

INTRODUCTION TO MACHINE INTELLIGENCE WRAP UP

FALL 2022

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WHAT IS MACHINE INTELLIGENCE?

- **Machine intelligence**, or *artificial intelligence*, involves the automation of tasks traditionally carried out by humans.
- What are some examples of machine intelligence?

 MUST READ: Windows or Chromebook? A Best Buy salesman told me it isn't even close

Apple Siri vs Amazon Alexa vs Google Assistant: Tests reveal which is smartest

Voice assistants from Amazon, Apple, and Google all improve on smartphones but Google Assistant is still top



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Coming soon to Netflix: Movie trailers crafted by AI

BY SARAH MIN

AUGUST 19, 2019 / 10:30 AM / MONEY

Letter | Published: 25 January 2017

Dermatologist cancer with de

Andre Esteva ✉, Brett Kuprel ✉, Roberto A. Novoa ✉, Justin Ko, Susan M. Swetter, Helen M. Blau & Sebastian Thrun ✉

- Sources
 - <https://www.zdnet.com/article/apple-siri-vs-amazon-alexa-vs-google-assistant-tests-reveal-which-is-smartest/>
 - <https://www.cbsnews.com/news/netflix-trailers-made-by-ai-netflix-is-investing-in-automation-to-make-trailers/>
 - <https://www.nature.com/articles/nature21056>



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Automation threatening 25% of jobs, mainly the 'I' ones:

The New York Times

*Prosecutors Don't Plan to Charge Uber
in Self-Driving Car's Fatal Accident*



WIRED

The Best Algorithms Struggle to Recognize Black Faces Equally

TOM SIMONITE BUSINESS 07.22.19 07:00 AM

THE BEST ALGORITHM RECOGNIZE BLACK FACES EQUALLY

NEWS

**AMAZON ALEXA CAPTURED AUDIO OF PEOPLE
HAVING SEX, POSSIBLE SEXUAL ASSAULTS:
REPORT**

Sources

- <https://www.cnbc.com/2019/01/25/these-workers-face-the-highest-risk-of-losing-their-jobs-to-automation.html>
- <https://www.nytimes.com/2019/03/05/technology/uber-self-driving-car-arizona.html>
- <https://www.wired.com/story/best-algorithms-struggle-recognize-black-faces-equally/>
- <https://www.newsweek.com/amazon-alexa-recordings-romania-sex-privacy-1452173>

OVERVIEW OF MACHINE INTELLIGENCE

Artificial Intelligence

Machine Learning

Deep Learning

The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.

A subset of AI that includes abstruse statistical techniques that enable machines to improve at tasks with experience. The category includes deep learning

Any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning)

WHAT ~~WILL~~ DID WE LEARN IN THIS CLASS?

- Python is a general purpose programming language commonly used for Machine Intelligence
- While the details of many methods are complex, many methods can be used directly within Python or by using Python and the application program interfaces (APIs) of cloud-based services
- We will learn the basic concepts of:
 - Python
 - Natural Language Processing
 - Data Mining Twitter
 - Digital Assistants
 - Machine Learning and Neural Networks, including those for image recognition

ADDITIONAL CLOUD-BASED SERVICES

IBM Watson® Assistant



Deliver fast, accurate information across any channel at the scale you and your customers need

IBM Watson® Discovery



Surface answers and insights from complex enterprise data with AI-powered search and text analytics

IBM Watson® Natural Language Understanding



The natural language processing (NLP) service for advanced text analytics



<https://www.ibm.com/watson/products-services>

- Python can be used with IBM and Google APIs to integrate powerful machine learning tools into software / apps

ADDITIONAL CLOUD-BASED SERVICES

AI and Machine Learning →

 Vertex AI Unified ML Platform for training, hosting, and managing ML models.	 Speech-to-Text Speech recognition and transcription supporting 125 languages.	 Vision AI Custom and pre-trained models to detect emotion, text, more.	 Text-to-Speech Speech synthesis in 220+ voices and 40+ languages.
 Cloud Translation Language detection, translation, and glossary support.	 Cloud Natural Language Sentiment analysis and classification of unstructured text.	 AutoML Custom machine learning model training and development.	 Video AI Video classification and recognition using machine learning.

