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# Meeting #02: Python Fundamentals



Michigan Hackers Machine Learning Team

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# Ice Breaker

Say your name, year, major, where you're from, and answer the following question:

*If you could invite one person over for dinner -- living, dead, or fictional -- who would you invite and why?*

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# Agenda

- 1) ML Overview
  - 2) Installing Anaconda
  - 3) Setting up terminal and git
  - 4) Running your first Python program
  - 5) Introducing your Python learning materials
  - 6) Work and ask questions
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# ML Overview

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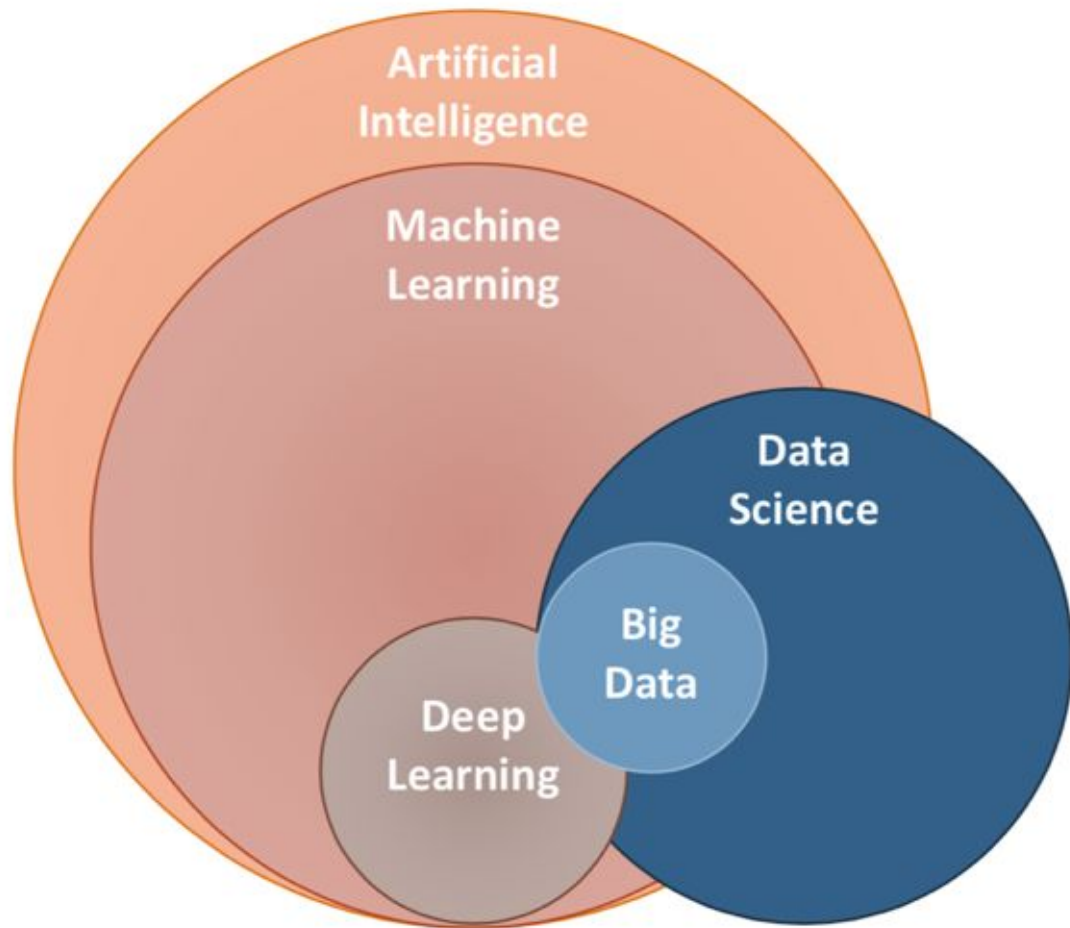
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# What is Machine Learning?

