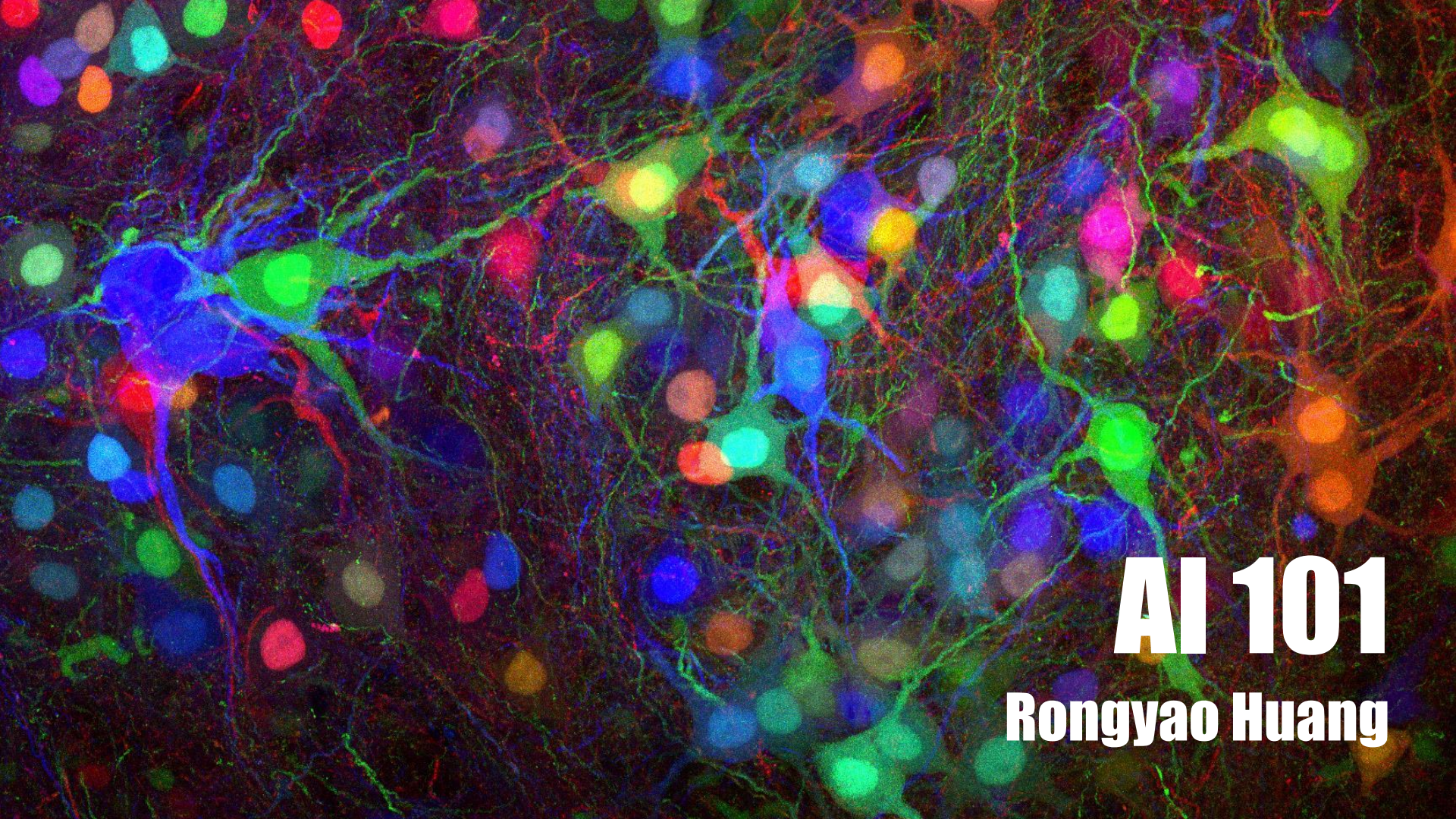
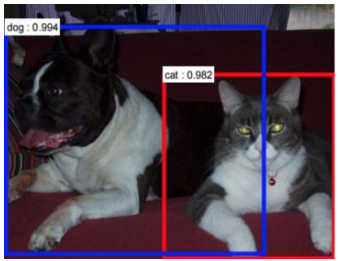
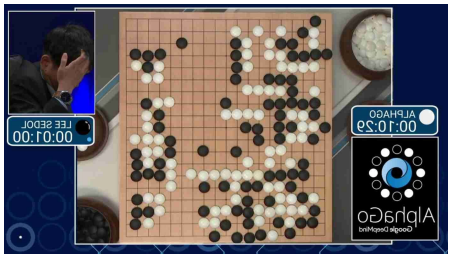

