A very brief intro to AI/ML
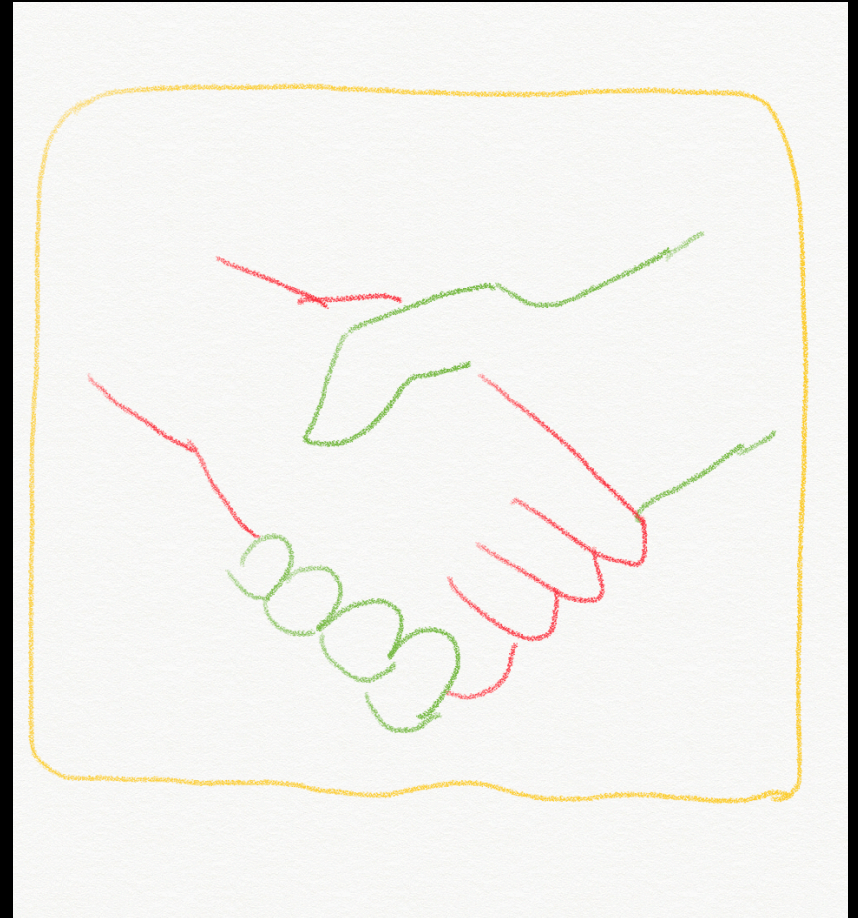
Jin Guo

Logistics

- Assignment 1 (Due Sep 20)

- Topic Assignment (in slack)

What is Intelligence?

- Draw a sketch to illustrate your understanding of Intelligence.

Does your "intelligence" mean

- **Think like people?**

- **Act like people?**

- **Think/Behave rationally?**

- **or**
  1.7 Einsteins, 2 Maxwells, 5 Faradays and .3 Manhattan Projects?

AI in the Textbook

Study the problem of building agents that can maximize the expected utility given certain constrains.

