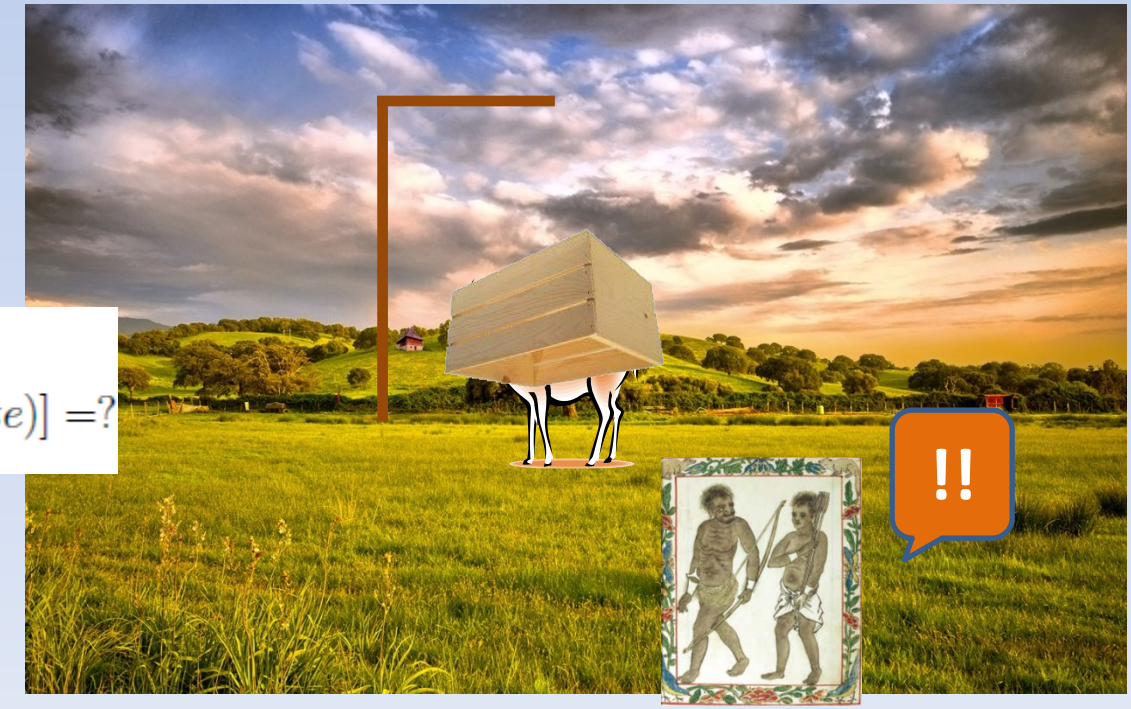

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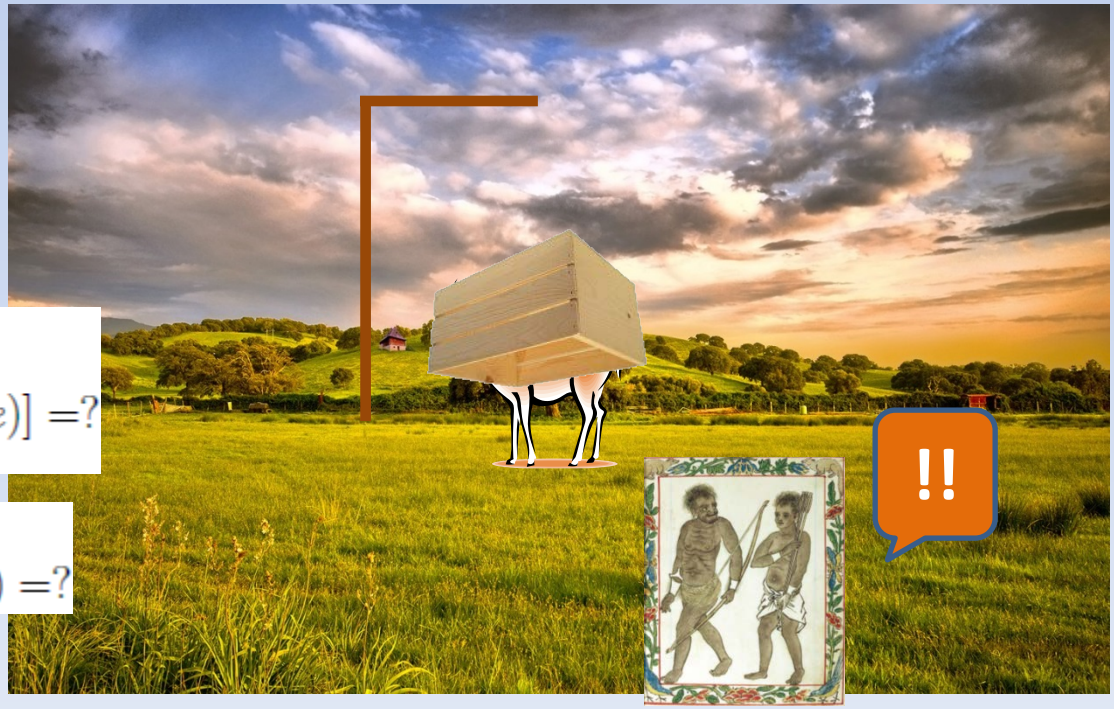

