MS*038*F21 | Machine Learning for Artists

Professor Douglas Goodwin

MW 09:35-10:50AM

Scripps Campus, Steele Hall, 229

Syllabus | Discord

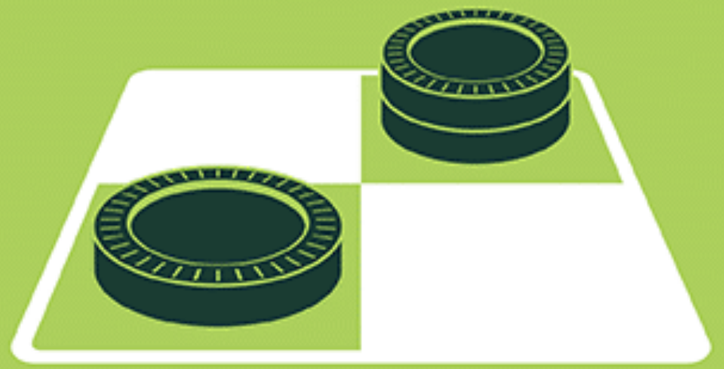
week 01

We are here to learn techniques to use them critically and aesthetically. This is not a theory course or a programming course, though you will learn enough to be dangerous.

What is **Artificial Intelligence**, **Machine Learning**, and **Deep Learning**?

ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



MACHINE LEARNING

Machine learning begins to flourish.

DEEP LEARNING

Deep learning breakthroughs drive AI boom.

1950's 1960's 1970's 1980's 1990's 2000's 2010's

Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

artificial intelligence

AI is the science of making inorganic stuff so smart that it exhibits (human) intelligence.

weak vs strong AI

Strong AI has a complex algorithm that helps it act in different situations, while all the actions in weak AIs are pre-programmed by a human. Strong AI-powered machines have a mind of their own.

general vs narrow AI

General AI: fabulous machines that have all our senses (maybe even more), all our reason, and think just like we do.

Most of AI today is Narrow AI systems that can only do one (or a few) defined things as well or better than humans.

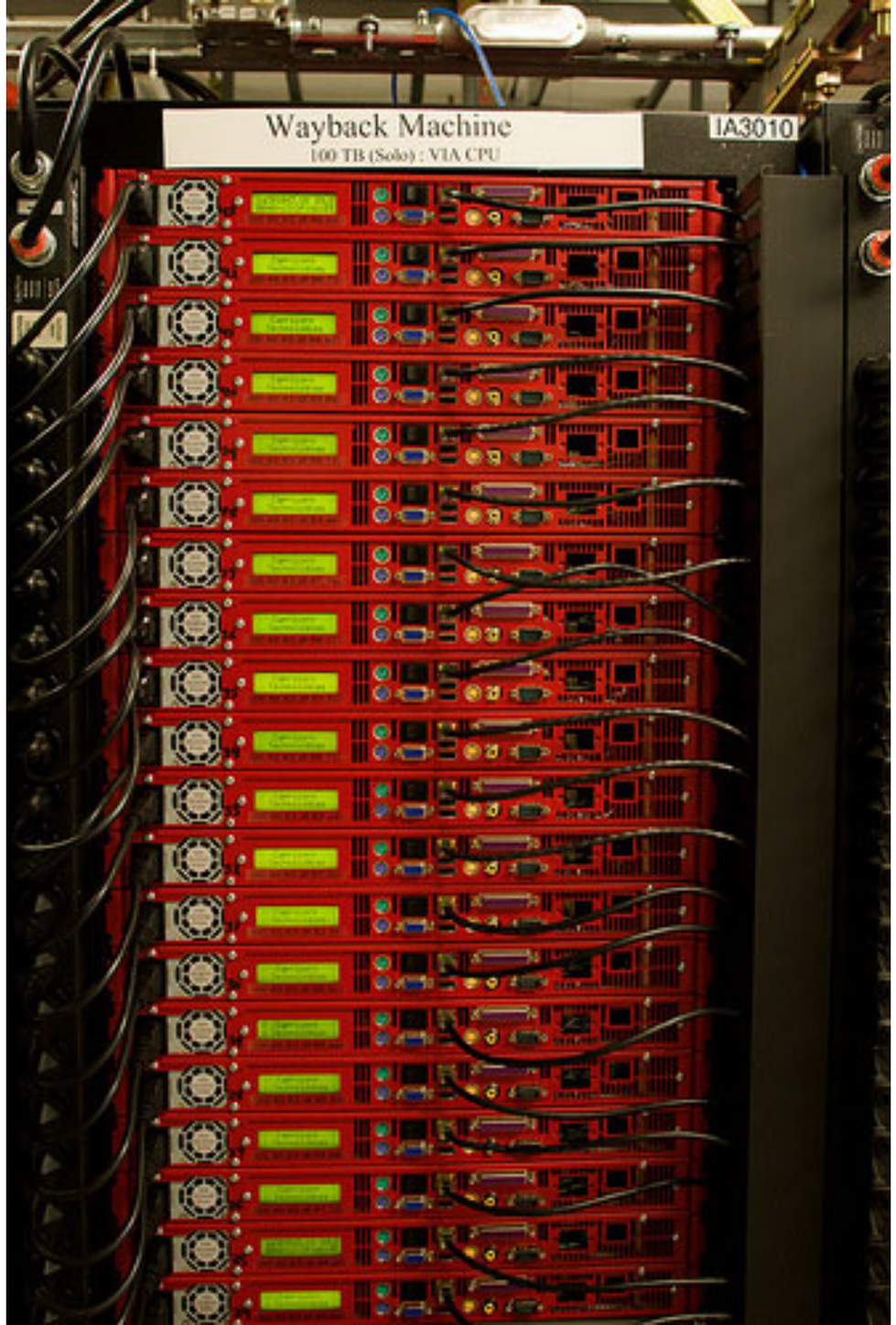
is fire intelligent? discuss.