AI 101
Rongyao Huang

I. Why do I care?

- *“The future is already here — it's just not very evenly distributed.”*
  --- William Gibson





...

II. So what is AI? Really.

- A very broad field & an evolving concept
- The Evolution of AI

- Birth of AI
- Logical expression & Heuristic Search
- 1st AI: The Logic Theorist

- Expert System
- Machine Learning

- Deep Learning

- Computer Vision
- Natural Language
- Cognitive Computing
- Machine Learning
- Robotics

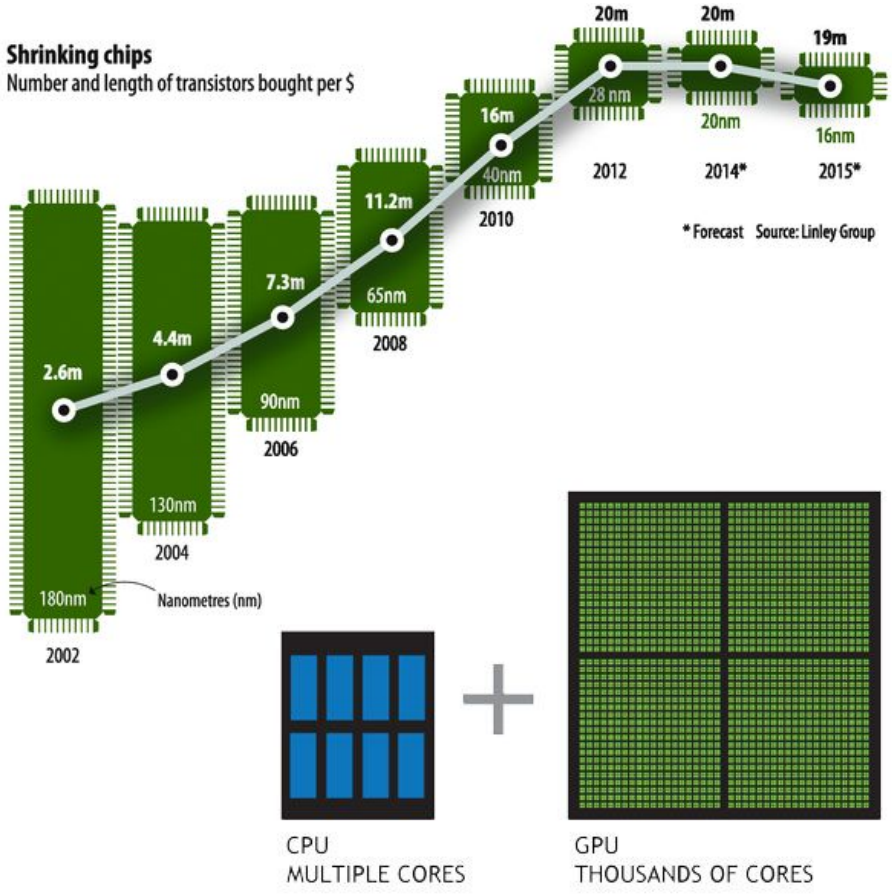
What’s the driving force?

