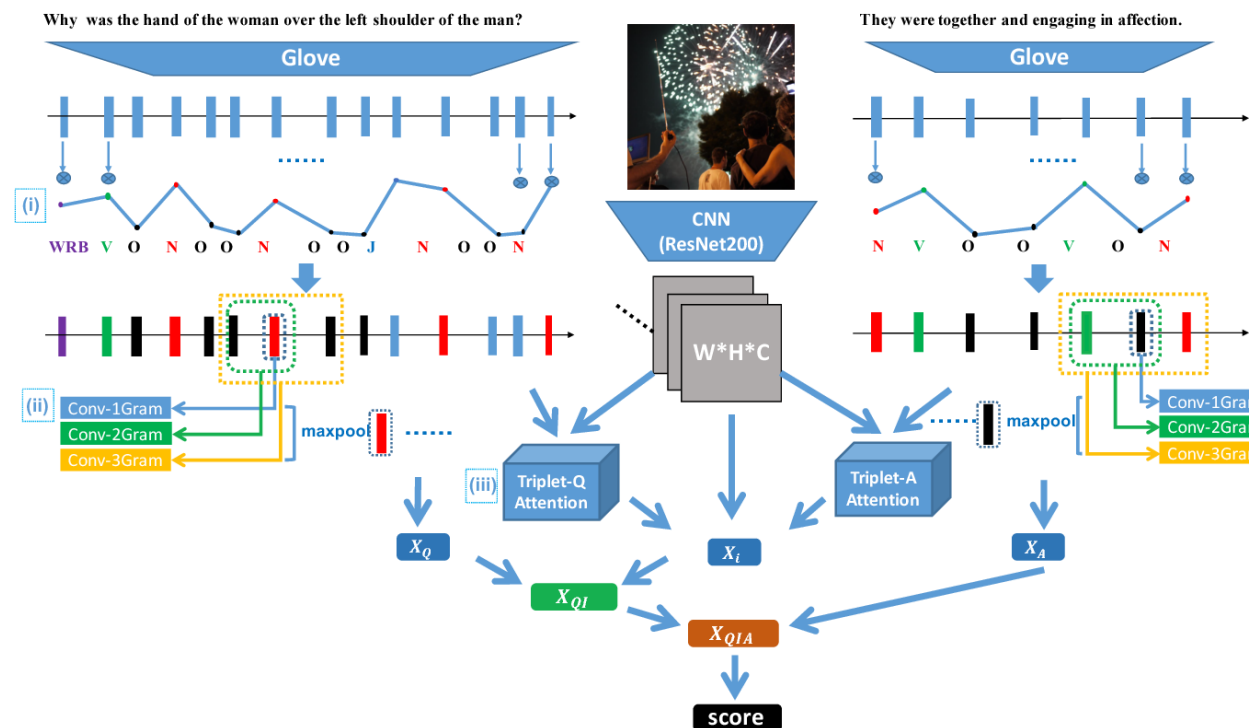


What Can Machine Learning Do For You?

Adam Prügel-Bennett



Machine Learning and AI

- Machine learning has been the driving force in the current revolution in artificial intelligence
- The last seven years has seen an unprecedented stride forward in machine learning due to the development of deep learning
 - ★ Super-human classification performance
 - ★ Beats humans at Go
- How can you use machine learning to build a super intelligent system that will revolutionise your field?

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- Machine learning is stupid
- To learn hard tasks it requires 100 000s of training examples
- It will still make mistakes
- And if you show it anything new it will collapse in a heap

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- It is very fast compared to humans
- It doesn't get bored
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- But at heart it is completely stupid

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- We have moved in the past seven years from systems that simply don't work to systems that are just stupid
- Although its origins are decade old the revolution happened in 2012 with the ImageNet competition

ImageNet Large Scale Visual Recognition Challenge

Image classification

Easiest classes

red fox (100) hen-of-the-woods (100) ibex (100) goldfinch (100) flat-coated retriever (100)



tiger (100)

hamster (100)

porcupine (100)

stingray (100)

Blenheim spaniel (100)



Hardest classes

muzzle (71) hatchet (68) water bottle (68) velvet (68) loupe (66)



hook (66)

