

Machine learning and AI for everyone

Lindsay Edwards
Respiratory Data Sciences
Group

Computational thinking

CODE

Use this calculator to see if robots will take your job



Guia Marie Del Prado

Sep. 15, 2015, 8:32 PM 5,870



FACEBOOK



LINKEDIN



TWITTER



EMAIL



PRINT

Sections

BBC NEWS

AA



TECHNOLOGY

AI will not kill us, says Microsoft

END OF HUMANITY? Demonic Possession could destroy us 'WITHIN DECADES' warns expert

A LEADING scientist involved in the development of Demonic Possession (AI) has warned that it could rise up against us and end humanity within decades.

By SEAN MARTIN

PUBLISHED: 17:33, Fri, Apr 15, 2016 | UPDATED: 17:44, Fri, Apr 15, 2016

SHARE



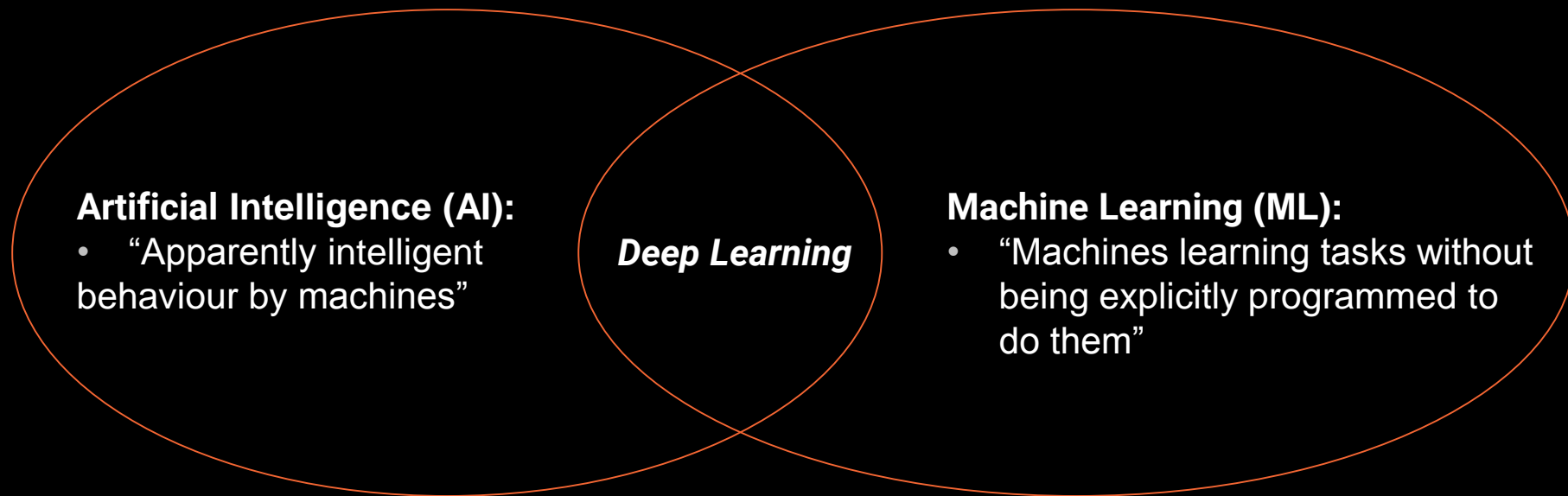
TWEET



651

80





AI, but not ML

- Chess machines (e.g. Deep Blue, Fritz)
- ELIZA – a Rogerian therapist
- **MYCIN** – a ‘rules-based’ system for diagnosing blood-borne infections and recommending treatment
- *Programs where the rules are ‘baked-in’*

ML, but not AI

- Predictive analytics
- Clustering
- *Pretty much everything that isn’t a neural network*

“A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P if its performance at tasks in T , as measured by P , improves with experience E .” – *Tom Mitchell*

T = the **task** we want the computer to do

E = the **experiences** or data we give it

P = how well the computer **performs** the job

The task (T)

- Classification
- Classification with missing inputs
- Regression
- Transcription (e.g. speech to text)
- Machine translation (e.g. natural language to natural language)
- Structured output
- Anomaly detection
- Synthesis and sampling (e.g. video game landscape generation)
- Imputation
- Denoising
- Gaming (Chess, Go, Atari)

Goodfellow, Bengio and Courville (2016) "Deep Learning"



Machine learning vs statistics

Use mathematical analysis (there were no computer)

We want to generalise (because there isn't much data)

Who's smarter: chemists or biologists?

