Incomplete History of Machine Learning

1946 - 2016

Bob Colner

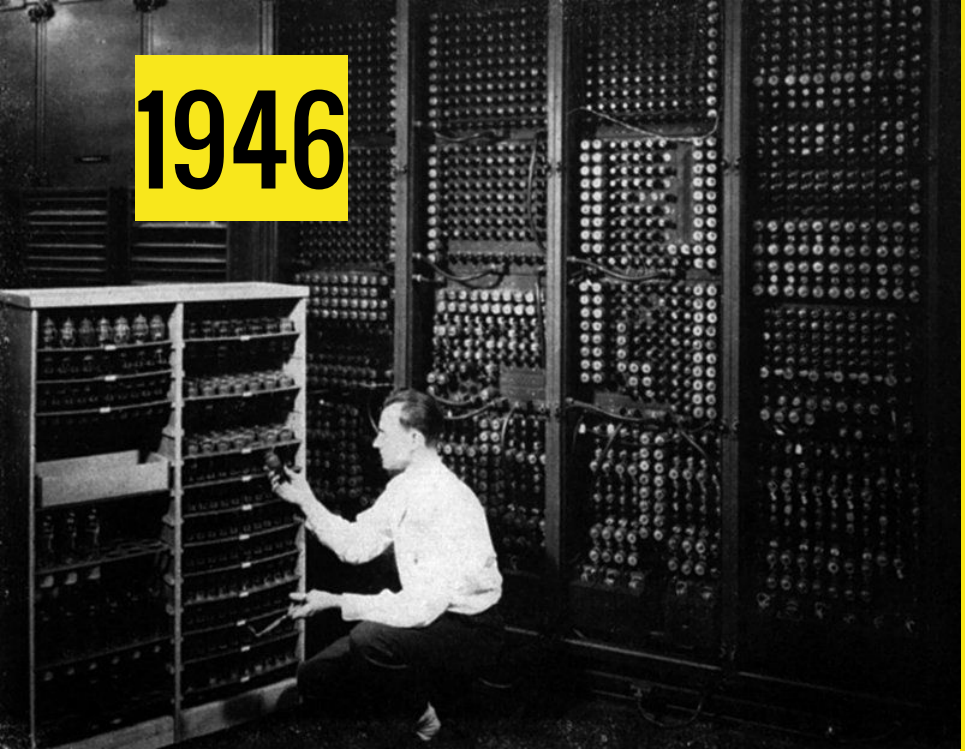
Machine Learning & Artificial Intelligence

General AI is the quest to build intelligent machines.

Machine learning is a branch of AI focusing on systems that **learn** from their environment (i.e. **data**).

The goal is to generalize this training to act intelligent in *new* environments.

The Quest for Artificial Intelligence begins with the first computer.



ENICA

Electronic Numerical Integrator & Computer

First general purpose digital computer. Powered by vacuum tubes

Built by US Army, used by *John von Neumann* to develop the **H-Bomb.**

Heralded as a *Giant Brain* by the press.

Prompted **Alan Turing** to devise a test to detect artificial intelligence. The *Turing-Test* has yet to be definitively passed.

> *Give machines the ability to learn without explicitly programming them*
>
> - Arthur Samuel, 1955

Arthur Samuel is recognized as the first *learning machine* which leaned to play (and win) checkers.

His algorithms used a heuristic search memory to *learn from experience.*

By the mid 1970's his program was beating capable human players.

Perceptron

Mark I

The Perceptron was the first *artificial neural network.*

Developed by Frank Rosenblatt at the US office of Naval Research for visual recognition tasks.

The New York Times reported the perceptron to be: "*the embryo of an electronic computer that will be able to walk, talk, see, write, reproduce itself and be conscious of its existence.*"

> *Will robots inherit the Earth? Yes, but they will be our children.*
>
> - Marvin Minsky

Cognitive scientist in the field of AI.