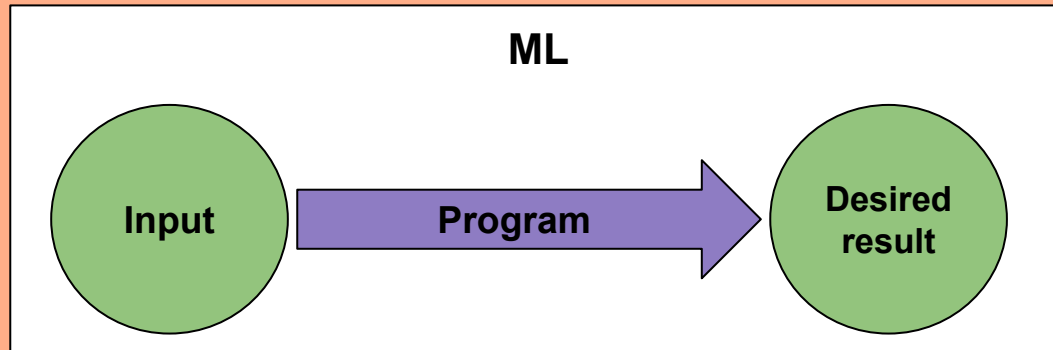
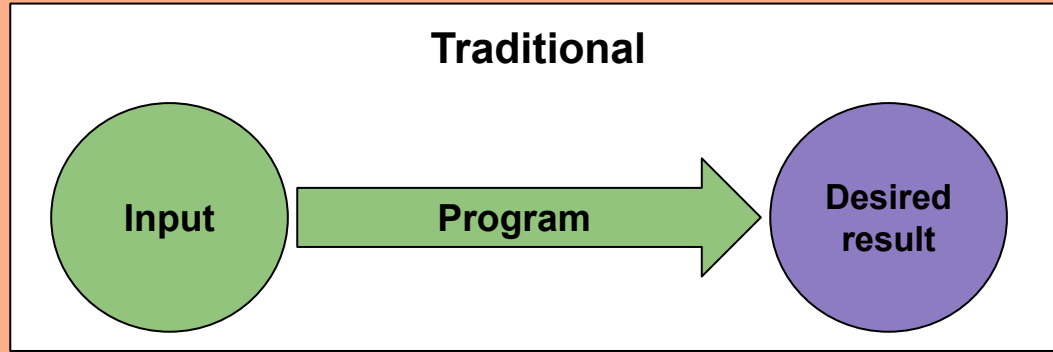
“Machine learning (ML) is the study of computer algorithms that improve automatically through experience” (Wikipedia)

How does machine learning relate to other fields?

- **AI:** the study of agents which use perceptions of their environment to inform their actions in the pursuit of some goal
  - **Data Science:** interdisciplinary field that uses scientific methods, algorithms, and systems to extract knowledge from data
  - **Optimization:** maximizing or minimizing a function by systematically choosing inputs
  - **Statistics:** drawing population inferences from a sample
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# ML vs Traditional Programming



What the  
programmer gives  
the computer



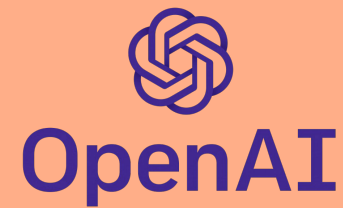
What the computer  
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programmer

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# Applications of Machine Learning

- Information Retrieval and Web Search -- Google
  - Computational Biology and Physics -- ATLAS Experiment
  - Finance and Ecommerce -- Capital One
  - Space Exploration -- NASA
  - Computer Vision and Robotics -- Amazon
  - Social Networks -- Facebook
  - Autonomous Vehicles -- Tesla
  - Natural Language Processing -- Siri
  - Quantum Computing -- IBM
  - *Many many more applications in several industries.*
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# Types of Machine Learning Algorithms