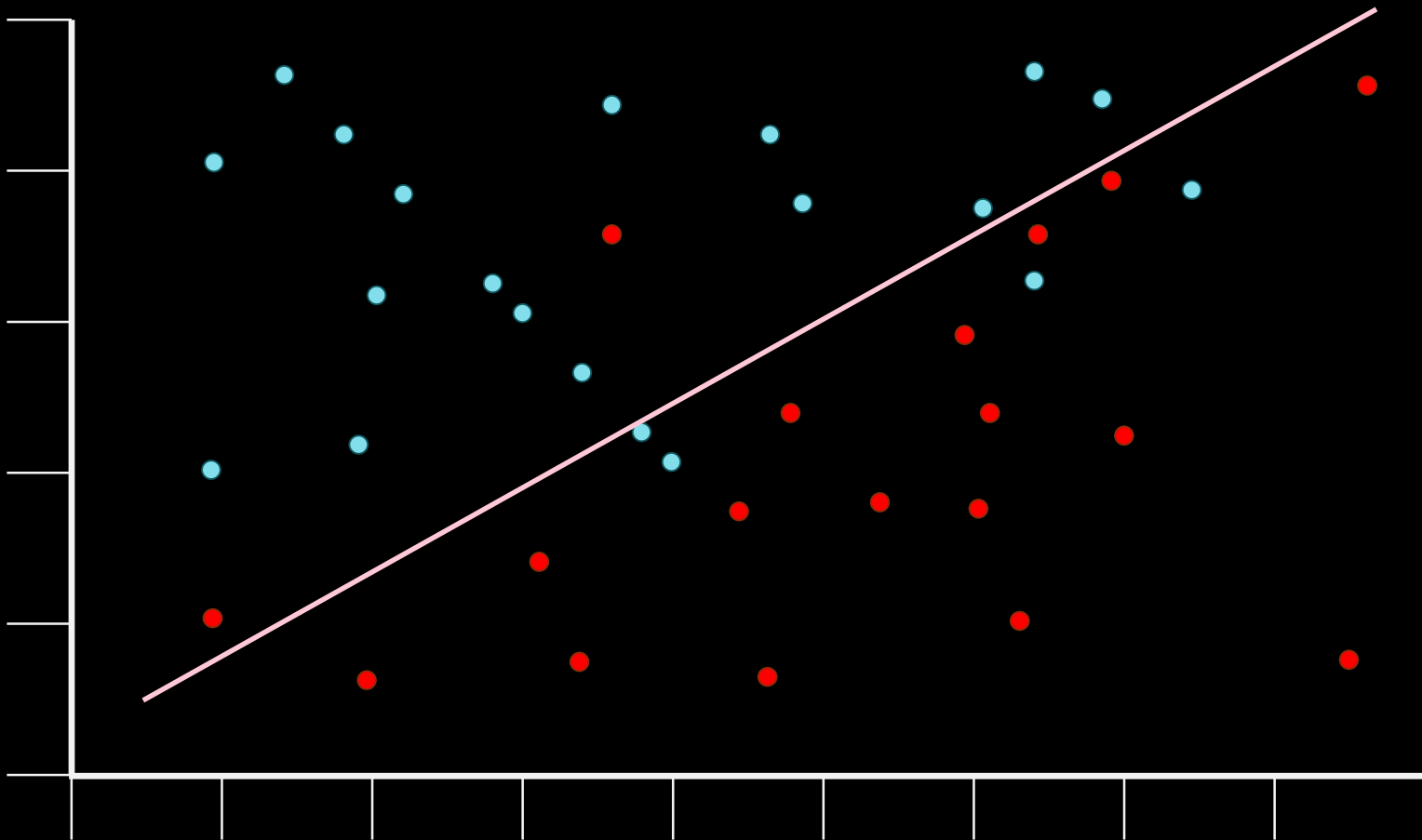
- Run lots and lots of experiments
- Measure all the chemists and biologists
- Run lots and lots of simulations