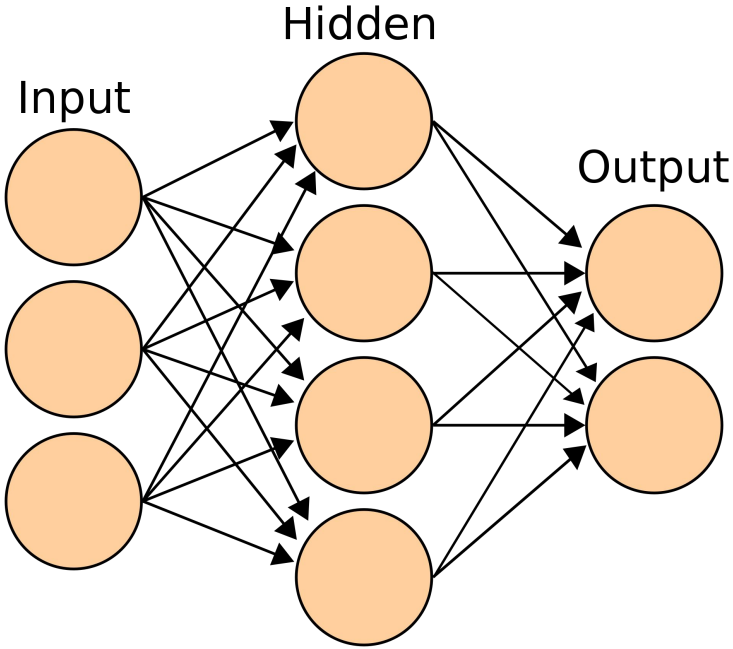
Co-founder of the MIT AI lab.

Published influential book describing fundamental limits of the perceptron (and all 2 layer neural networks).

This was a bummer.

AI Winter

1970-1980



Neural Network Breakthrough

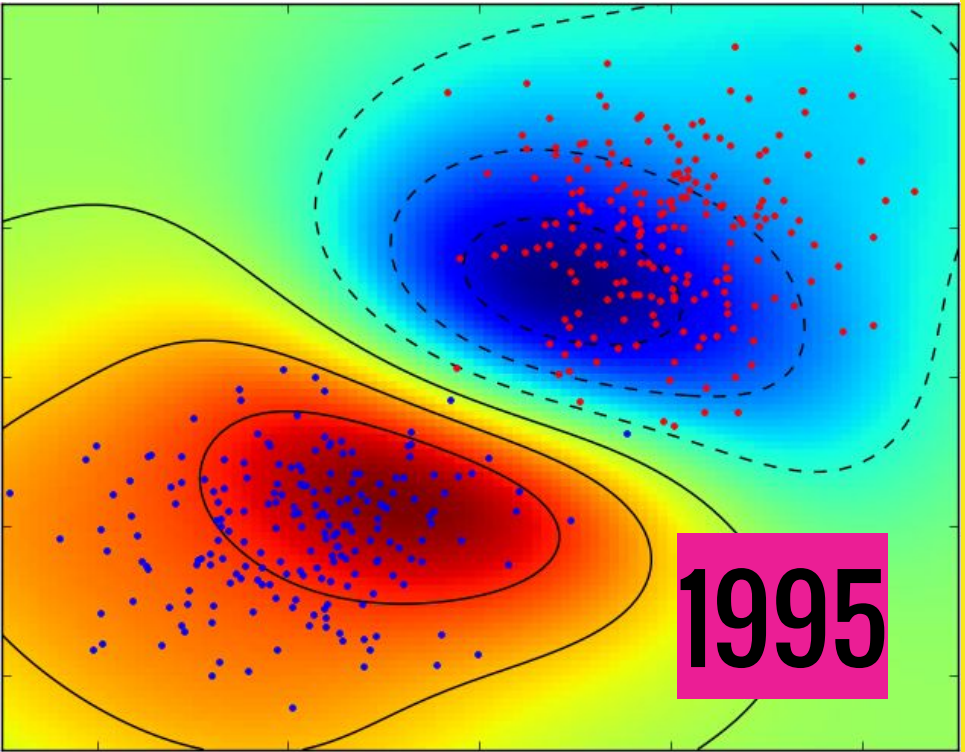
1985

In the mid 1980's multiple people independently (re)discovered the *Backpropagation algorithm.*

Allowed more powerful neural networks with *hidden layers* to be trained.