Stuart **Russell**

Peter **Norvig**

Artificial Intelligence
A Modern Approach
Third Edition
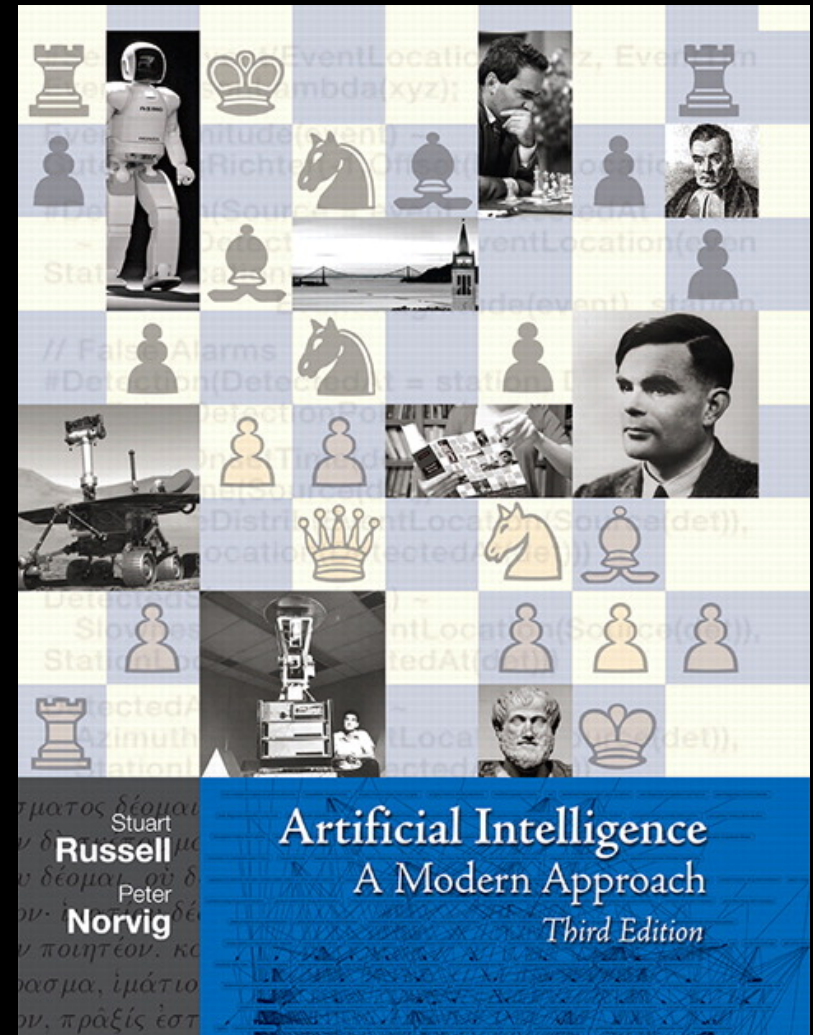
AI in the News

The New York Times

SCIENCE

Optimism as Artificial Intelligence Pioneers Reunite

Researchers who in the 1960s tackled a field that is still mystifying scientists come together again.

By John Markoff

PRINT EDITION
December 8, 2009, Page D4

TECHNOLOGY

Google's Computing Power Refines Translation Tool

The company's network pushes the limits of translation technology and has become a favored source for millions.

By Miguel Helft

PRINT EDITION Google Can Now Say No to ‘Raw Fish Shoes,’ in 52 Languages | March 9, 2010, Page A1

TECHNOLOGY

Bringing Data Mining Into t

A leading data-mining expert explains w field into the mainstream of business.

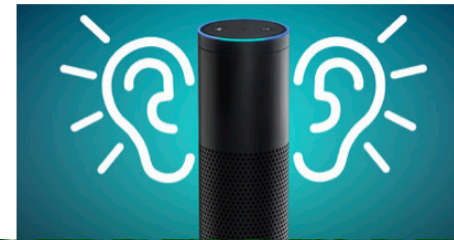By Steve Lohr

AI in the News

The New York Times

PERSONAL TECH

Amazon Echo, a.k.a. Alexa, Is a Personal Aide in Need of Schooling

The Amazon Echo is an artificially intelligent personal assistant answering to the name Alexa. It's not yet heavy on the "intelligent," but could one day

By Farhad Manjoo

PRINT EDITION A~
Schooling | Jun

TECHNOLOGY

A Facebook Project to Beam Data From Drones Is a Step Closer to Flight

The company said its unmanned aerial vehicle, intended to bring Internet access to remote areas, is ready for tests in the upper atmosphere, most likely in the United States.

