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Machine Learning (ML)

Machine Learning (ML) in computer science is basically what it sounds like, machines *learn* from data. With large amounts of data, machines can 'learn' to make inferences and even propose solutions that can lead to results not otherwise considered by people (Deitel, & Deitel, 2020).

Machines that can learn sounds like it is a form of artificial intelligence (AI). "AI systems will generally demonstrate at least some of the following traits: planning, learning, reasoning, problem solving, knowledge representation, perception, motion, and manipulation and, to a lesser extent, social intelligence and creativity (Heath, 2018, p.1.)". Therefore, machine language is a subset of artificial intelligence and a contributor to the larger goal of artificial intelligence.

Machine learning works by using large amounts of data. For example, teaching a machine to determine if a picture of a dog or cat *is* a dog or cat necessitates providing many, many pictures of different dogs and cats, so that eventually when a picture of one of these two animals is fed into the machine, the machine can say with a high level of probability whether the animal in question is a dog or a cat (Deitel, & Deitel, 2020). One example of the usefulness of this type of machine language is the recommendation systems that booksellers and clothing purveyors offer on their websites. With a person's purchase history, the machine provides suggestions on books that may appeal to the purchaser based on their history of past book purchases (Deitel, & Deitel, 2020).

There are three types of machine learning algorithms: supervised learning, unsupervised learning, and reinforcement learning. Supervised learning is task-driven via classification and regression, Unsupervised learning is data-driven via clustering, and Reinforcement learning is when an algorithm learns to react to its environment (Shaikh, 2017).

Supervised learning is "teach me" learning. It requires that the data used to train the algorithm is already labeled with correct answers. For example, to teach the algorithm the difference between an orange and an apple, many, many pictures and specific details of oranges and apples are compiled in order to 'train' the algorithm.

Supervised learning is split into two categories, classification and regression. "Classification algorithms predict the discrete classes(categories) to which samples belong.(Deitel, & Deitel, 2020. p. 597)." An example of a binary, for two, classification is the 'spam' or 'not spam' designations in an email application. An example of multi-classification uses more than two classes, such as a classification for movies could classify them as 'action', 'romance', 'science fiction', or 'mystery' (Deitel, & Deitel, 2020).

Regression analysis of supervised learning is a form of predictive modelling technique used for forecasting, predicting continuous output, time series modelling and finding the causal effect relationship between the variables. An example of regression analysis is the determining the relationship between impetuous driving and the number of road accidents by a driver (Ray, 2015).

Unsupervised learning is “I’ll teach myself” learning. Unsupervised learning utilizes algorithms to identify patterns in data, attempting to determine similarities that split that data into categories. An example of unsupervised learning is how Airbnb clusters houses and condominiums available to rent by neighborhood. Another example is Google News grouping together stories on congruous topics each day. The algorithms used by unsupervised learning simply look for data that can be grouped by its similarities, or for inconsistencies that stand out (Heath, 2018).

Reinforcement learning is a form of machine learning in which algorithms learn from their environment. This is similar to how a baby learns to walk, or a video gamer learns a new game (Deitel, & Deitel, 2020). In learning from their environment, the algorithm needs an agent that tries a task and there is a feedback loop present that rewards the agent for the correct move and punishes (or withholds a reward) for the wrong move. Examples of reinforcement learning include driverless cars, self-navigating vacuum cleaners, and scheduling of elevators (Shaikh, 2017).

References

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