Reinvigorated research; many people excited about Neural Nets as model for the mind/brain (connectionism) & commercial applications.

Statistical Approaches to Machine Learning



By the 1990's neural networks had fallen out of favor (again).

Lack of good theory, tendency to overfit, biologically implausible.

New methods like *Support Vector Machines* are in-vogue.

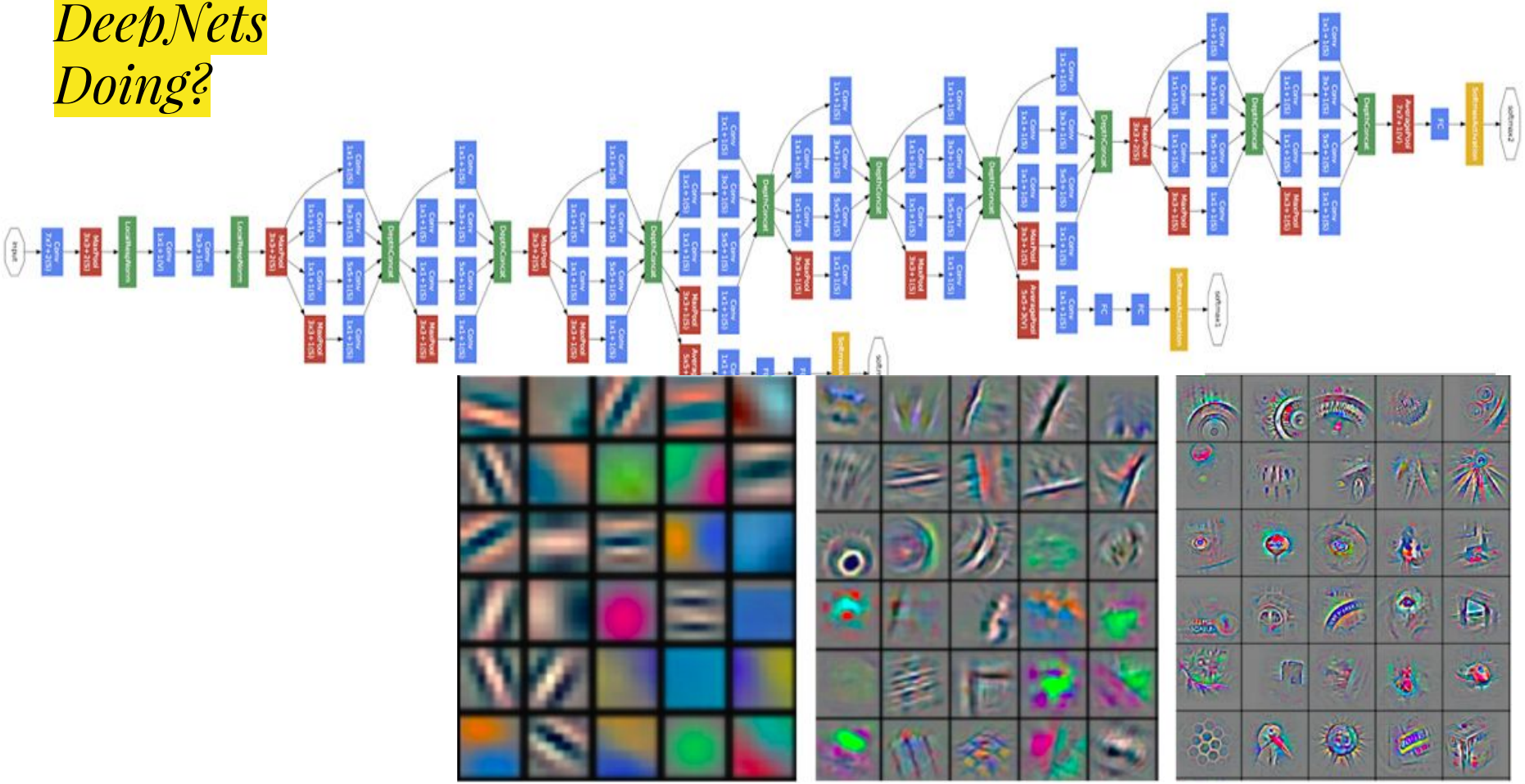
SVM are amenable to rigorously mathematical analysis and achieve state-of-the art performance.