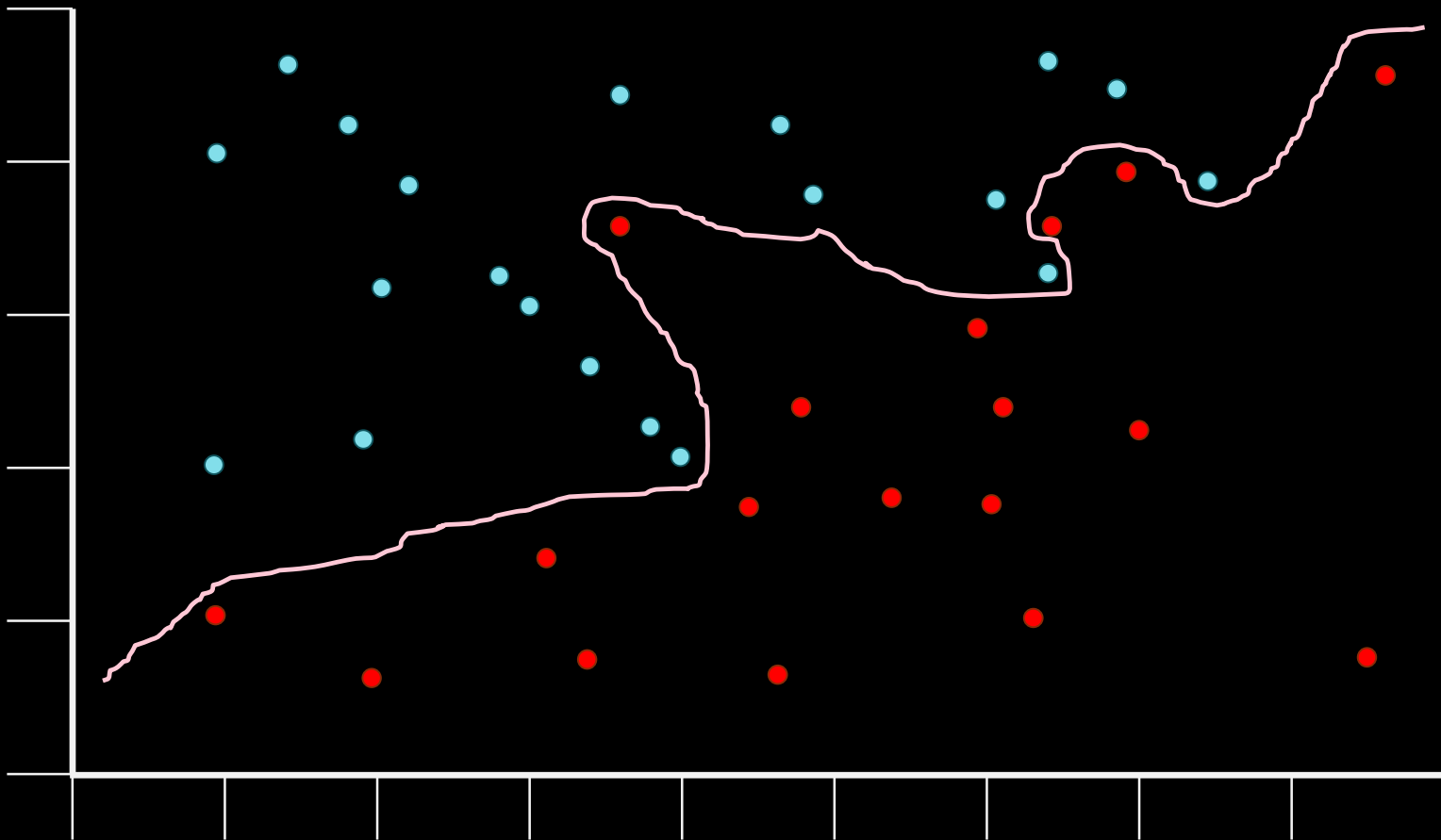
p = the probability that, were you to run exactly the same experiment again, you would see a result at least as extreme as the one in front of you, *if in fact there was nothing there*