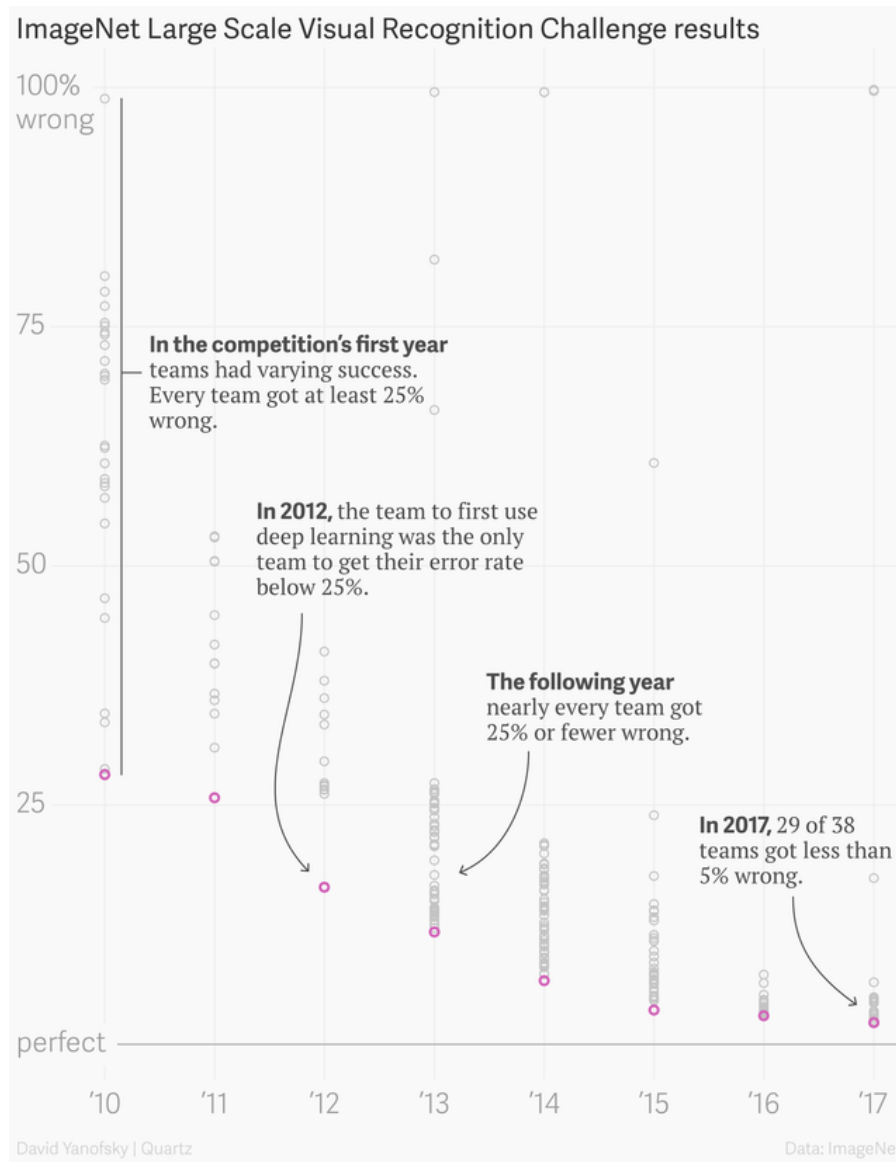
spotlight (66)

ladle (65)

restaurant (64) letter opener (59)