Logic based: expression, deduction → **Probabilistic model based: data, computation**

II. So what is AI? Really.

The Driving Forces:

- Increasing computational power
- Big data: volume, variety, velocity
- Cheap storage



II. So what is AI? Really.

1950’ Boom
- Birth of AI
- Logical expression & Heuristic Search
- 1st AI: The Logic Theorist

1970’ Bust

1980’ Boom
- Expert System
- **Machine Learning**

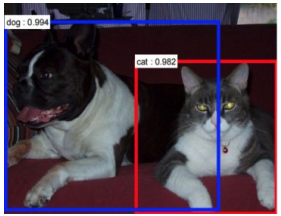
1990’ Bust

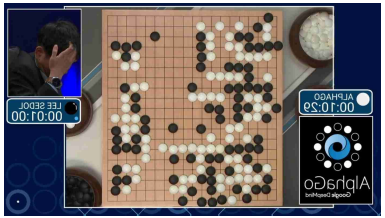
2010’ Divergence

Boom Convergence
- **Deep Learning**

?

- Computer Vision
- Natural Language
- Cognitive Computing
- Machine Learning
- Robotics



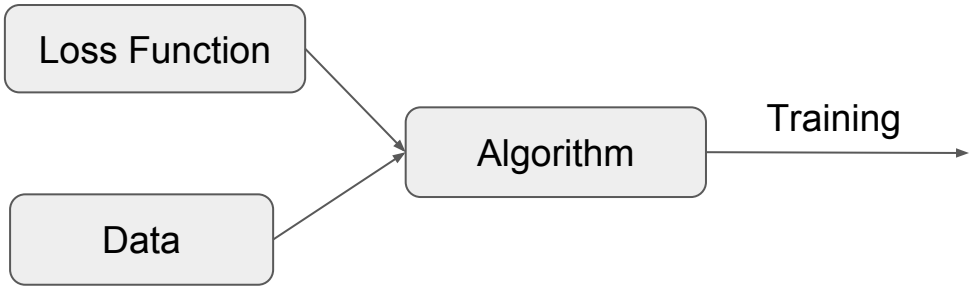


II. So what is AI? Really.

- **What is Machine Learning**
- “an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed”
- **E.g. Spam Filter**