- fire controls and maintains critical temperature
- fire identifies consumabe resources
- fire self-organizes
- fire responds to stimuli
- fire can grow

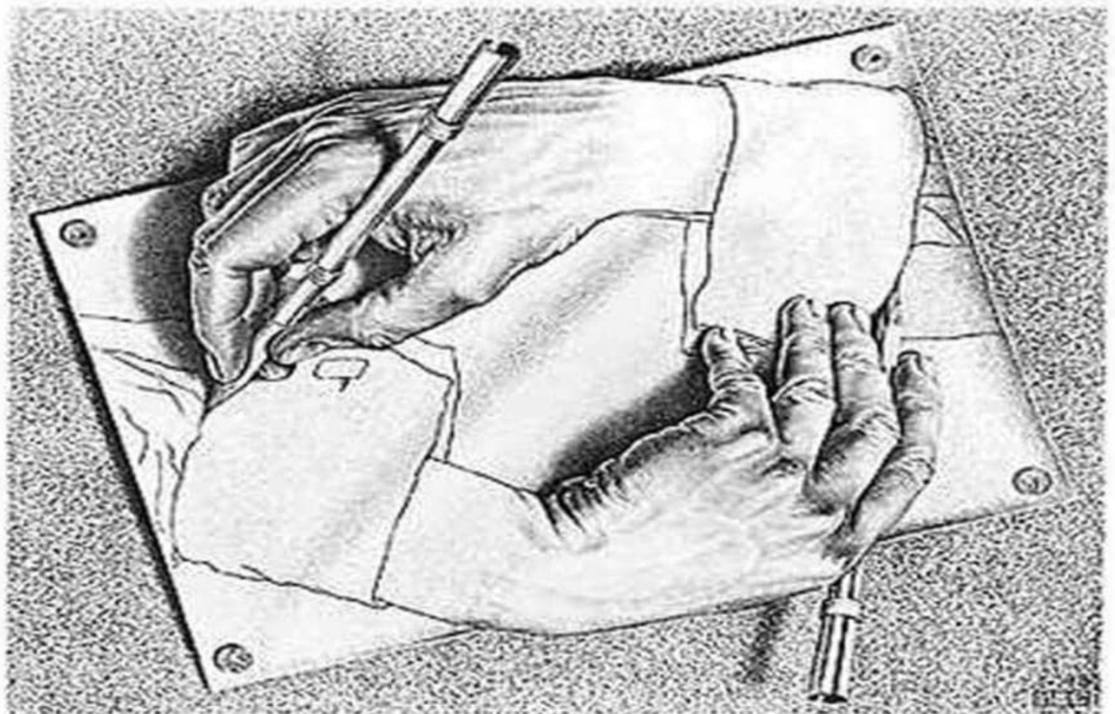
is the roomba intelligent? discuss.

machine learning

A field of computer science that uses statistical techniques to give computer systems the ability to "learn" with data, without being explicitly programmed.