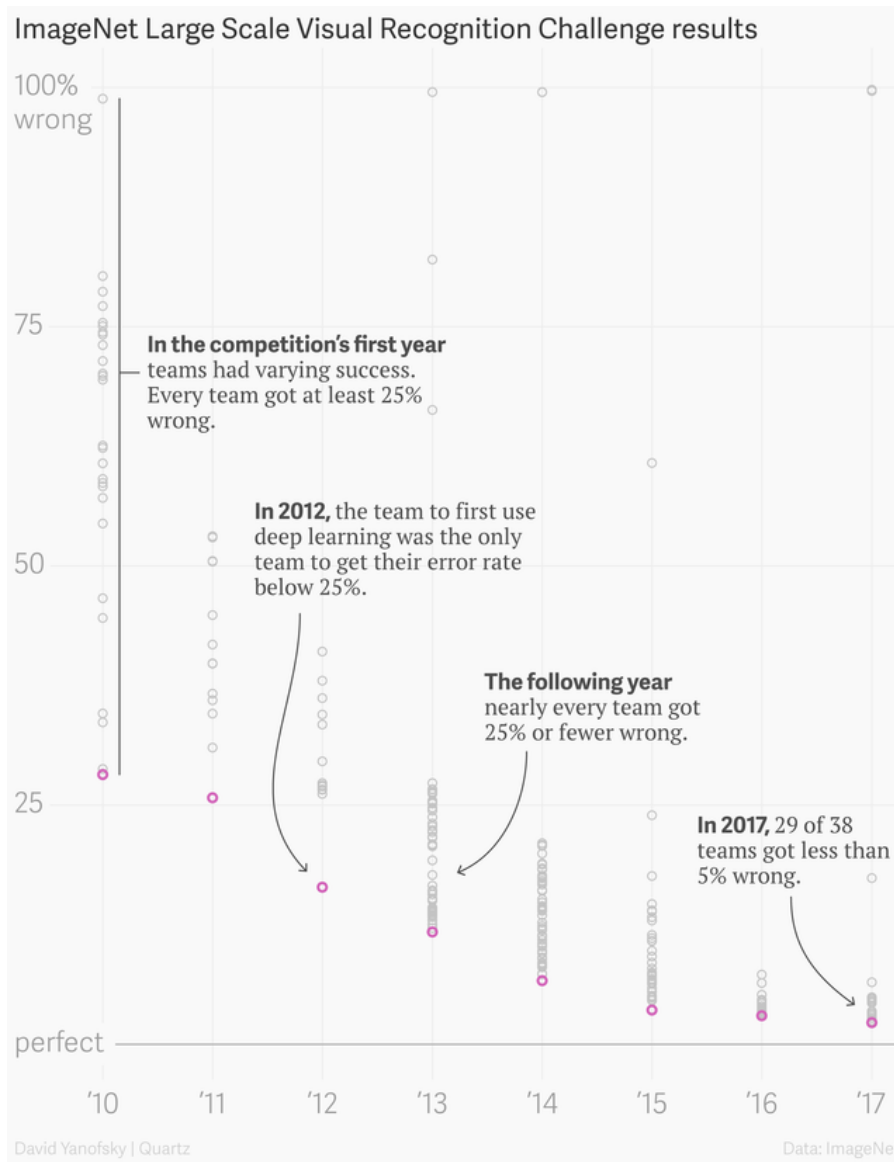


The Revolution



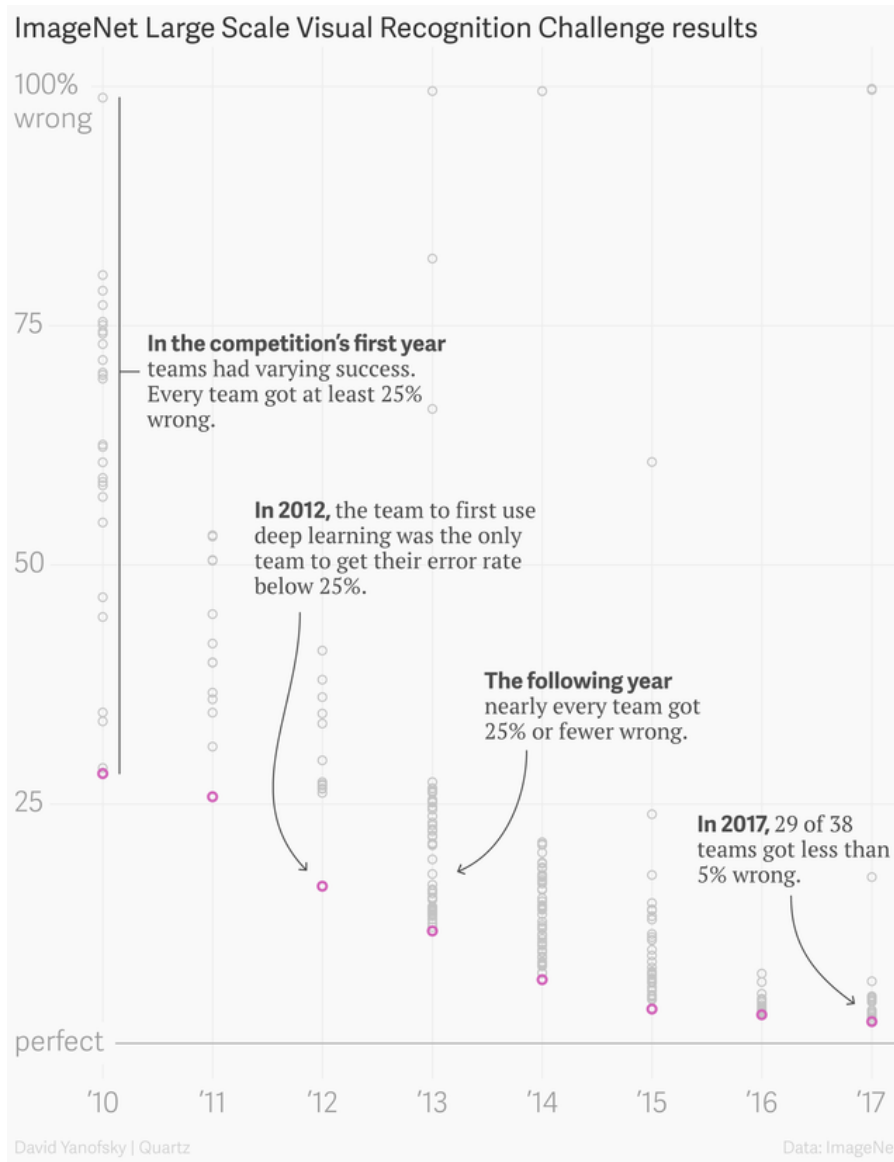
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