By Vindu Goel and Quentin Hardy

PRINT EDITION A Facebook Project to Beam Data From Drones Is a Step Closer to Flight | July 31, 2015, Page B3

AI in the News

The New York Times

OPINION

How Do You Know a Human Wrote This?

Machines are gaining the ability to write, and they are getting terrifyingly good at it.
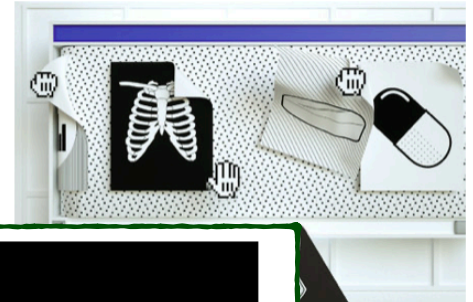
By Farhad Manjoo

PRINT EDITION
July 30, 2020, Page A22

Dear Reader

TECHNOLOGY

How A.I. Steered Doctors Toward a Possible Coronavirus Treatment

Specialists at the London start-up BenevolentAI helped identify the arthritis drug baricitinib, which is now part of a clinical trial.
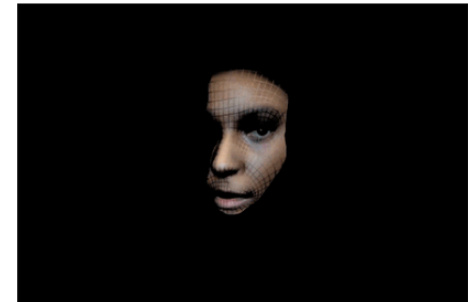
TECHNOLOGY

A Case for Banning Facial Recognition

A Google research scientist explains why she thinks the police shouldn't use facial recognition software.

By Shira Ovide

PRINT EDITION
June 10, 2020

AI in the Research Frontier

Latent Variable Modelling with Hyperbolic Normalizing Flows
Avishek Joey Bose, Ariella Smofsky, Renjie Liao, Prakash Panangaden, William L. Hamilton

Laplacian Change Point Detection for Dynamic Graphs
Shenyang Huang, Yasmeen Hitti, Guillaume Rabusseau, Reihaneh Rabbany

Algorithmic Improvements for Deep Reinforcement Learning Applied to Interactive Fiction.
Vishal Jain, William Fedus, Hugo Larochelle, Doina Precup, Marc G Bellemare

A Cross-Domain Transferable Neural Coherence Model
Peng Xu, Hamidreza Saghir, Jin Sung Kang, Teng Long, Avishek Joey Bose, Yanshuai Cao, Jackie Chi Kit Cheung

How To Evaluate Your Dialogue System: Probe Tasks as an Alternative for Token-level Evaluation Metrics
Prasanna Parthasarathi, Joelle Pineau, Sarath Chandar

Building reproducible, reusable, and robust machine learning software
Joelle Pineau

Machine Learning

Constructing and/or learning the parameters of a specified model given existing data

- Supervised

  Known: Input instances, corresponding labels

  Predict: labels using unseen instances

- Unsupervised

  Known: Input instances

  Recognize input structure, Generate data

- Reinforcement Learning

Supervised Learning

Input $\longrightarrow$ **Model** $\longrightarrow$ Model Output

Input

ID	Temperature	Cough	Sore throat	Headache
1	37	Yes	No	No
2	39	No	Yes	No
3	39.2	Yes	No	Yes

Features

Output

Flu
No
No
Yes

Training the model

$$activation_w(x) = \sum_{i=1} w_i \cdot f_i(x)$$

Linear classifier

Input $\longrightarrow$ **Model** $\longrightarrow$ Model Output

	Input				**Output**
1	37	Yes	No	No	No
2	39	No	Yes	No	No
3	39.2	Yes	No	Yes	Yes
ID	Temperature	Cough	Sore throat	Headache	Flu

Features

Loss Function

- A Quantitative measure of loss when the output label is different from the label assigned by the classifier

- Use to calculate empirical risk of the classifier with respect to the training data