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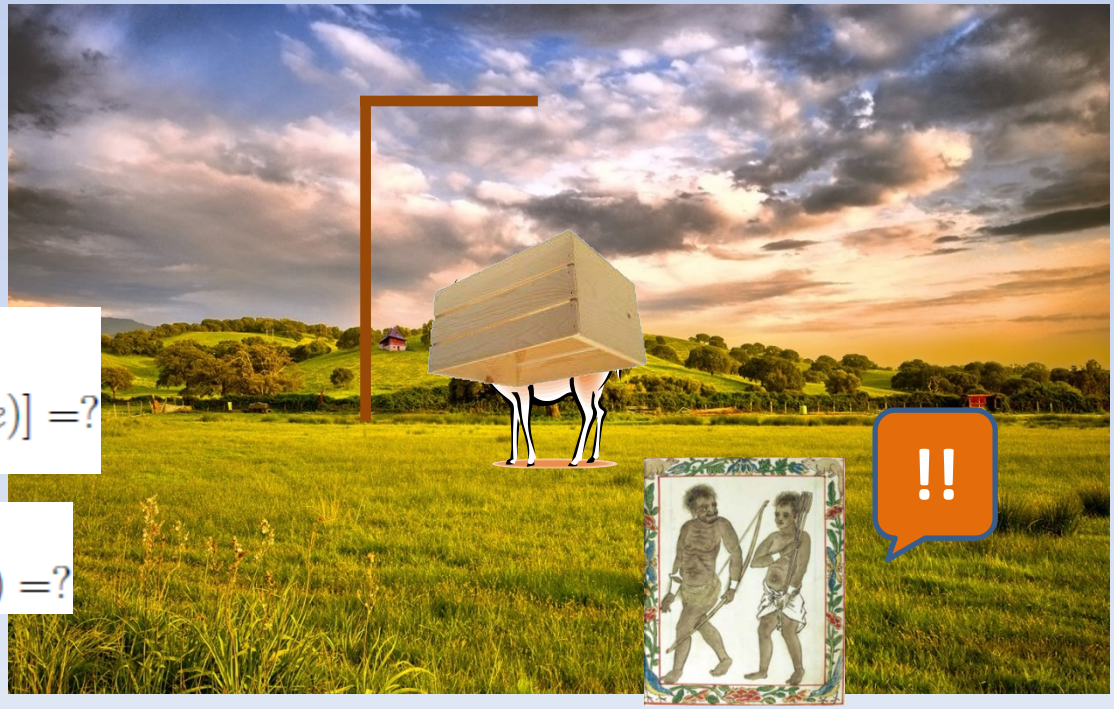