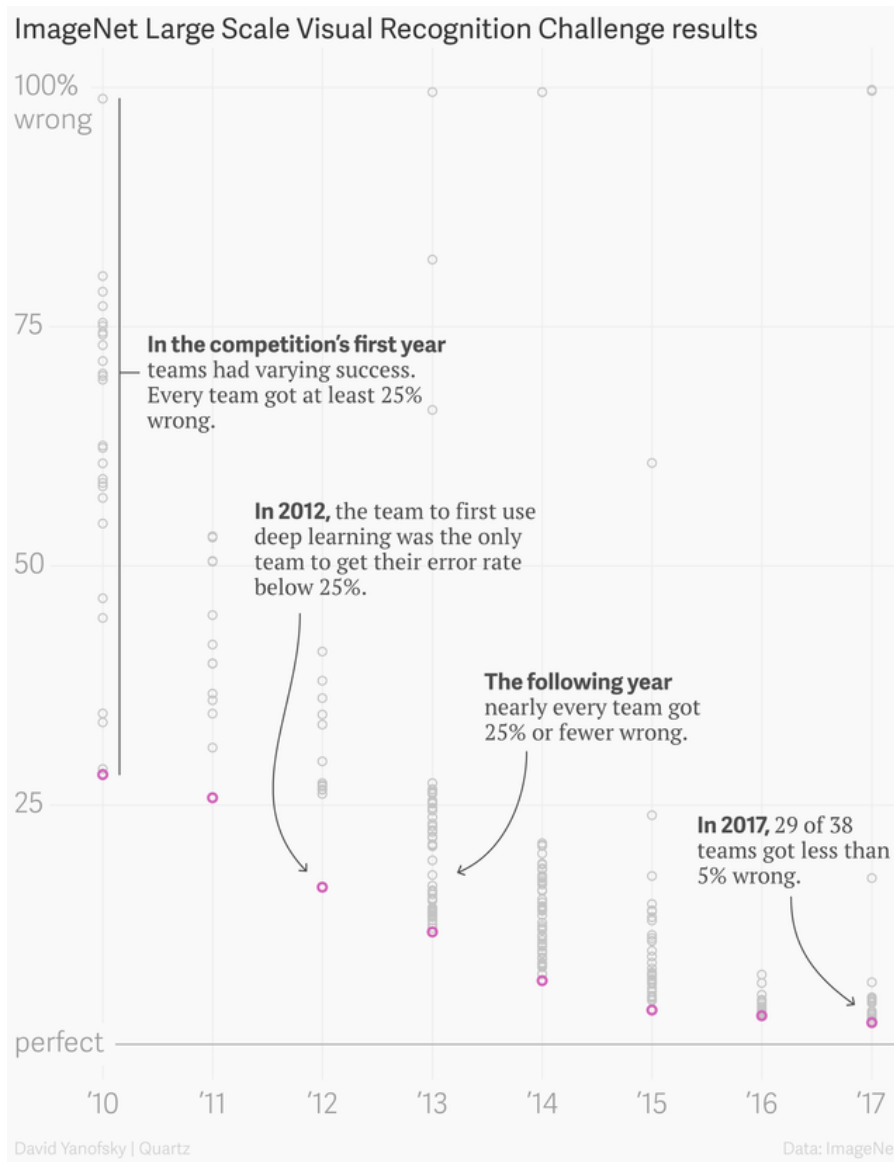
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- This is super-human performance