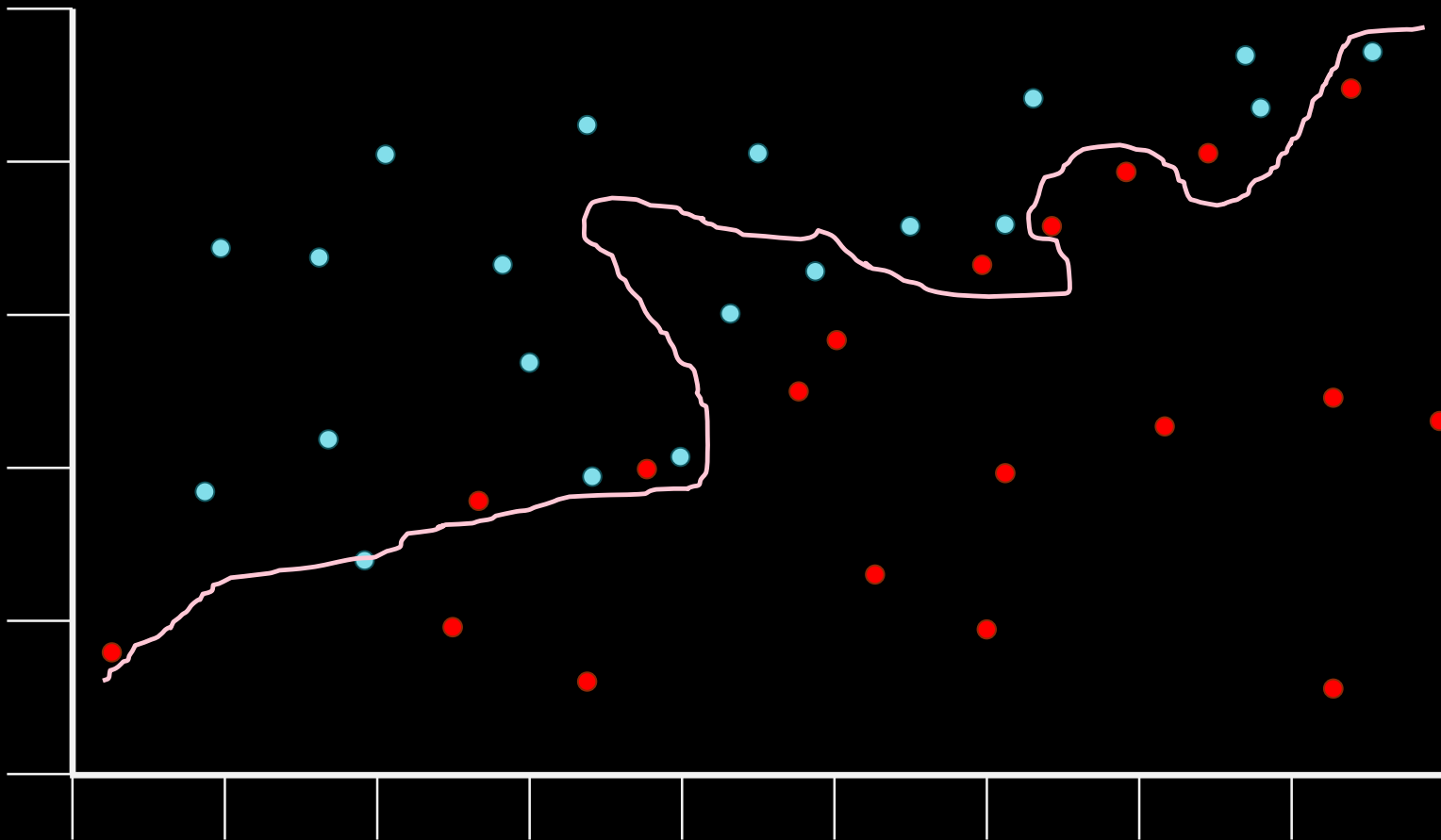
p = the fraction of times, if you ran exactly the same experiment a ton (say, 100,000 times), that you would see a result at least as extreme as the one in front of you, *if in fact there was nothing there*