II. So what is AI? Really.

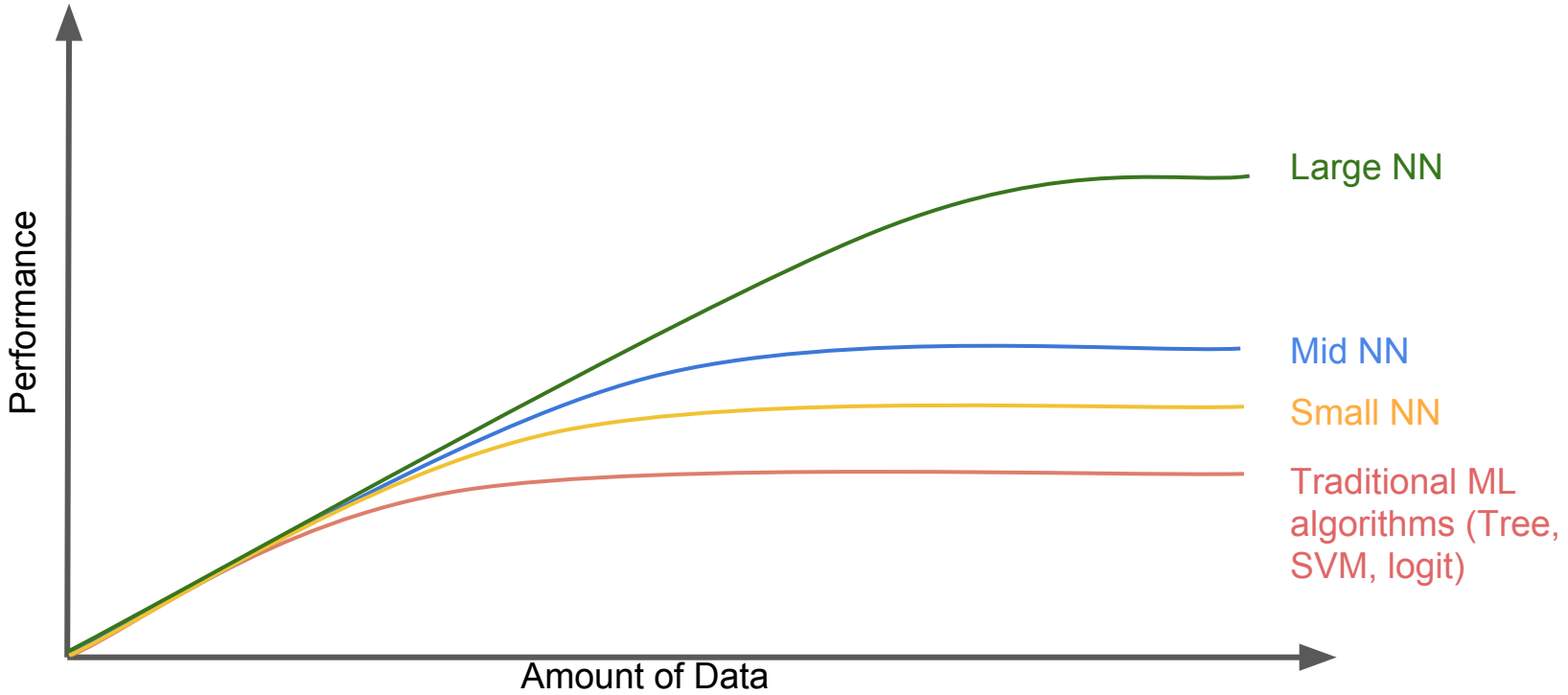
- **What is Machine Learning**



- **A Diverse Set of Algos & Meta Algos**
- Linear Regression, Logistic, SVM, Tree, **Neural Network**, **Deep Learning** ….
- Bagging, Boosting, Ensemble
- Supervised, Unsupervised
- …

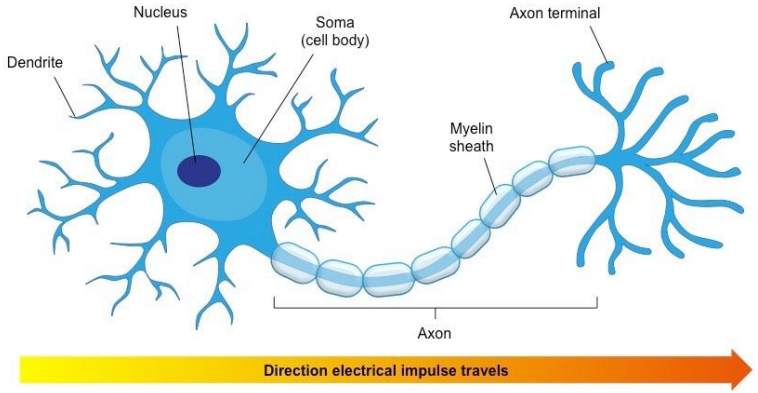
II. So what is AI? Really.

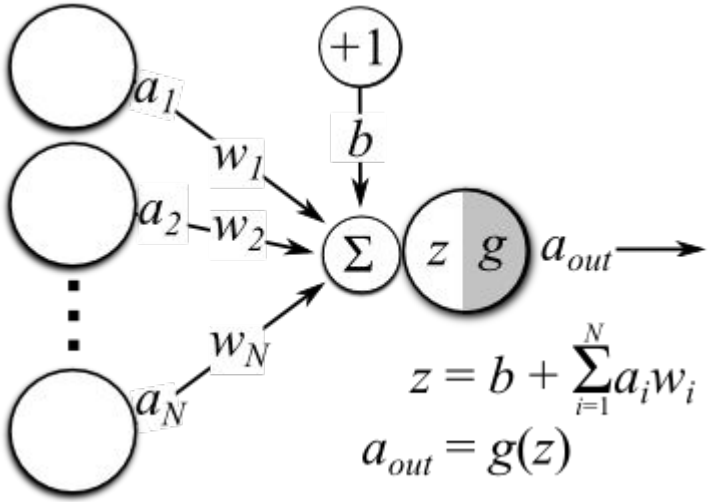
- So what makes deep learning stand out?