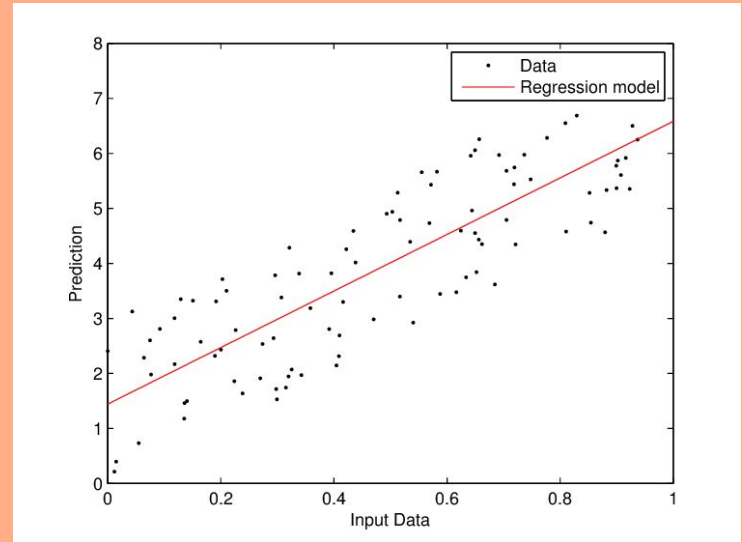
- Supervised Learning
    - training data and their labels are given
  - Unsupervised Learning
    - training data are given without their labels
  - Semi-Supervised Learning
    - training data are given; some are labeled
  - Reinforcement Learning
    - actions are adjusted based on rewards
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# Regression Problems

Regression analysis is a part of supervised learning that estimates the relationship between two or more variables.

- Given  $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$
- Learn a function  $f(x)$  to predict  $y$  given  $x$ 
  - $y$  is real-valued  $\rightarrow$  regression



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# Classification Problems

Classification is a part of supervised learning that categorizes discrete data into two or more sets.

- Given  $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$
- Learn a function  $f(x)$  to predict  $y$  given  $x$ 
  - $y$  is categorical  $\rightarrow$  classification