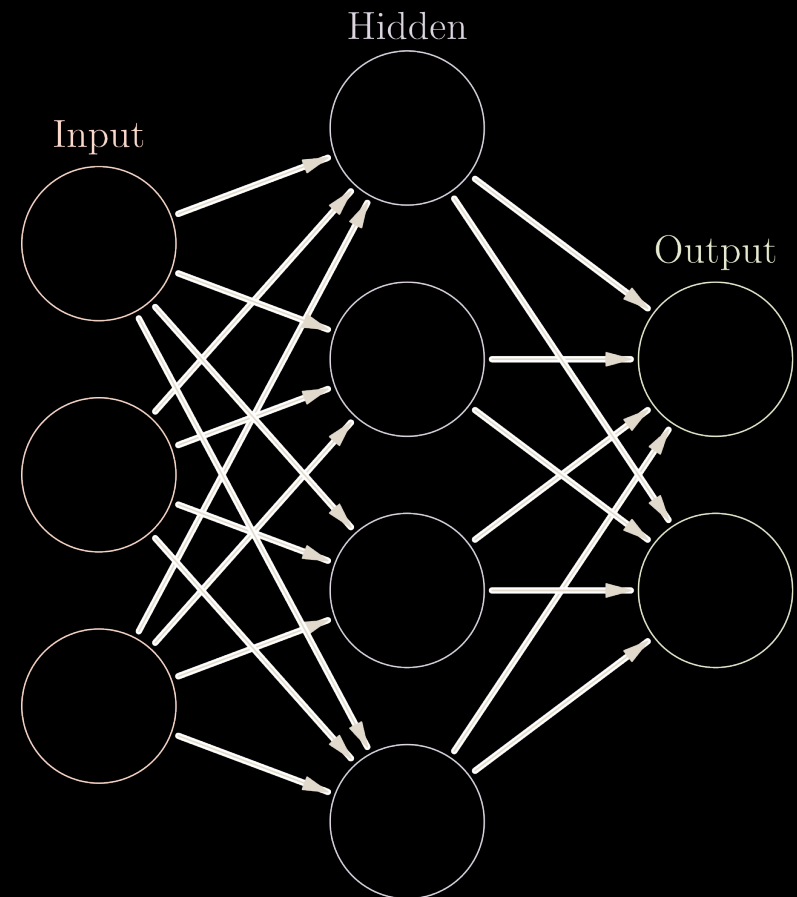|		Input				Output
1	37	Yes	No	No		No
2	39	No	Yes	No		No
3	39.2	Yes	No	Yes		Yes
ID	Temperature	Cough	Sore throat	Headache		Flu
			Features			

Training the models

$$activation_w(x) = \sum_{i=1} w_i \cdot f_i(x)$$

Linear classifier

$$z = \sum_{i=1} w_i \cdot f_i(x)$$

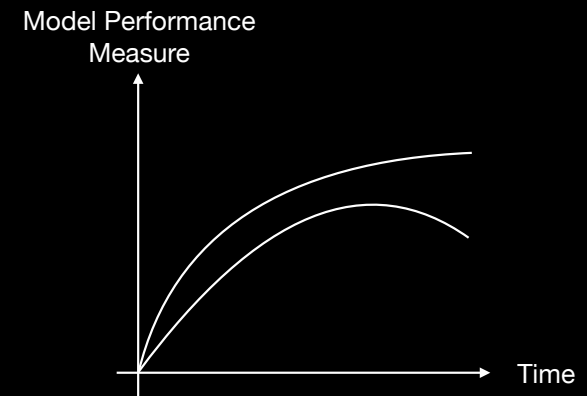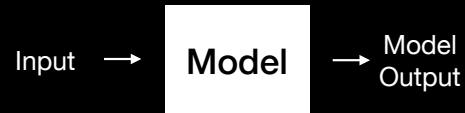$$\sigma(z) = 1/(1 + e^{-z})$$

Probabilistic decisions

http://playground.tensorflow.org/

Input   Hidden   Output

Probabilistic multilayer perceptron

How general is the classifier?