III. Understand Deep Learning

- Deep Learning = Neural Network with lots of hidden layers
- NN: a model loosely inspired by network of neurons and synapses in our brains.

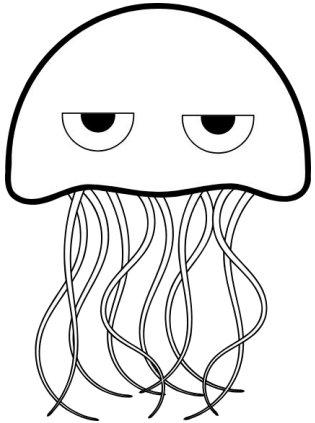




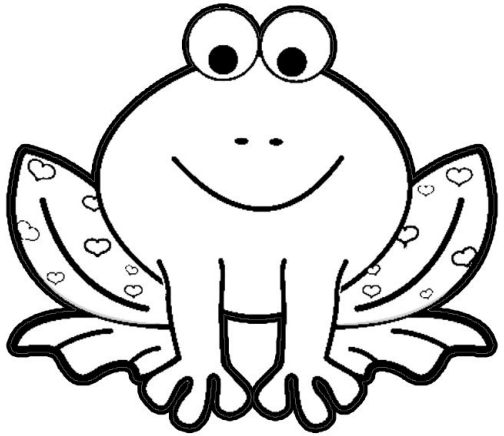
III. Understand Deep Learning

- The power of adding simple things up!

302 neurons ~7500 connections



5600 neurons



16,000,000 neurons

III. Understand Deep Learning

Guess Time!

- The power of adding simple things up!