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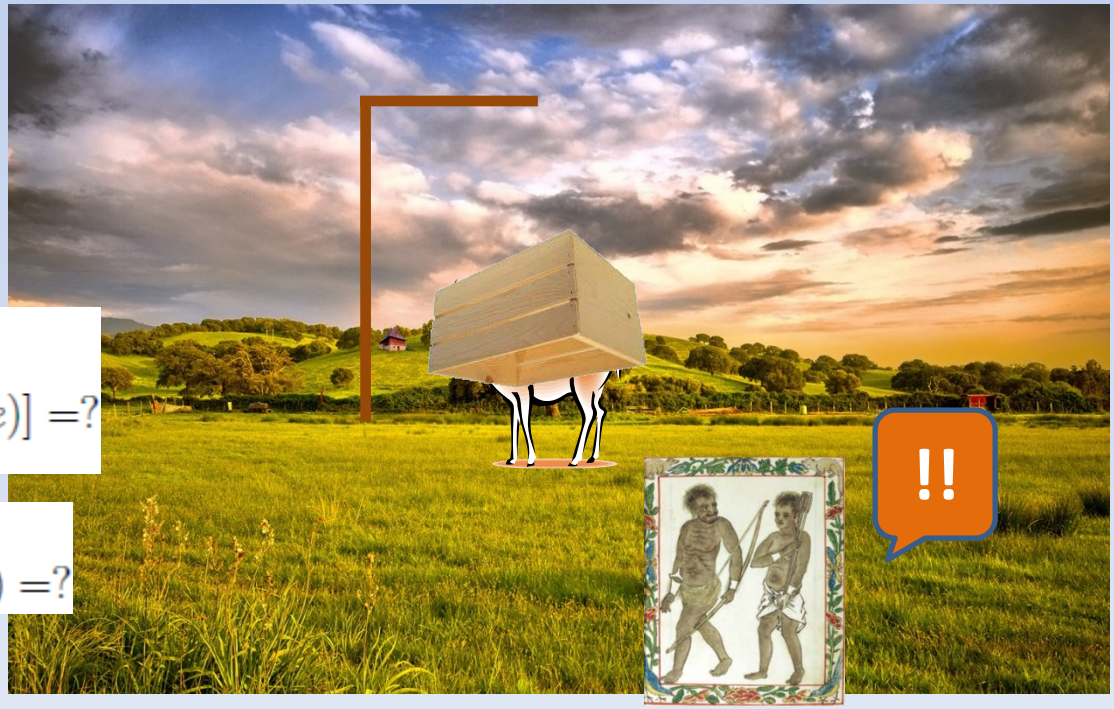

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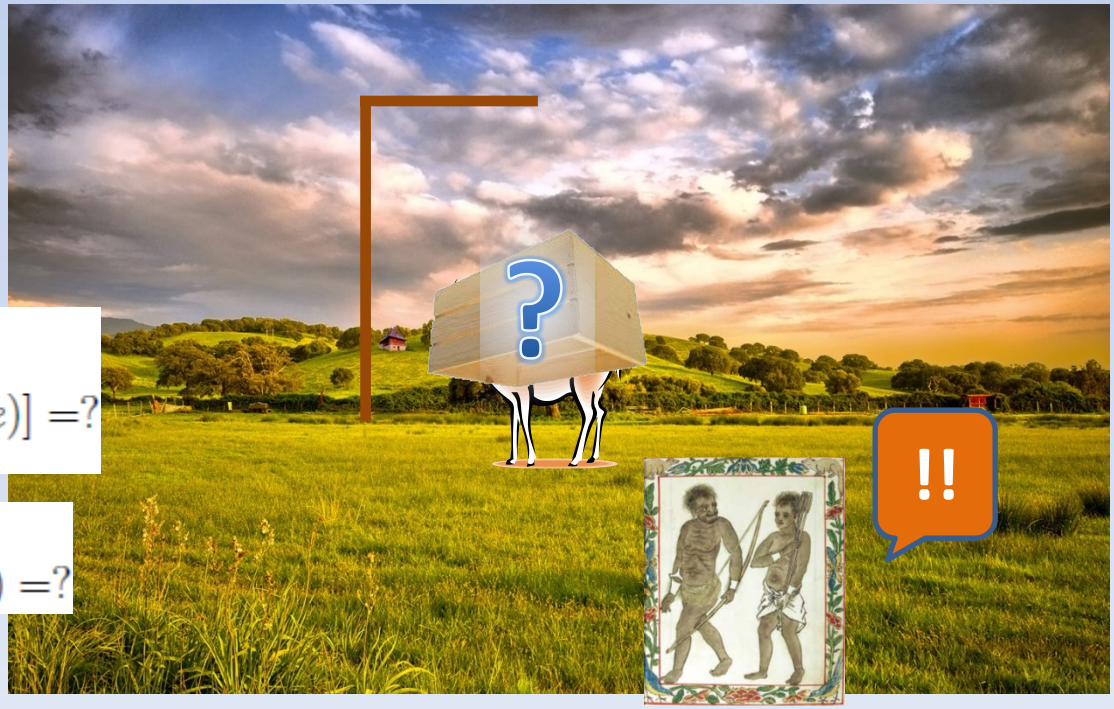