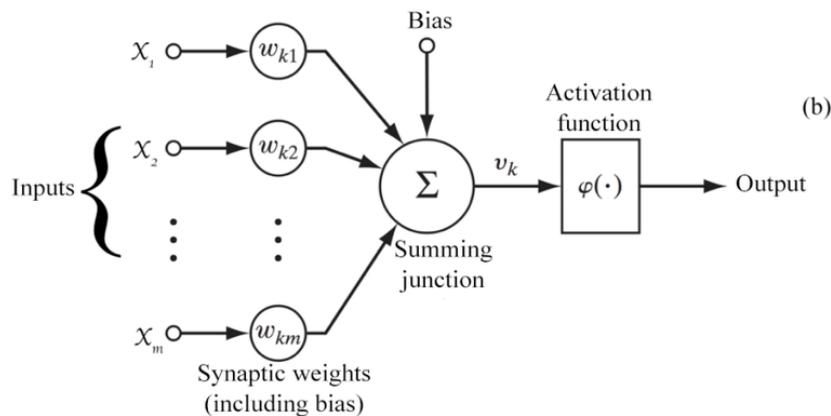


<https://cloud.google.com/vertex-ai>
<https://cloud.google.com/vision/docs/object-localizer?hl=en>

- Python can be used with IBM and Google APIs to integrate powerful machine learning tools into software / apps

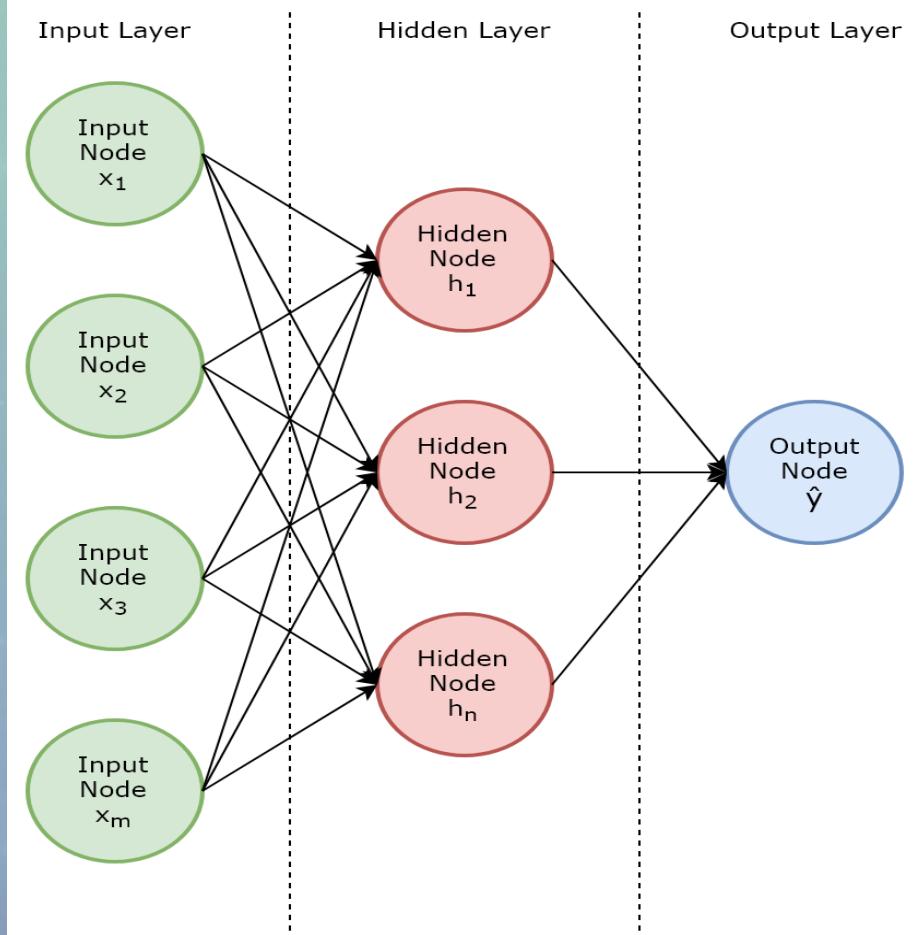
NEURAL NETWORKS (REVIEW)

Perceptron



Similarity between biological and artificial neural networks
(Arbib, 2003a; Haykin, 2009b).