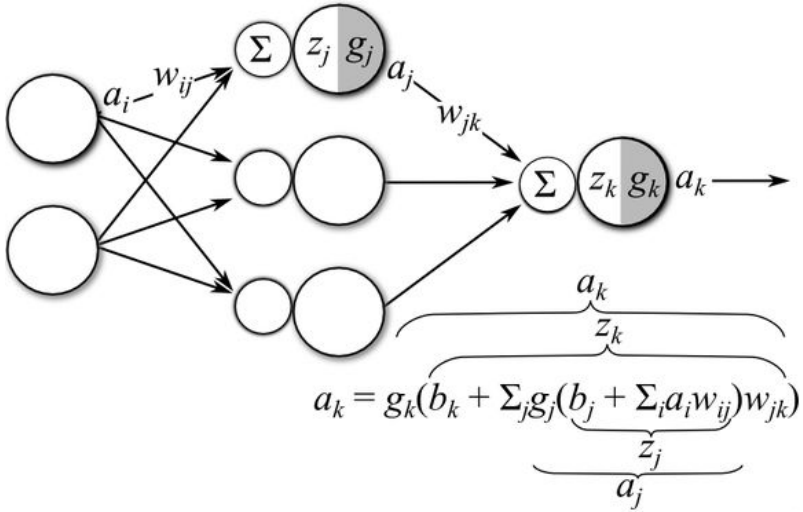
500, 000, 000 neurons

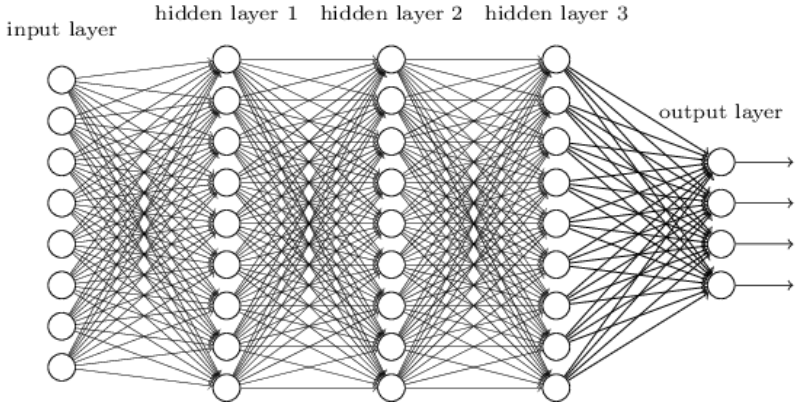
86, 000,000,000 neurons

257,000, 000,000 neurons

III. Understand Deep Learning

- The power of adding simple things up!

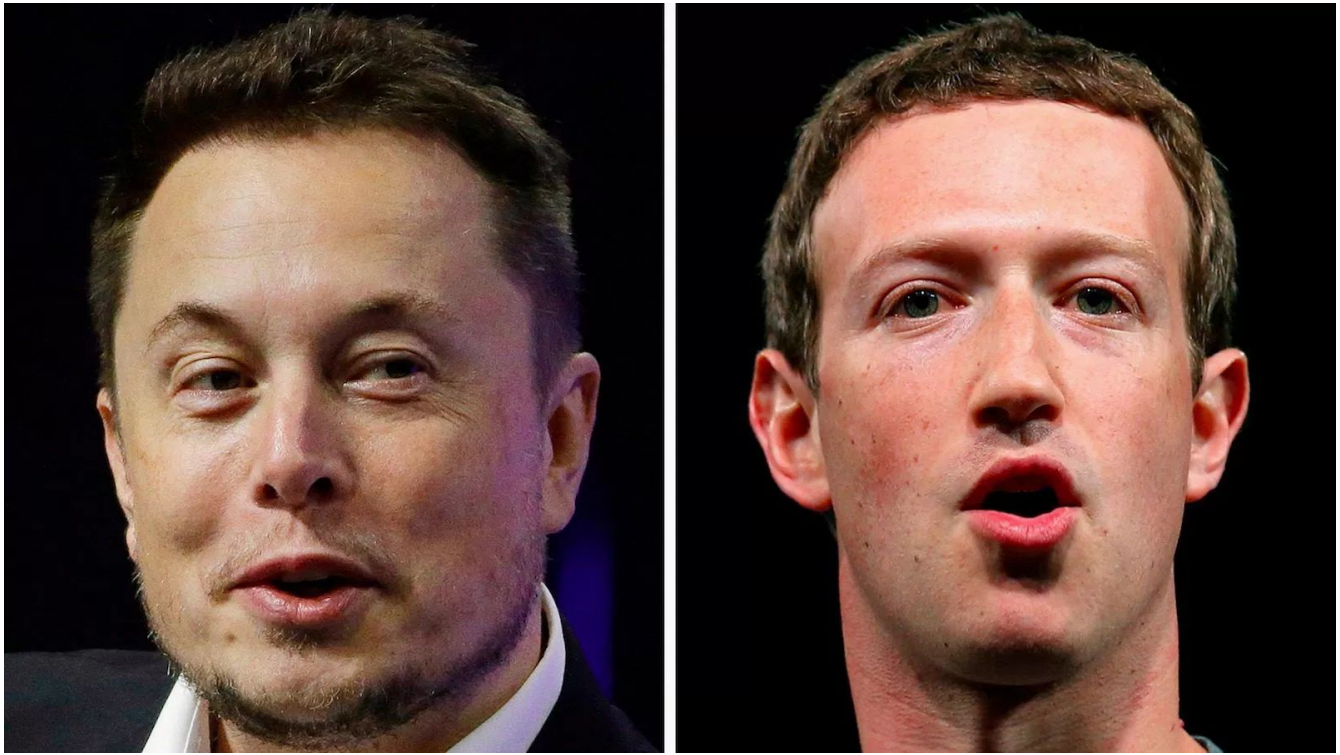




How big is AlphaGo?