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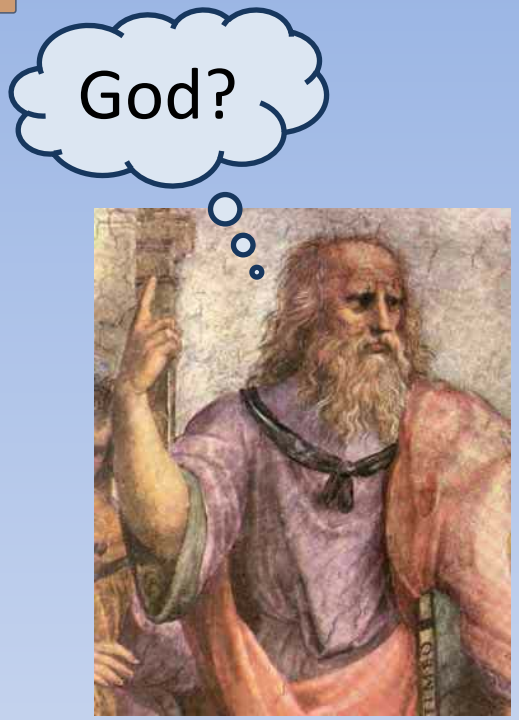


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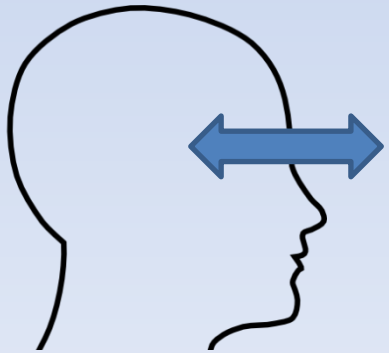
<u>Empiricists</u>

Senses
Knowledge ← **Environment**



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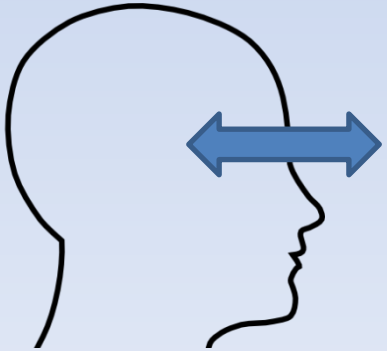
**Observe** Everything → Know Everything



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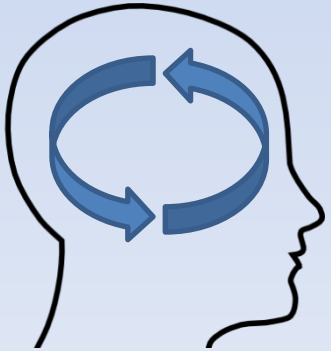

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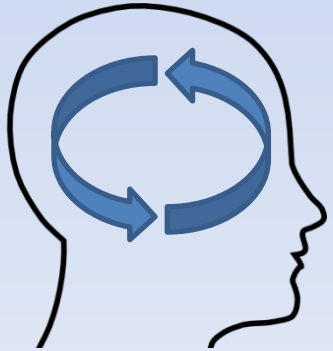

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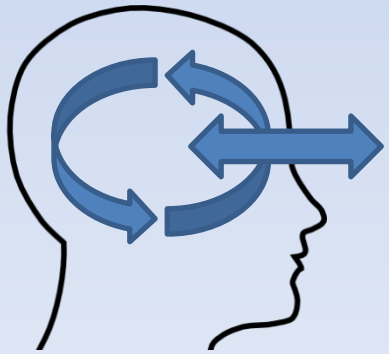
*God-Machine?*

∞ processing

∞ memory

∞ bandwidth



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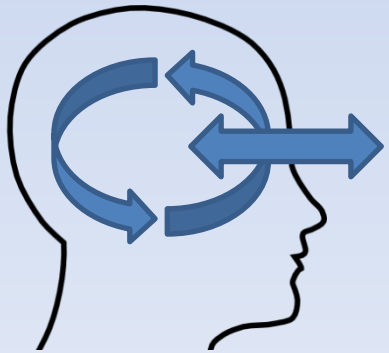
**Can we reach the God Machine?**



# Reality Check: Hard Limits

| | | |
|---|---|---|
| $\lim$ | $\lim$ | $\lim$ |

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| Physical Measurements | $lim$ | $lim$ |
| --- | --- | --- |
| **Heisenberg** $\sigma_x \sigma_p \geq \frac{\hbar}{2}$ | | |