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- Surely a system achieving super-human performance can't be an idiot?
- ImageNet is trained on over 1 million images
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AlphaGo



- The board game Go had been a long running challenge for AI for years
 - ★ It has a massively larger search tree than chess
 - ★ Board evaluation is very hard
- In October 2015 Alpha Go developed by *DeepMind* beat a professional Go player for the first time
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- In general machine learning is only as good as the data its be trained on

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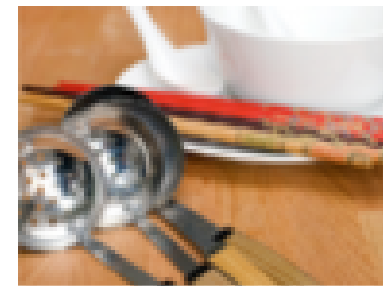
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- But 2% error is usable. In fact it's a game changer



An Idiot for Its Time

- Why ML is useful is because of data
- Machine learning works by **learning from data**
- We live in world where we can collect and share data on a scale that is hard to comprehend

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Data in the 1930s

The Iris Dataset

Collected by Ronald
Fisher in 1936



Data in the 1930s

IRIS dataset



Iris Versicolor



Iris Setosa



Iris Virginica

Data in the 1930s

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5.0	3.6	1.4	0.2	setosa
6	5.4	3.9	1.7	0.4	setosa
7	4.6	3.4	1.4	0.3	setosa
8	5.0	3.4	1.5	0.2	setosa