III. Understand Deep Learning

- **Geoffrey Hilton**
- the Godfather of Deep Learning
- inventor of backwards propagation



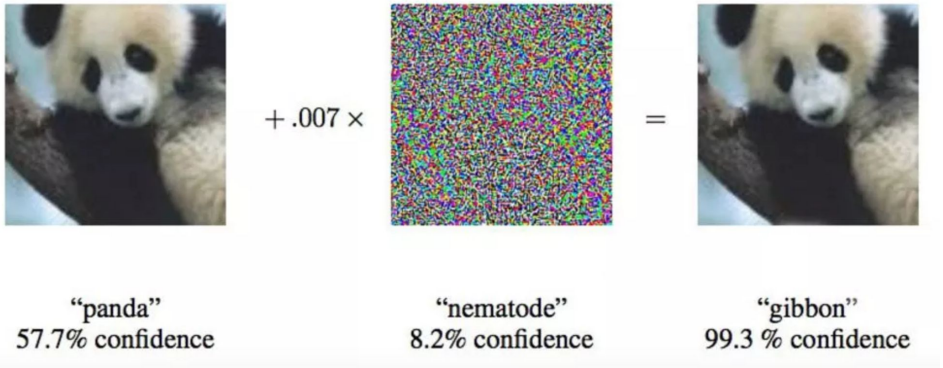
IV. No. It's not any close to human intelligence, yet.

- Our understanding of the brain is very very shallow.

- We don't fully understand how a single neuron works.
- The 302 neurons took hundreds of people 30 years.
- The OpenWorm Project: trying to simulate C. elegans bottom up.

IV. No. It's not any close to human intelligence, yet.

- *"A real intelligence doesn't break when you slightly change the problem."*
  --- Bennie Mols



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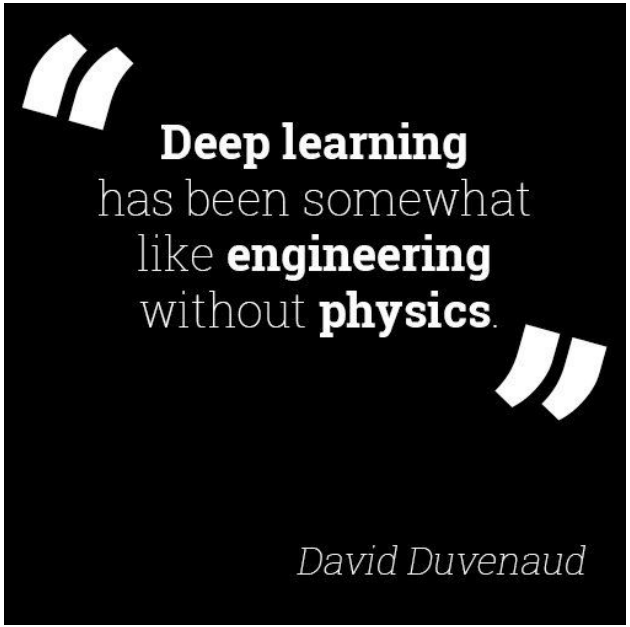

IV. No. It's not any close to human intelligence, yet.

- Efficiency, Efficiency, Efficiency
  - Big Data, Small Tasks V.S. Small Data, Big Tasks
  - Some Interesting Stats
    - human brain ~ 20 watt
    - cpu ~ 80 watt, gpu ~ 200 watt
    - AlphaGo used 1900 CPU and 280 GPU when playing with Le Sedol
    - 20 watt V.S. 208, 000 watt

V. Going into the Future

- **Deep Learning**
  - without human input (reinforcement learning)
  - new architecture: Capsule
  - principles and common sense

- Go Dark, Beyond Deep.

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