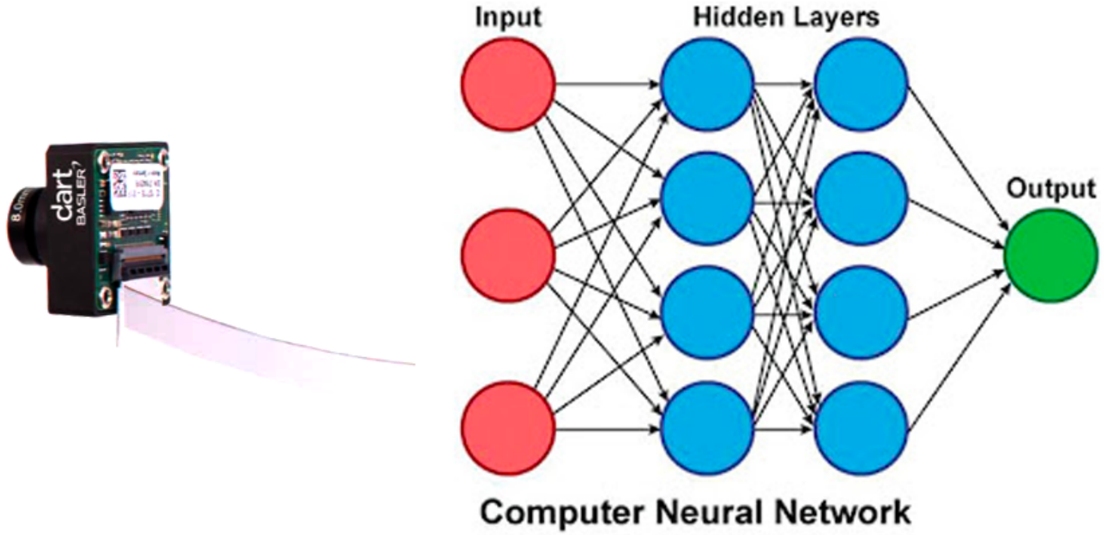
machine learning vs traditional programming