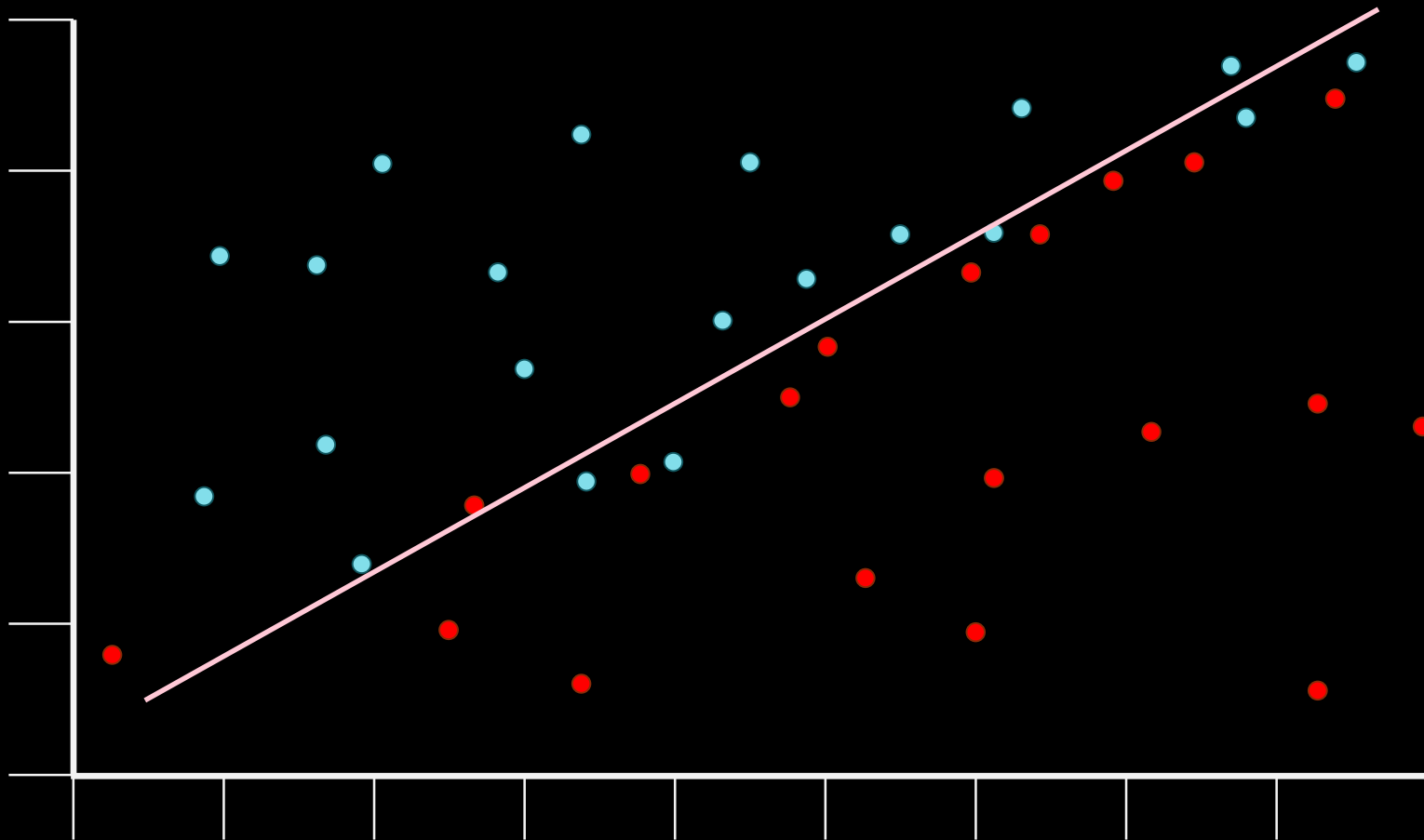
DEMO

Support vector machines
Random forests
Gradient boosted trees









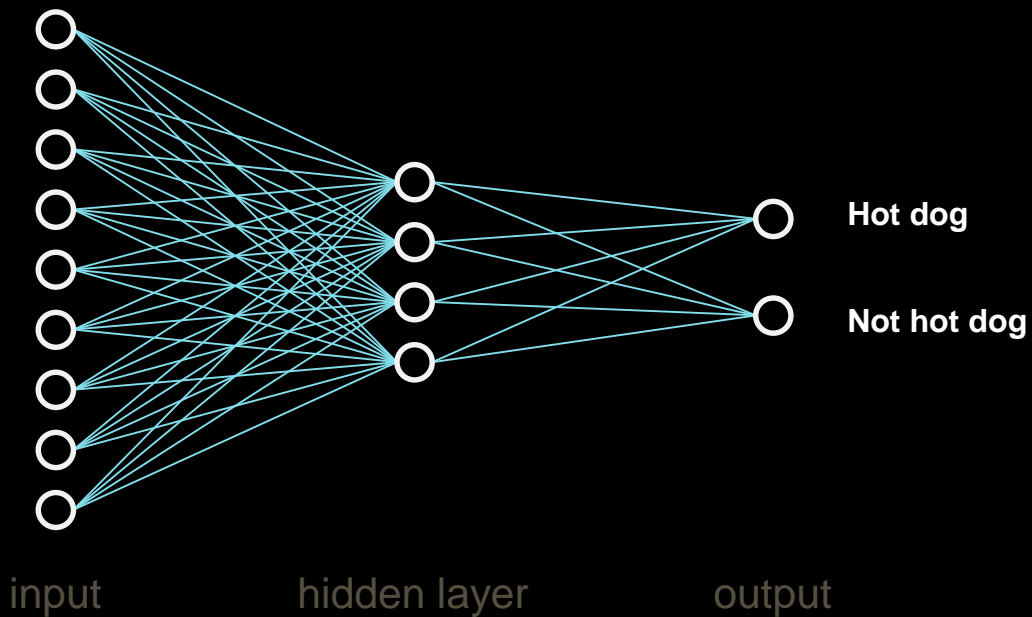
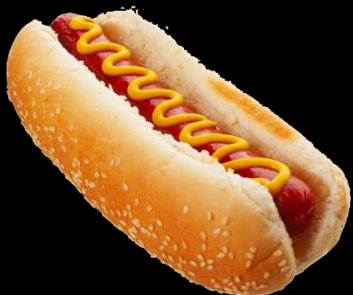
1. Use a model that is only as flexible as you need, and no more so.
2. Always validate your model with 'new data'

- Traditional statistics is about *knowing the theory* (including the assumptions)
- Machine learning is about *running the experiment*



Deep Learning and AI

Neural networks



Deep Learning



Draw your number here

0123456789

8



Downsampled drawing: 8

First guess: 8

Second guess: 6

Layer visibility

Input layer

Convolution layer 1