- 50 measurements for each class

Data Today



- Large Synopsis Survey Telescope

Data Today



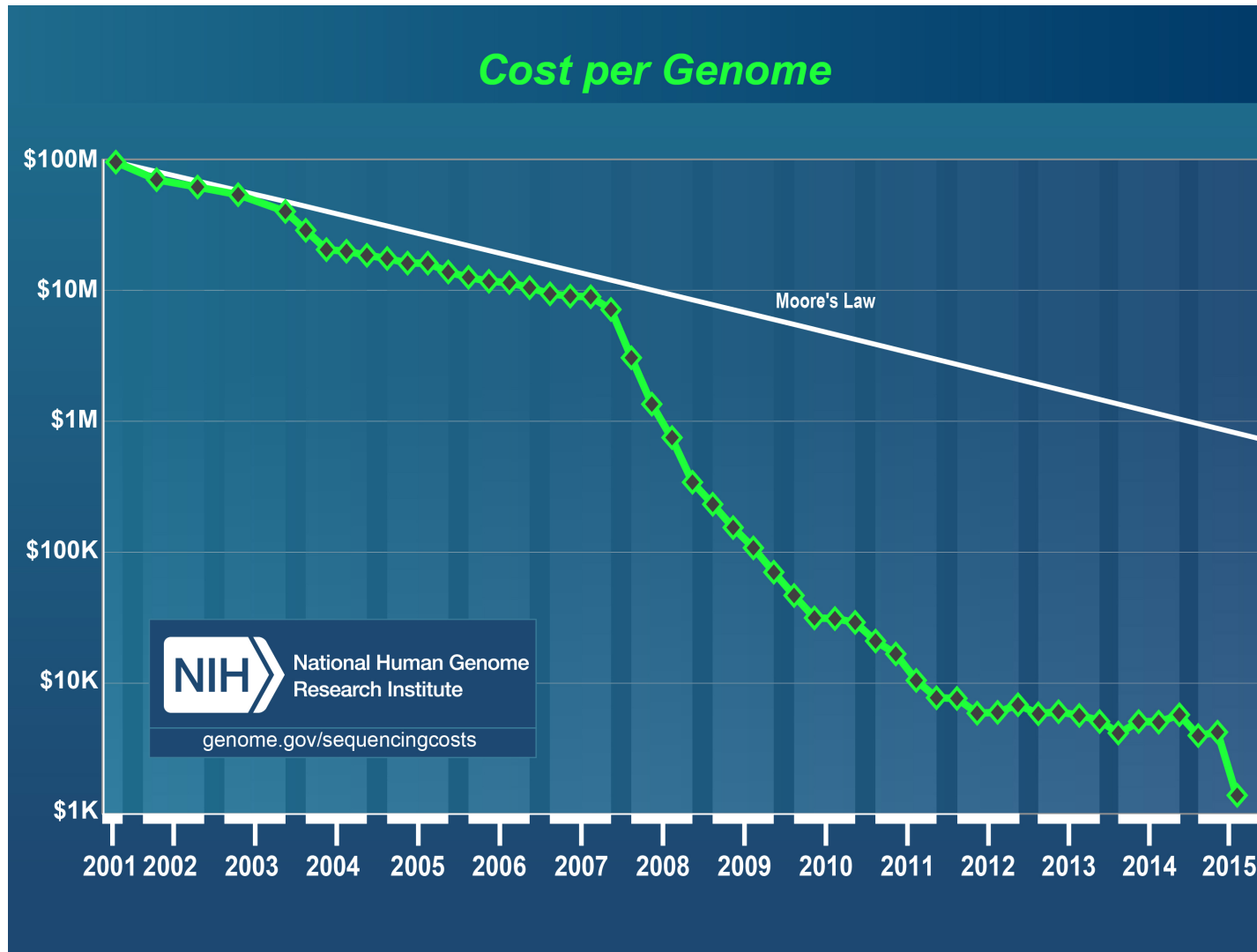
- Large Synopsys Survey Telescope
- Aims to collect 500 petabyte set of images

Sequencing Technology



- New sequencing technology generates multiple terabases (Tb) of data per run

Cost of Sequencing



Underwater Data



- Can collect close to 1km^2 of images in a day

How Many Crabs are There?



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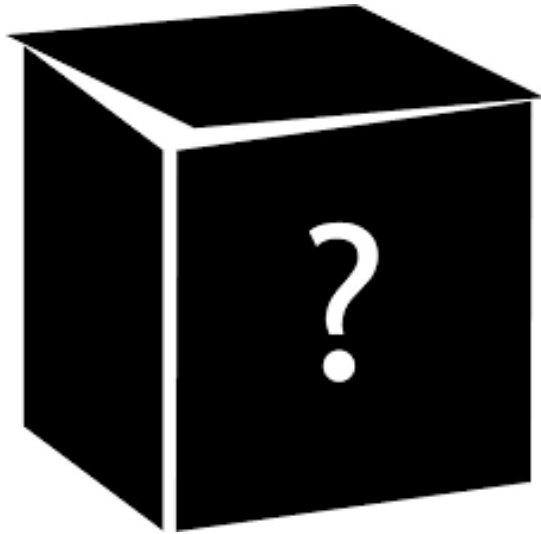
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- You need to tune parameters
- You might need to try different learning machines
- But if you can program then you can get simple ML to work

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- But, it can be done and it can give you dramatically better results

The Truth About Machine Learning

- Machine learning hasn't enabled **artificial intelligence**
- It has unleashed the **artificial idiot**
- This can be transformative for a lot of problems with data
- It requires imagination to think how you can exploit this new AI
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