Multilayer Perceptron



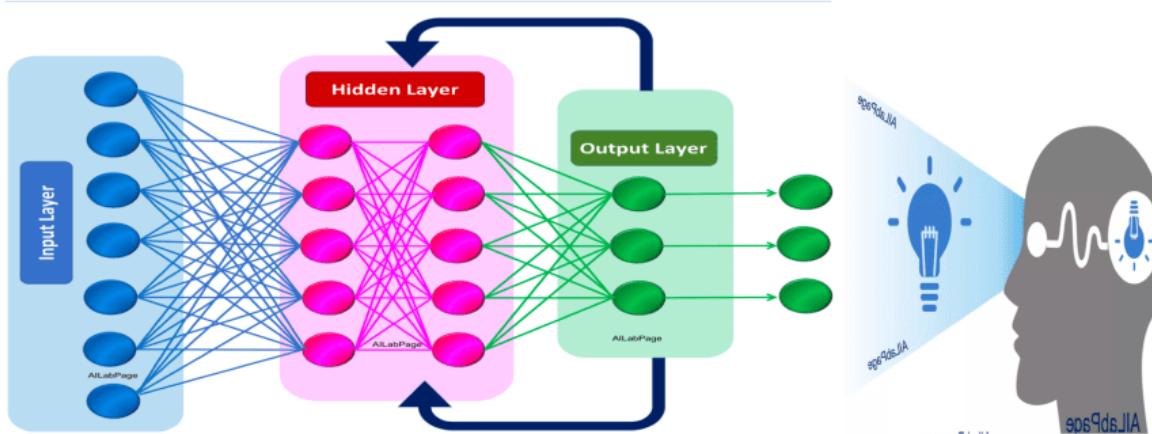
MLP Image from:

<https://www.oreilly.com/library/view/machine-learning-with/9781789346565/961ec36c-b4e9-4899-89b5-c6b762cda234.xhtml>

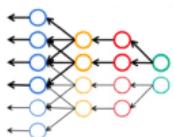
NEURAL NETWORKS (MORE)

Recurrent Neural Networks

Deep Learning – Introduction to Recurrent Neural Networks



- 01 **Useful**
Useful for tasks that are dependent on a sequence of successive states.
- 02 **Training**
The network can be trained by backpropagation.
- 03 **Memory**
The network has a form of short-term memory.
- 04 **Simplicity**
Simple recurrent network (SRN) has a similar form of short-term memory.



Backpropagation through time

BPTT – An algorithm used for updating weights in the recurrent neural network, to minimize the error of the network outputs. For every recurrent network there is a feedforward network with identical behavior.

Back Activation

A recurrent connection feeds back activation that will affect the output from the network during subsequent iterations.



<https://AILabPage.com>

<https://vinodsblog.com>

Image source: <https://vinodsblog.com/2019/01/07/deep-learning-introduction-to-recurrent-neural-networks/>

Applications:

- Text translation
- Sentiment analysis

NEURAL NETWORKS (MORE)

Applications:

- Photo generation
- Face aging
- Music synthesis
- Video prediction

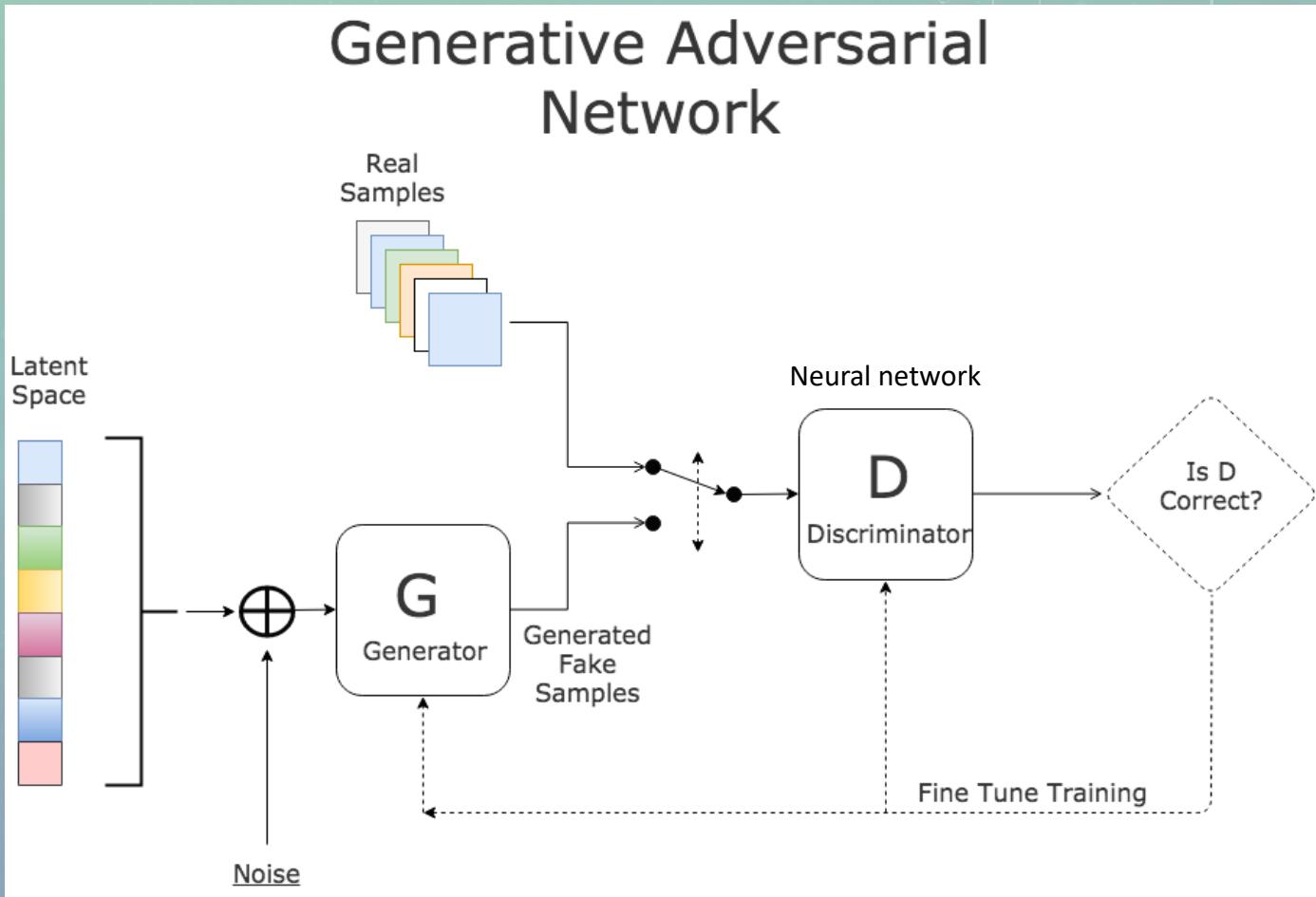
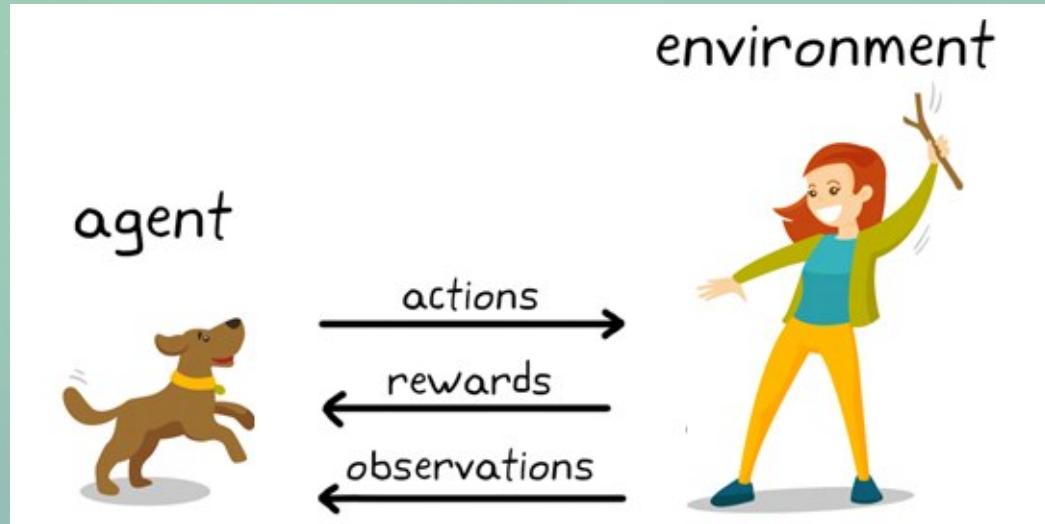


