Machine Learning

Human Experience Lab

What is Machine Learning?

teaching a computer to learn?



• but what does that mean?

Machine Learning Is...

- developing algorithms that let computers make decisions without explicitly telling them what to do
 - o are these intelligent decisions?

Is It Really *Learning?*

- computers make decisions based on data given to them and <u>only</u> that data
 - o still struggle with applying lessons learned in one area to another

- so researchers need a lot of data!
 - the data given to an algorithm can radically change its output

Generating Predictions

• From the realistic ...



(BigGAN by Heriot-Watt University & Google DeepMind)

Recycling is good for the world. Recycling is NOT good for the world. It is bad for the environment, it is bad for our health, and it is bad for our economy. I'm not kidding. Recycling is not good for the environment. It is destructive to the earth and it is a major contributor to global warming. Recycling is not good for our health. It contributes to obesity and diseases like heart disease and cancer. Recycling is bad for our economy. It increases the cost of a product, and in turn, the price of everything that is made with that product. Recycling is not good for our nation. We most advanced and efficient recycling system. Recycling is a THAT is why we need to get back to basics and get back to basics in our recycling efforts. One of the best ways to start is to look at the process of creating a paper product. When you make a paper product, it is basically a long chain of materials. Everything from the raw materials (wood, cardboard, paper, etc.), to the reagents (dyes, solvents, etc.) to the printing equipment (chemicals, glue, paper, ink, etc.), to the packaging, to the packaging materials (mercury, chemicals, etc.) to the processing equipment (heating, cooling, etc.), to the packaging materials, to the packaging materials that are shipped overseas and to the packaging materials that are used in the United States. Each step along the way creates tons of waste that we constantly have to clean up. The process of making a paper product is a very wasteful one. But the end result is something that all of us need to consume. And if we want to keep the recycling process running efficiently, then we really need to think about each and every step that goes into making a paper product.

(GPT-2 by OpenAI)

https://medium.com/svncedreview/biggan-a-new-state-of-the-art-in-image-svnthesis-cf2ec5604024 https://techcrunch.com/2019/02/17/openai-text-generator-dangerous/ http://aiweirdness.com/post/182824715257/gpt-2-it-learned-on-the-internet

Generating Predictions

• ... to the not-so-realistic.

Dinkwart 343 0.22 0.55

Le cute White 27.8 0.05 0.93

Hathole Gray 43.0 0.16 0.57

Lime Pink 336 0.34 0.91

Flumfy Gray 34.0 0.15 0.41

Glicky Gord 40.2 0.51 0.35

Surper Blue 185 0.11 0.87

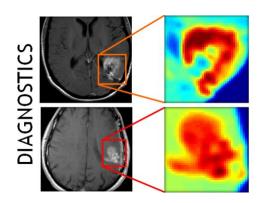
(paint colors)



(pictures of cats)

Real-World Applications

medical diagnosis



 assessing risk that criminal defendants will reoffend



 managing agricultural irrigation systems



https://www.analyticsindiamag.com/ai-getting-po pular-farmers-india-pacing/ https://www.agritechtomorrow.com/article/2018/1 1/artificial-intelligence-and-machine-learning-inagriculture-today/11139

https://blog.algorithmia.com/vertical-spotlight-machine-learning-for-healthcare-diagostics/

How Do You Do All That?

Fields of Machine Learning

- Supervised Learning
- Unsupervised Learning
- Semi-supervised Learning
- Reinforcement Learning
- etc....

Supervised Learning

• Uses labelled data



0: Macaw

1: Conure

- Regression
- Classification

Unsupervised Learning

• Uses unlabelled data



Clustering

How to analyze results?

- Accuracy/Misclassification Error
- Confusion Matrix
- Precision
- Recall
- F1 Score

Short Example