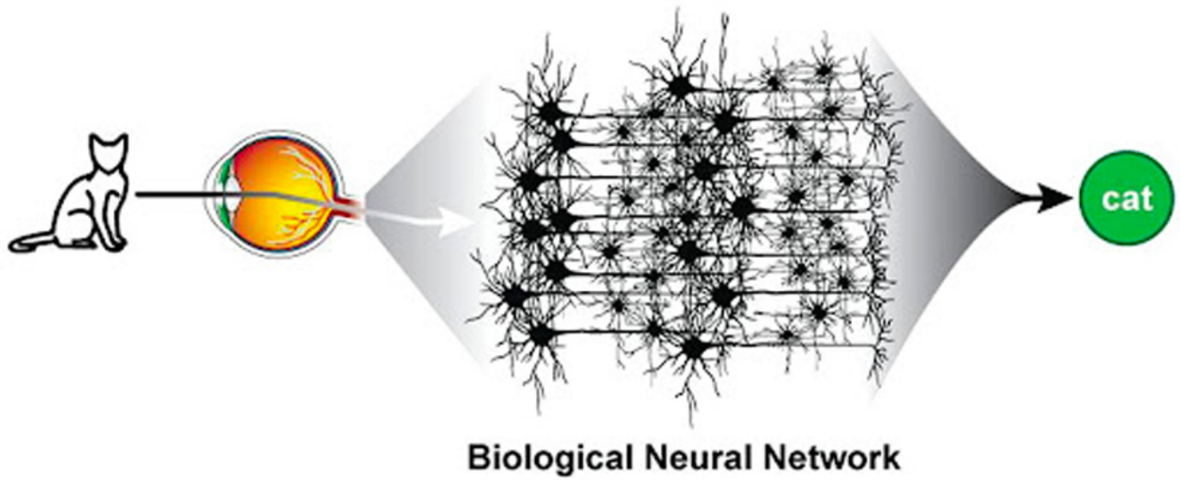


deep learning

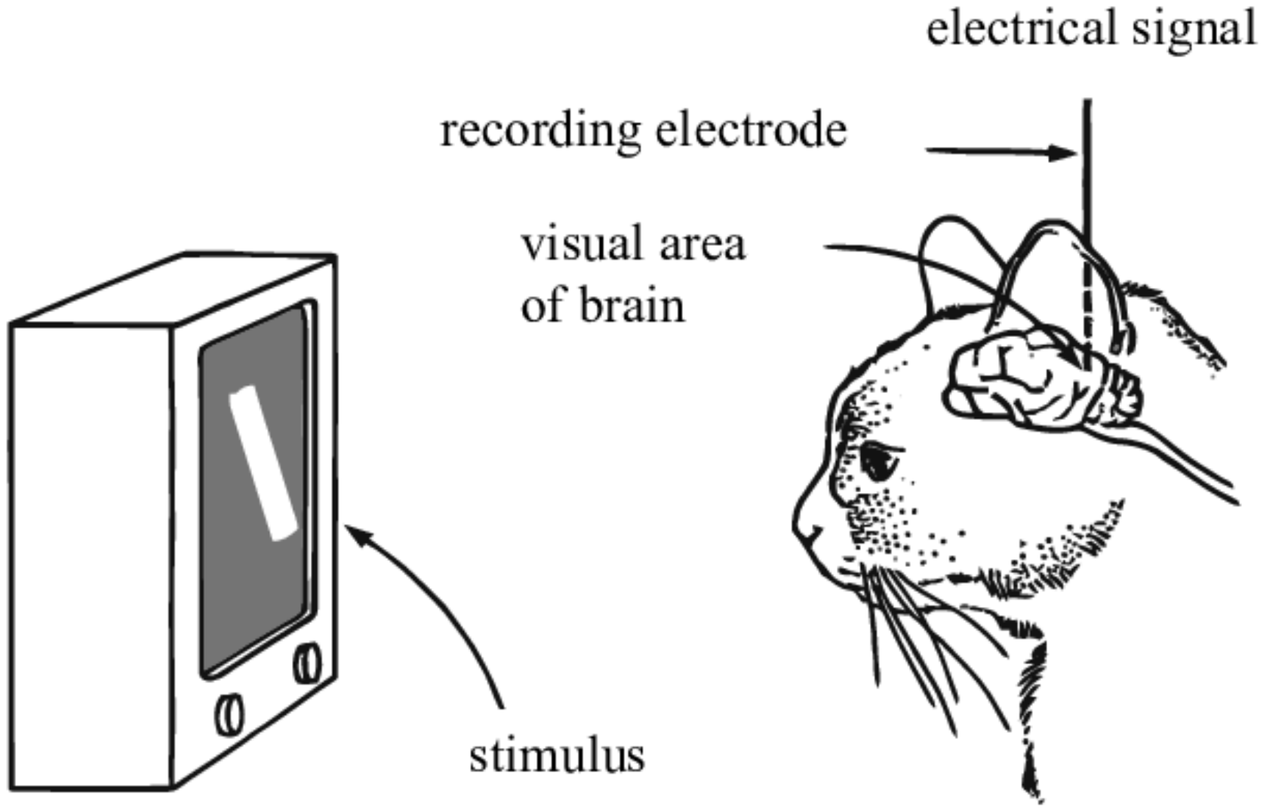
A technique for implementing Machine Learning

- Uses multi-layered artificial *neural networks* to deliver state-of-the-art accuracy.
- Can automatically learn representations/features from data such as images, video or text.