1997

IBM's *Deep Blue* beats Chess Grandmaster Garry Kasparov. (Brute Force != ML).


The ImageNet Challenge
Classify 1M Images into 1K Categories
Microsoft's deep rectified model exceeds human accuracy in 2015

What are DeepNets Doing?

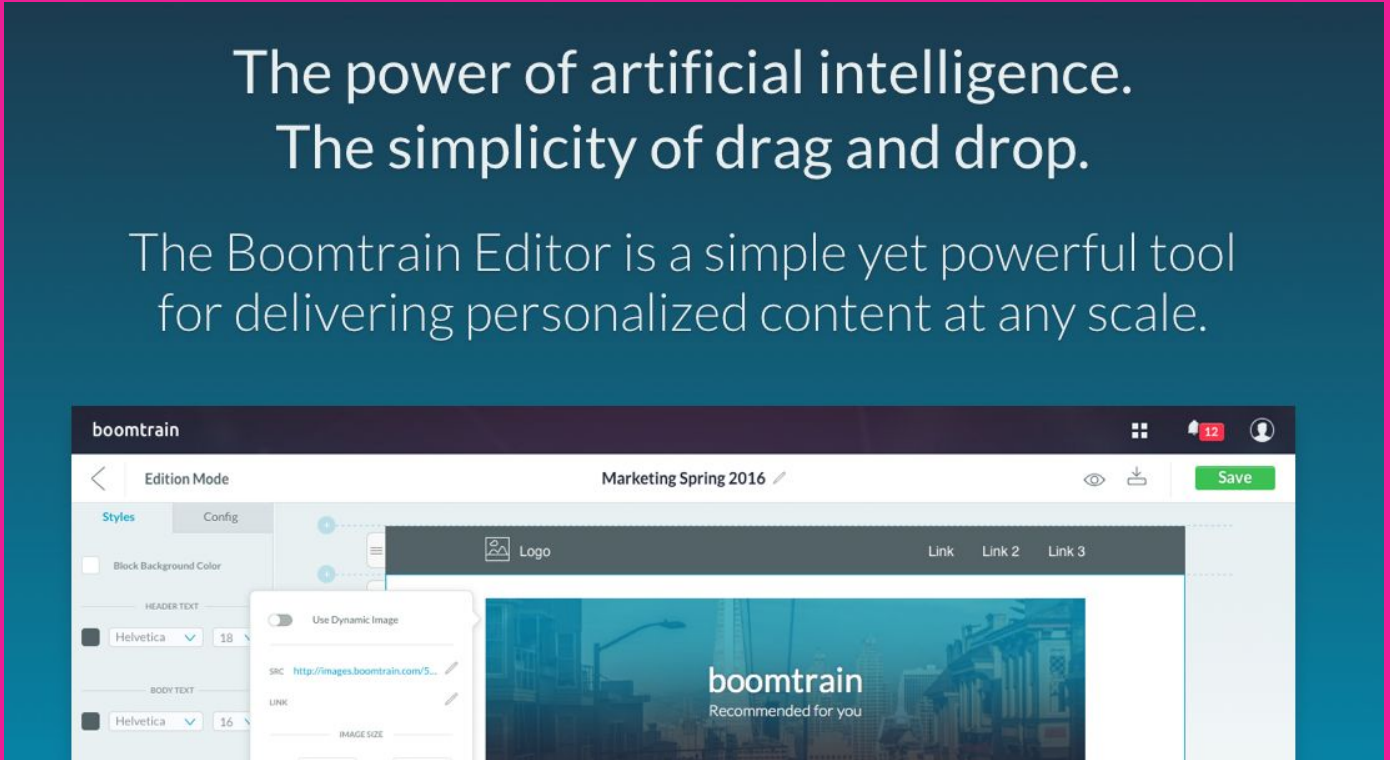


2016

Google’s AlphaGo Model defeats Euro Go Campaign

Boomtrain Editor

2016



Looking to the (Near) Future

2015 Royal Society Keynote:
Geoffrey Hinton