Artificial Intelligence and Applied Methods

Seminar 5: Machine Learning

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Summary:

What is Machine Learning?

Machine Learning (ML) is the area of study that gives computers the ability to learn and adapt without being explicitly programmed to do so. In short, ML gives computers a more human like characteristic, the ability to learn [1]. ML has become extremely popular in recent years. There are many reasons for this but the main reason for this is that computers are becoming more and more powerful allowing ML and artificial intelligence to become stronger and more intelligent. To achieve self-learning computers, we require a huge amount of data. This has led to an increase in data collecting and data analysis. Furthermore, this data must be given to the agent in a form that they can use, usually an array of numbers. This means that data collection is a very important part of ML.

Machine Learning has its core revolving around spotting patterns and making predictions based on these trends [2]. ML takes in a huge amount of data and runs this data through algorithms that analyze the data and tries to find a linear regression as this will make it possible make accurate predictions and classifications based on new data coming in. The more data that is input into the system the better it will be as this data mimics experience and learning.

Questions:

1. What is the difference between AI and ML?

Artificial intelligence is a more broad area of computers that tries to create intelligent systems that can think and reason by themselves, whereas, machine learning is an application, or subset, of AI that allows machines to begin learning and reasoning for themselves [4].

1. What are some common areas that use ML?

* Economics:
  + Sales and operations planning.
  + Product analysis.
  + Customer modelling and audience segmentation.
  + Market research/content research [5].
* Healthcare:
  + Disease identification.
  + Diagnosis and Medical Imaging.
  + Drug Discovery.
  + Robotic Surgical Tools [6].

1. What is overfitting?

Overfitting is a situation that occurs when a model learns the training set too well, taking up random fluctuations in the training data as concepts. These impact the model’s ability to generalize and do not apply to new data.

1. What are the different types of ML?

**Supervised Learning:** In supervised machine learning, a model makes predictions or decisions based on past or labeled data. Labeled data refers to sets of data that are given tags or labels, and thus made more meaningful.

**Unsupervised Learning:** In unsupervised learning, we do not have labeled data. A model can identify patterns, anomalies, and relationships in the input data.

**Reinforcement Learning:** Using reinforcement learning, the model can learn based on the rewards it received for its previous action. Consider an environment where an agent is working. The agent is given a target to achieve. Every time the agent takes some action toward the target, it is given positive feedback. And, if the action taken is going away from the goal, the agent is given negative feedback [3].

1. What is the difference between supervised and unsupervised learning?

Supervised learning involves giving a system a training data set that has been labelled i.e. Some data has already been analyzed as the correct identification. The system then learns, by excessive training, how to classify the correct answer when it is given unlabeled data. Unsupervised learning involves giving allowing the agent to work through the unlabeled data itself without supervision [7].

References:

[1] <https://www.geeksforgeeks.org/machine-learning/>

[2] <https://www.geeksforgeeks.org/machine-learning-and-data-science/>

[3] <https://www.simplilearn.com/tutorials/machine-learning-tutorial/machine-learning-interview-questions>

[4] <https://www.javatpoint.com/difference-between-artificial-intelligence-and-machine-learning#:~:text=AI%20is%20a%20bigger%20concept,data%20without%20being%20programmed%20explicitly>.

[5] <https://theappsolutions.com/blog/development/machine-learning-applications-guide/#contents_0>

[6] <https://medium.com/@karl.utermohlen/4-applications-of-machine-learning-ml-in-the-healthcare-industry-51adb91c79f8#:~:text=ML%20is%20capable%20of%20more,helping%20patients%20with%20complicated%20conditions>.

[7] <https://www.guru99.com/supervised-vs-unsupervised-learning.html>