# Reality Check: Hard Limits

| Physical Measurements | | Knowledge |
|---|---|---|
| **Heisenberg** | $\lim$ | **Gödel Incompleteness** |
| $\sigma_x \sigma_p \geq \frac{\hbar}{2}$ | | $\text{Complete} \oplus \text{Consistent}$ |

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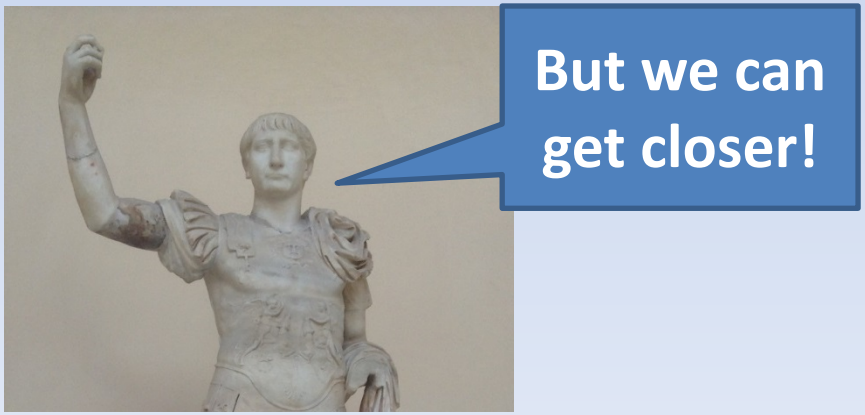

# Push the Limits

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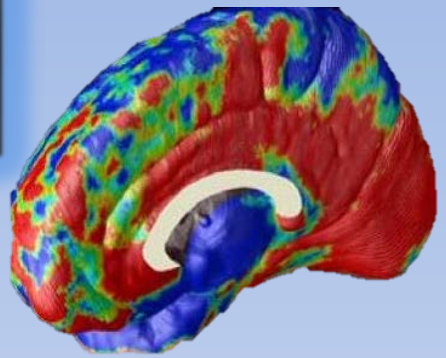

- Push bandwidth (I/O)
  - More Data, More *Relevant* Data

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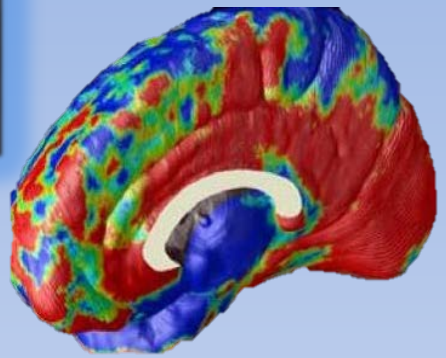

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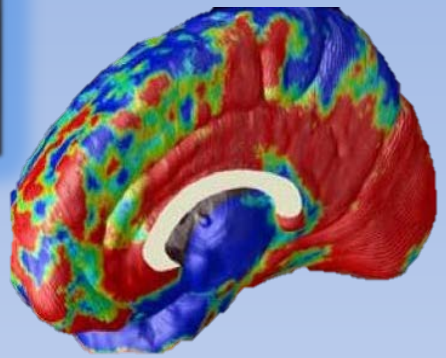

- Push bandwidth (I/O)
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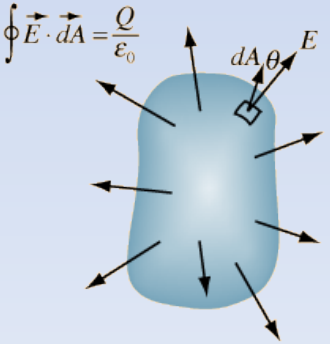
  - New ways of thinking → Theories
    - Classical to Probabilistic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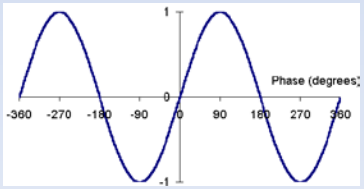


xyz

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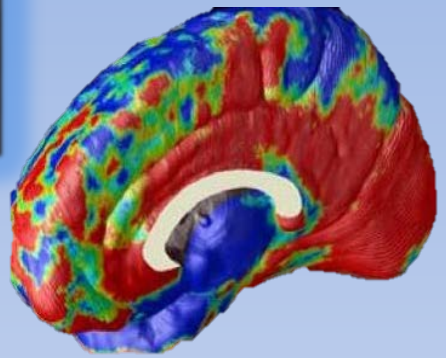
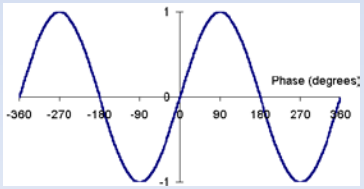


