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Overview of Machine Learning with Definitions

What is Machine Learning?

Machine Learning is the process of learning more about given information for the sake of categorization or prediction, however active learning scenarios may be more about optimizing actions.

Summarize the importance of data, pattern recognition, and accuracy in ML.

Data is what we give to an algorithm so that it may understand that to produce more data, trends, and the like. In the process of understanding data, it becomes able to recognize patterns. If an informative algorithm can understand the patterns in data, it will have better accuracy in which it either categorizes given data or predicts new data given certain changing conditions. If there is no data, we cannot train a machine learning model. If it can't recognize patterns, it cannot do what it was built to. Similarly, if it is not sufficiently accurate, there is little applicability of machine learning at all, as what it produces may not be trustworthy enough to use. Starting with good data will ensure that it will have the best pattern recognition, and therefore the most accuracy. All these items must rely on the other.

Describe the relationship between AI and ML.

Machine Learning is a category of Artificial Intelligence that focuses on algorithms that cannot be necessarily created well by human hands, and instead focus on algorithms that aid in recognizing specific patterns. Both are used to come to conclusions, however, AI is more often focused on branching, searching, and trees in its use to come to a conclusion, while ML seeks to understand data based on training to come to conclusions.

List at least 2 examples of modern machine learning applications, and explain why these application could not be built with traditional programming.

Handwriting identification - Since this is about learning shapes in an image and their variations, there is not a straightforward algorithm that can properly be coded to understand them. Instead, a machine learning model can be built to process this information in a more of a human manner. By understanding the commonalities between things of a certain label, new items without a label can still be recognized and understood.

Climate Change - While humans can research and understand trends of climate change and the like, a machine learning model can be more reactive, more efficient, and provide predictions of what would be next, accounting for more factors and in a less linear fashion than easily done with traditional programming. A machine learning model for climate change, for example, might be able to predict future wildfire risk based on environmental factors such as greenhouse gas emissions in an area, temperature, and other traits of the environment when previous wildfires took place.

In a paragraph, define the terms observation, feature, quantitative data, and qualitative data and discuss their importance in machine learning.

An observation is an instance of data, such as the entry on an employee including age, job title, years with the company, hours worked, number of warnings, and more. A feature would be the aspect of a set of data instances/observations, such as the age category. Age would be an example of quantitative data, or rather, of a number or value. Job title would be an example of qualitative data, or data of a category or class. A feature can be either quantitative or qualitative, and an observation may contain both categories of data. Without observations full of all the other keywords, there is nothing to be trained on, and no kind of feature can be predicted (which is the goal of both regression and classification algorithms.)

Write a paragraph describing your personal interest in ML and whether/how you would like to learn more about ML for personal projects and/or professional application.

I'm interested in Machine Learning for creative personal purposes, but also professional applications in future work. I am most often entertained by how machine learning can produce content that is only adjacent to making sense, and would like to utilize and prepare things for creative writing and video game purposes. Even if those categories of topics aren't covered much or at all in class, I am looking forward to building a sturdy foundation, professional development, gaining the ability to understand more about open source models, and even being able to more effectively troubleshoot them when needed.