Image source:

<https://www.kdnuggets.com/2017/01/generative-adversarial-networks-hot-topic-machine-learning.html>

REINFORCEMENT LEARNING

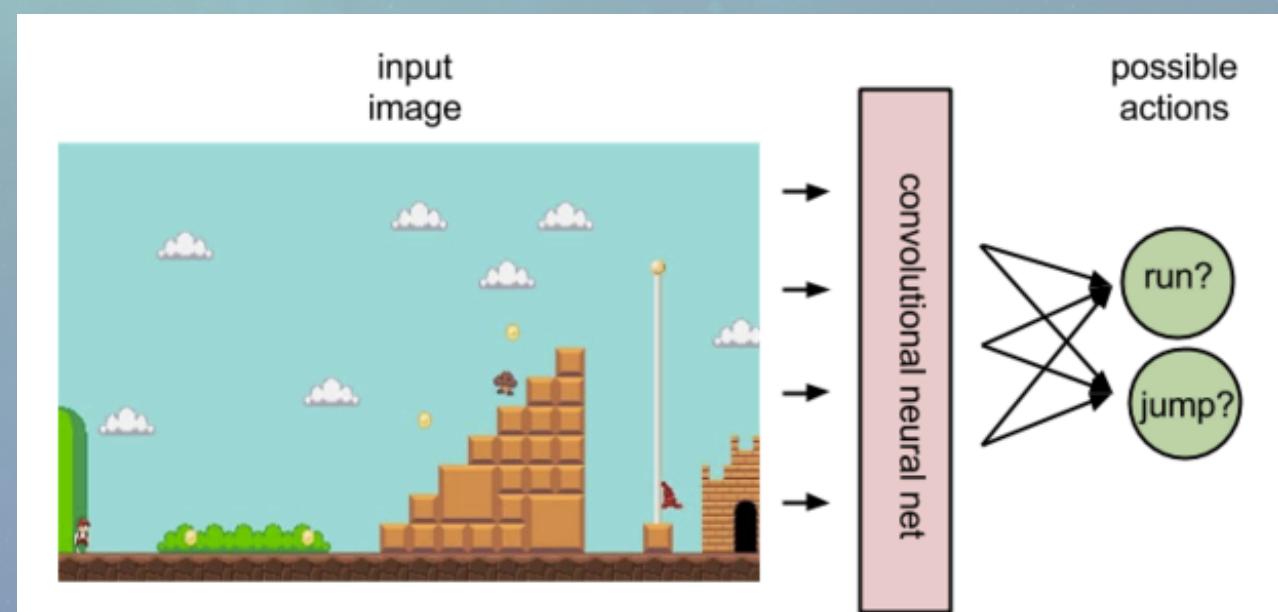


Reinforcement learning

Applications:

- Games
- Robotics / Motion control

Deep reinforcement
learning



<https://skymind.ai/wiki/deep-reinforcement-learning>