- Push bandwidth (I/O)
  - More Data, More *Relevant* Data
- Push Memory (RAM, Storage)
  - Summarize and condense (Hash)
- Push Computation (Processor)
  - New ways of thinking → Theories
    - Classical to Probabilistic
  - Increase thinking efficiency


123

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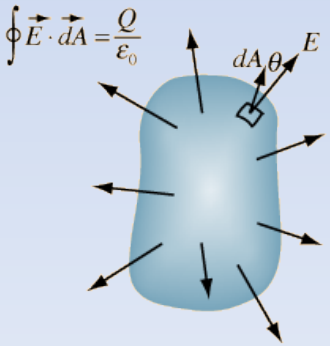

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- Accuracy & Precision ↗
  - Assumptions ↘
  - Minimize error
- Compatibility w/ other models ↗ (Unification)
- Computability ↗
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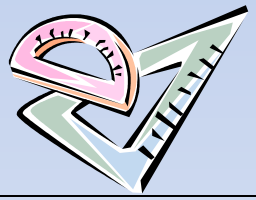

**Engineering**: leverage all knowledge & Solve problems

<u>The Bottom Line</u>:

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1) Advance humanity toward ***your future vision***
   ➔ Your meaning of life

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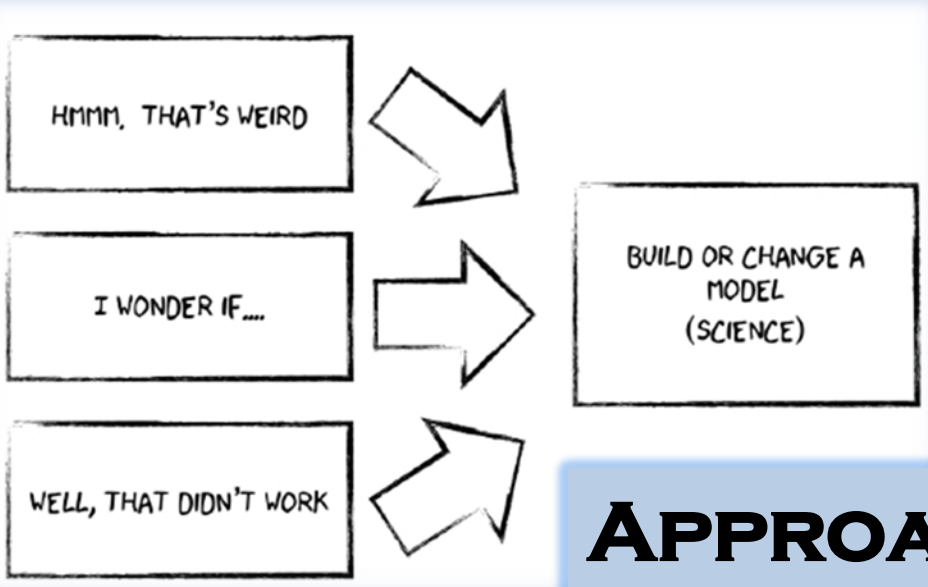
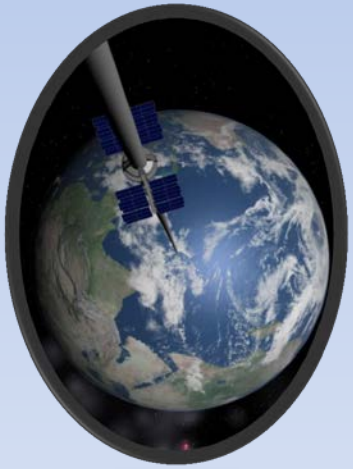