background: hubel & weisel

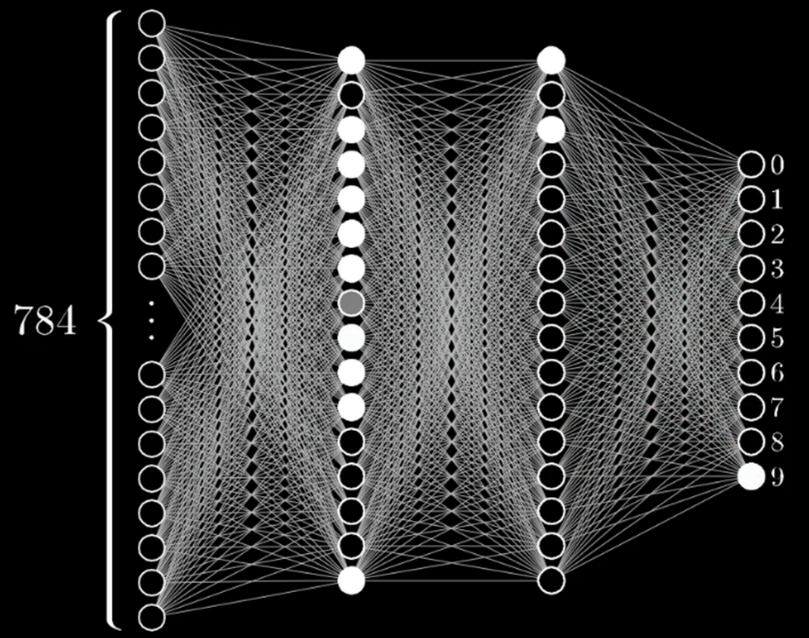


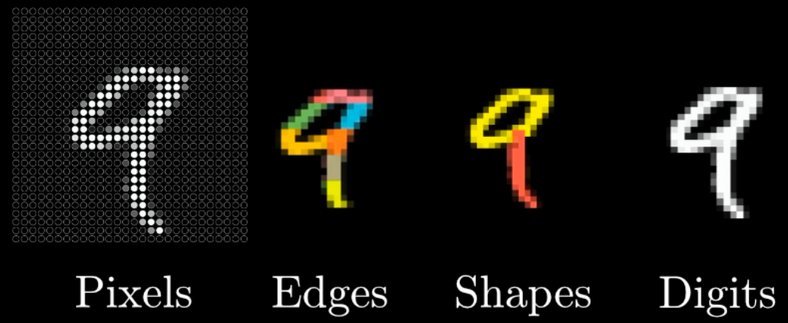
nobel prize for their discoveries concerning information processing in the visual system

1. visual perception is layered
2. layered architectures can solve problems (roomba)

deep learning example

- what do the layers do?
- how does it compare to visual perception?





machine learning approaches

1. supervised learning
2. unsupervised learning
3. reinforced learning

1/ supervised learning

“Supervised learning typically requires a large set of positive examples ... and negative examples ... . Each example is labeled by a human with its category—here, 8 or not-8. This label will be used as the supervision signal. Some of the positive and negative examples are used to train the system; these are called the training set.”

2/ unsupervised learning

"Yann LeCun himself acknowledges that *unsupervised learning is the dark matter of AI.* In other words, for general AI, almost all learning will have to be unsupervised, but no one has yet come up with the kinds of algorithms needed to perform successful unsupervised learning."[1]

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[1] Melanie Mitchell. "Artificial Intelligence."

3/ reinforced/reinforcement learning

“reinforcement learning requires no labeled training examples. Instead, an agent—the learning program—performs actions in an environment (usually a computer simulation) and occasionally receives rewards from the environment. ... reinforcement learning played a central role in a stunning and momentous achievement in AI: a program that learned to beat the best humans at the complex game of Go.”

https://www.3blue1brown.com/lessons/neural-networks

machine learning outputs

1. **Regression**: Predict continuous values (price of a stock)
2. **Classification**: Predict a class/label (cat or dog?)
3. **Clustering**: Most similar other examples (Amazon related products recommendation)
4. **Sequence Prediction**: Predict the next word/sentence

1/ Regression

2/ Classification

3/ Clustering

4/ Sequence Prediction

what's machine learning good for?

- Object recognition
- Speech recognition / sound detection
- Nlp, sentiment analysis
- Creative: style transfer
- Prediction
- Translation/restoration and transformation

can you make art with ml? yes!

- Lauren McCarthy
- Mario Klingemann
- Sofia Crespo
- Tom White
- Anna Ridler
- Alexander Mordvintsev
- Sougwen Chung
- Memo Akten

tools and resources

1. teachable machine (free ?)
2. ml5.js (free)
3. google colab (free-$)
4. runwayml ($$)
5. paperspace ($$)

google's teachable machine

Train a computer to recognize your own images, sounds, & poses.
A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.


Teachable Machine