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Overview of ML

Machine Learning (ML): A branch of computer science that utilizes the availability of data to design methods that learn from the data to make processes such as data analysis and pattern recognition more efficient. ML allows for intelligent computer programs that make decisions based on previous data and must rely less on human output.

With the availability of large amounts of data, we can learn from the data. This idea is the basis for ML. Data is the most important part of ML because that is what we analyze to recognize patterns in the data. The more data we have, the more accurate the prediction of the pattern can be. It is important to look for patterns in the data because it can help us/the computer predict. The predictions are dependent on what the data is related to and the patterns that the models may find. Day by day, there is more data; this allows for more patterns to be found or make the patterns we already know of more accurate.

Machine learning is an application of the idea of Artificial Intelligence (AI). AI is the process of using mathematics/models of data to help a computer learn more about a set of data. AI also includes actively writing and rewriting code to make pattern recognition easier. The goal of incorporating ML in any process is to minimize human input and let the computer learn/recognize patterns in the data through experience. Improvement in an ML model is simply done by feeding more data into it so that the computer can learn and continue to become more accurate. AI requires human input because the humans interpret the results of their programs and edit to handle tasks.

Modern ML Applications:

- Image Recognition
    - There are ML models that can classify images. For example, there are ML models for animals, and through image detection, animals can be identified using the ML model. This would be impossible/inaccurate to do without ML because it would require the human to do the identification and have the human tell the computer what kind of animal it is. Through training and experience, an ML model does not require human input for it to recognize if an animal is a cat, dog, or giraffe. It can be trained to identify features/attributes of animals, so humans don't have to.
- Product Suggestions on Internet
    - By analyzing search histories and what the user seems to be looking for, there are ML models that can suggest results that the user may find relevant. Large companies are infamous for allowing this. When we go to Facebook/Instagram/Twitter, the ads are tailored to each user based on the users' interests. In this way, we can differentiate ourselves from certain groups but also target ourselves to groups we share interests with.

Data being the reason ML is possible, it is important that we know how to describe data. For this purpose, it breaks down into two categories: quantitative and qualitative. Quantitative data is any data that is represented by numbers, whereas qualitative is data that is represented by anything else. Quantitative data's significance is measured by numbers and how the

numbers measure to the range of the data; qualitative data is very similar to classification or types that can be represented by characters or symbols. In an dataset, we have numerous observations of such types of data. Each occurrence that fits to the parameters/attributes of the dataset is an observation of the dataset. If there was a dataset that recorded different cell phones and its hardware specifications, each cell phone would be an observation of the dataset and the characteristics of the phone such as display size, RAM, camera pixels, etc. would be the attributes. Attributes describe observations.

ML has been a growing interest of mine recently. I am a data science major, and I have been taking more degree-relevant courses now which heavily focus on data manipulation and what a user can read from the data. ML is a principle that is going to be integral in the future and I am really excited I am in its generation. In my recent internship, I worked a lot of pose detection using prebuilt ML models and they greatly interest me on how certain tasks become so much easier. I would love to learn more about making my own ML models and I look forward to being able to apply this knowledge to make ML models of my own in personal and professional settings.