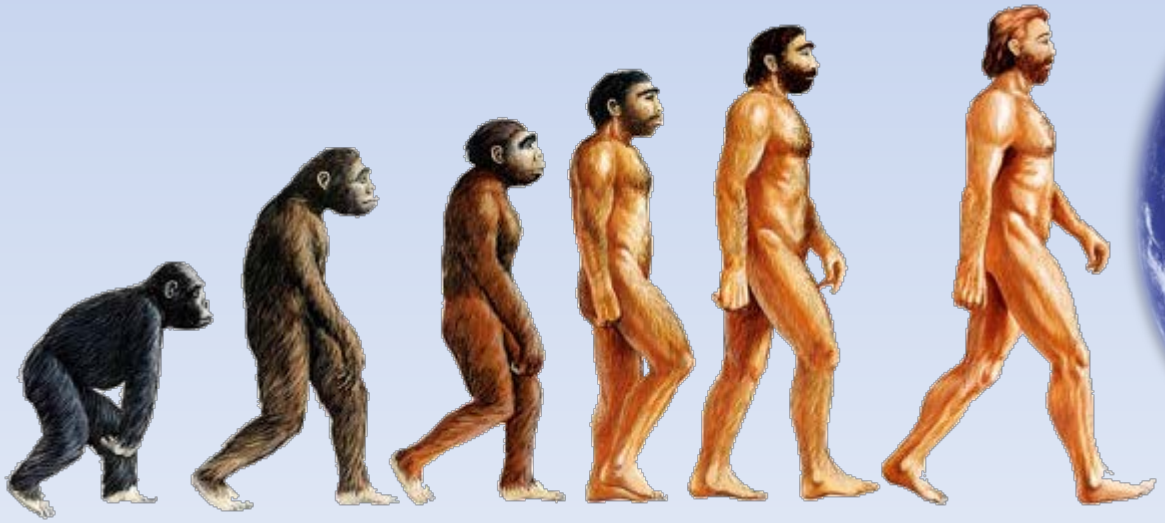

*Better…*

- **Predictions**
- **Explanations**
- **Interventions**

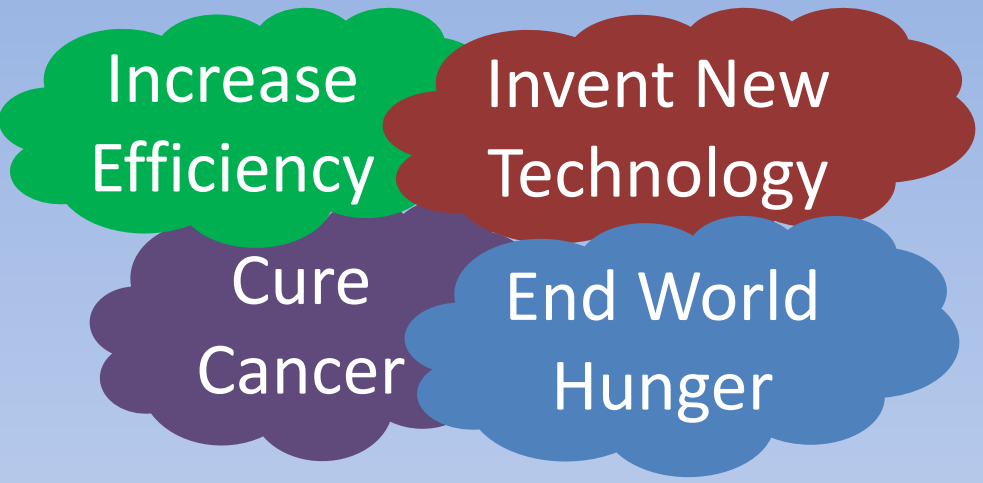


**APPROACH OUR LIMITS AND PROSPER!**

# PART II: CONSEQUENCES



# Majority's Future Vision: "*Progress*"

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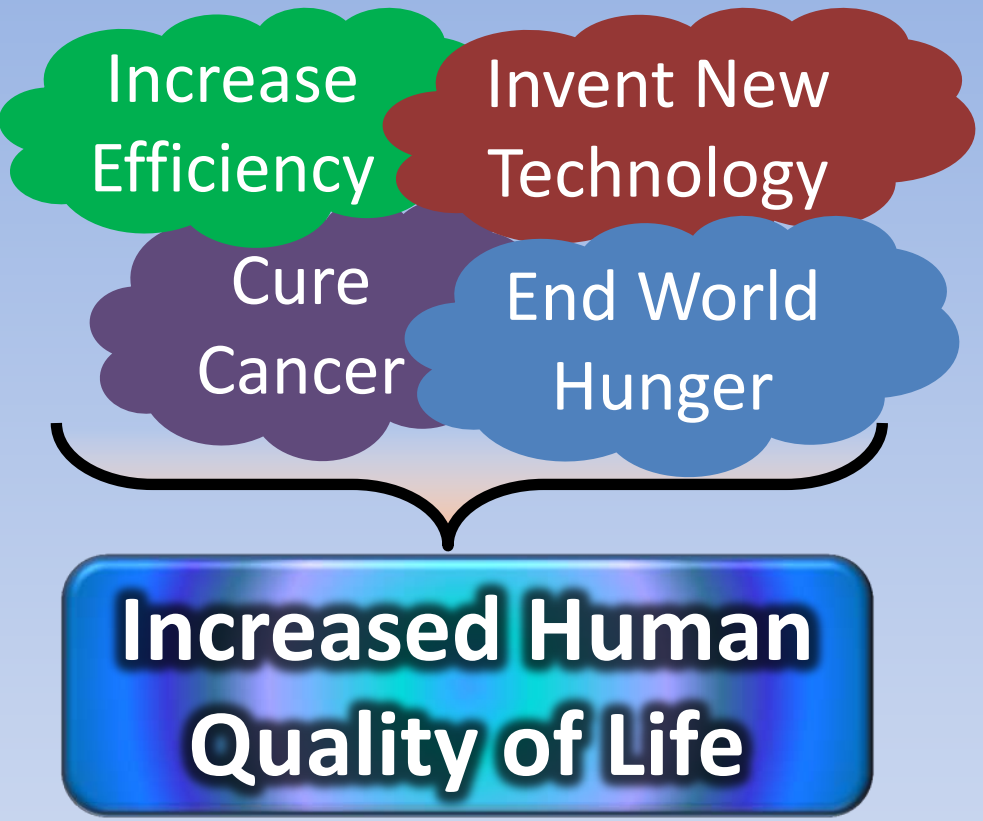


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Invent New Technology

Cure Cancer

End World Hunger

**Increased Human Quality of Life**

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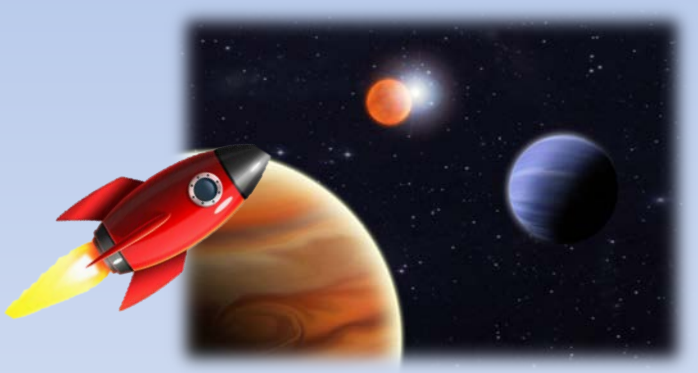
# Progress Cycle → …?


1. Stop human population growth
   - Redefine society's notions of ethics and "progress"
2. Colonize Space
   - Infinite growth ok
     in the infinite universe



3. Perish
   - Humans kill themselves or Earth?
   - Black swan event?

# Solution: 1 + 2

1. Accept finite human population
   - Political/Cultural Problem
   - Better limit human pop. growth → limit rate of QoL ↘
2. Continue infinite growth – to Space!
   - Technological/Engineering Problem
   - Defines rate of QoL ↗

Utopia: Hard finite human population, tech. advances ↗QoL indefinitely

Goal: #2 Rate of QoL↗ **>** #1 Rate of QoL↘

# My Proposal: 2 + 1

1. Accept finite human population
   - Indirect action – be the role model and inspire value change among others *locally*
   - Overt mass convincing is hard
     - I can only control myself, not anyone else directly
2. Continue infinite growth – to Space!
   - Direct Action; Science & Engineering

# Backup!

# Modern Models

- Physics
  - Prediction: What is the path of an electron?
  - Explanation: What causes gravity?
  - Intervention: If we build a rocket and ignite it, will it launch into orbit?
- Finance
  - What will the value of Apple be in 3 months?
  - What circumstances led to the 2008 crash?
  - If the Federal Reserve repurchases treasury bonds, will inflation decrease?
- Music
  - How will it sound if a violin plays A, a Flute plays B, a Cello plays C, …
  - What leads an audience to most appreciate a sound? [psychology]
  - If we change the increase a tune's time signature, will it appear faster?
- Love, History, Biology, Mathematics, Engineering, Health, …….