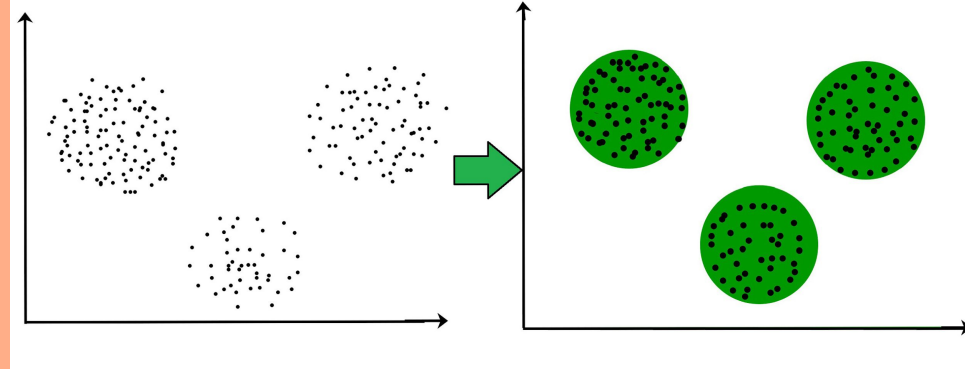


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# Clustering Problems

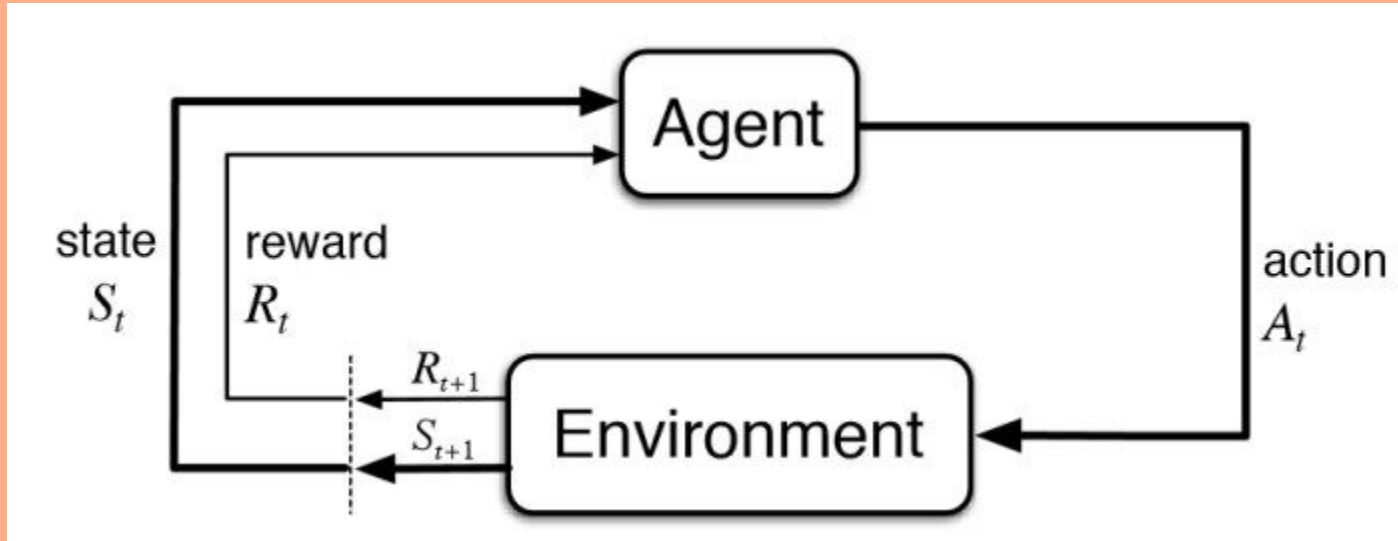
Clustering is a form of unsupervised learning that groups unlabeled data into two or more sets.

- Given  $x_1, x_2, \dots, x_n$ , we want to find some hidden structure behind the data



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# Reinforcement Learning



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# Installing Anaconda

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# Install Anaconda

- 1) Follow this link: <https://www.anaconda.com/products/individual>
  - 2) Click the “Download” button
  - 3) Select the graphical installer for your operating system
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# Define Terms

**Programming language:** a set of syntactic rules and “words”

**Python:** a programming language

**Python implementation:** a program which can interpret and run files written in the Python language

**Python distribution:** a bundle containing a Python implementation alongside numerous tools

**Anaconda:** a Python distribution

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# Define Terms

**Notebook file:** a special type of file containing cells which can run code or be used as plain text

**Jupyter Notebook:** an application which runs in your browser and can open notebook files. One of the “tools” in Anaconda.

**Anaconda Navigator:** an application with a graphical user interface (GUI) which makes it easy to use the rest of the Anaconda distribution. One of the “tools” in Anaconda

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# Anaconda Overview

We install Anaconda which contains a Python implementation, Anaconda Navigator, and Jupyter Notebook.

We use Anaconda Navigator to launch Jupyter Notebook where we write and run Python programs in notebook files.

The Python implementation interprets our programs behind the scenes when we click “Run” in a notebook file.

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# Setting up Terminal and Git

Follow this [tutorial presentation](#) link

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# Running Python

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## Hello World in Python

1. In Anaconda, launch Jupyter Notebook which will open up in your default browser.
2. Navigate to your MHML folder, not the machine-learning folder which uses git, on Jupyter.
3. On the top right corner, click the New: tab and select Python 3 Notebook. This will open a new script in a new tab.
4. Rename the Untitled notebook, HelloWorld.
5. In the first line, type in the code  
`print("Hello World!")`
6. Click Run and “Hello World!” should print below the code.
7. Save the notebook.

Congratulations! You just wrote your first Python Script!

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# Work and Ask Questions

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# Work and Ask Questions

- 1) Resolve issues with your computer setup
  - 2) Complete the updated [Onboarding Document](#)
  - 3) Begin learning Python
    - a) **Beginner:** Courses 1-3 of the Python 3 Programming Specialization on Coursera. Use the practice feature of the interactive textbook every day
    - b) **Intermediate:** Review chapters 2 and 3 of Data Science from Scratch. Practice writing code in Jupyter as you go
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# Thank You!

Michigan Hackers Machine Learning Team

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**MH**  
**ML**

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