Input

ID	Temperature	Cough	Sore throat	Headache
1	37	Yes	No	No
2	39	No	Yes	No
3	39.2	Yes	No	Yes

Features

Output

Flu
No
No
Yes

Dataset Split

- Training data

- Validation data (dev, hold-out)

- Test data (consider as final)

Input → Model → Model Output

Input → Model → Model Output

Input → Model → Model Output

Model Performance Measure

Time

Data Preparation
Example: Human Sketch Recognition
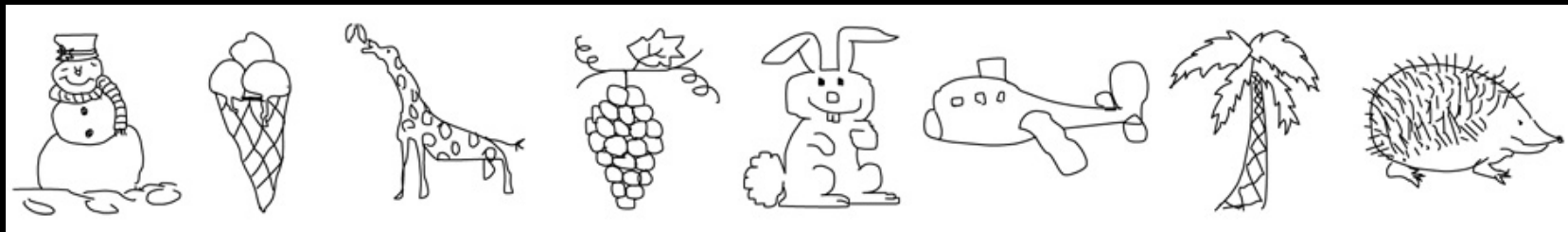
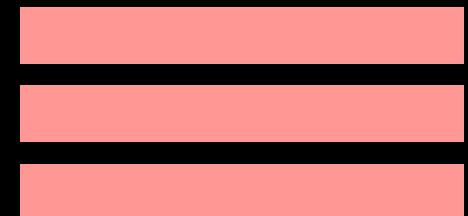| Snowman | Ice cream | Giraffe | Grape | Rabbit | Airplane | Tree | Hedgehog |

Input   **Output**

ID   *Features*

Eitz, M., Hays, J. and Alexa, M., 2012. How do humans sketch objects?. *ACM Transactions on graphics (TOG)*, *31*(4), pp.1-10.
http://cybertron.cg.tu-berlin.de/eitz/projects/classifysketch/

Data Preparation
Example: Human Sketch Recognition

Input

Features
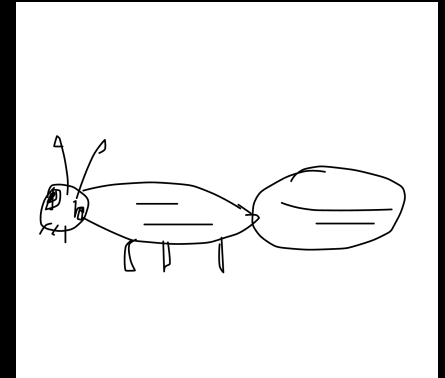
Eitz, M., Hays, J. and Alexa, M., 2012. How do humans sketch objects?. *ACM Transactions on graphics (TOG)*, *31*(4), pp.1-10.
http://cybertron.cg.tu-berlin.de/eitz/projects/classifysketch/

Data Preparation
Example: Human Sketch Recognition

Miguel Sanchez 📁 Junk - Exchange   August 21, 2020 at 12:01 PM
Business Relationship.
To: jin.guo@mcgill.ca,
Reply-To: msanchez1@163.com

Hello,
I have a proposal that would be beneficial to you. Kindly get back to me.
Miguel Sanchez.

Input

Output

ID   *Features*