Downsampling layer 1

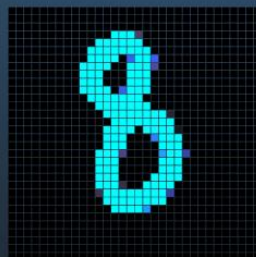
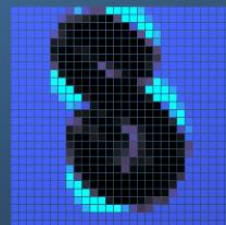
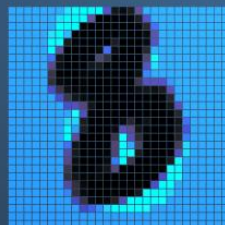
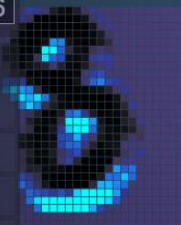
Convolution layer 2

Downsampling layer 2

Fully-connected layer 1

Fully-connected layer 2

Output layer



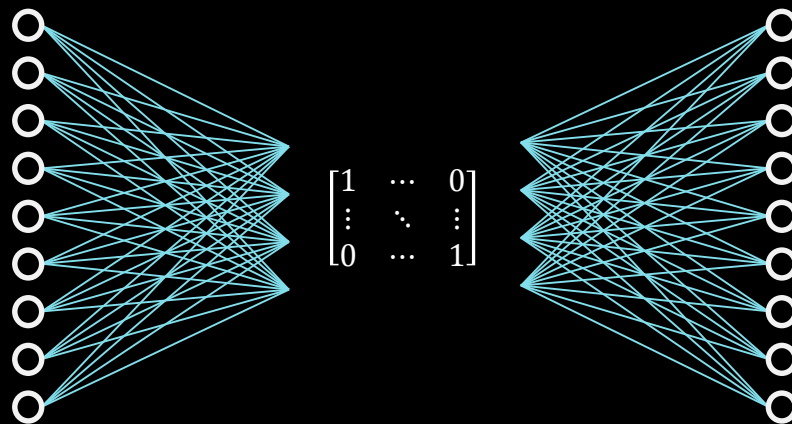
Examples

Image to caption

Image



Abstract representation
(‘embedding’)



Caption

“A group of
people
shopping at
an outdoor
market”

<https://arxiv.org/pdf/1411.4555v1.pdf>

Video to text



<https://arxiv.org/pdf/1611.05358v1.pdf>

Video to speech

Video to sound



<http://arxiv.org/abs/1512.08512>

fin