Machine Learning

Introduction

Machine Learning

- Grew out of work in AI
- New capability for computers

Examples:

- Database mining

  Large datasets from growth of automation/web.

  E.g., Web click data, medical records, biology, engineering

- Applications can't program by hand.

  E.g., Autonomous helicopter, handwriting recognition, most of Natural Language Processing (NLP), Computer Vision.

- Self-customizing programs

  E.g., Amazon, Netflix product recommendations

Machine Learning Definition

- Machine Learning is the science of getting computers to learn and act like humans do, and improve their learning over time in autonomous fashion, by feeding them data and information in the form of observations and real-world interactions.
- ML is the science of getting computers to act without being explicitly programmed.
- Machine Learning at its most basic is the practice of using algorithms to parse data, learn from it, and then make a determination or prediction about something in the world.

Machine Learning definition

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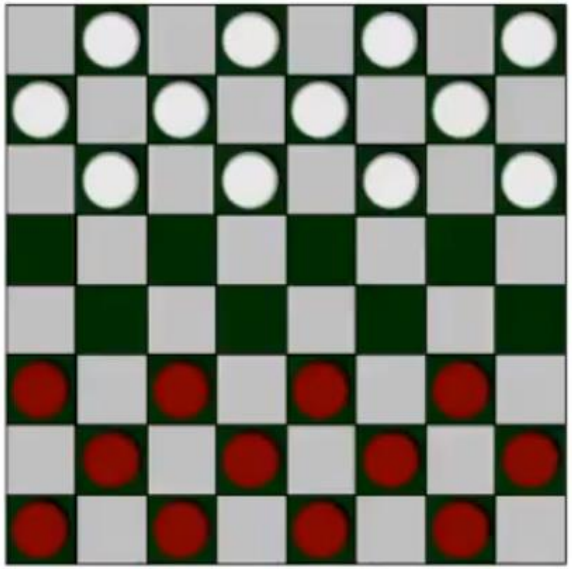

Machine Learning definition

- Arthur Samuel (1959). Machine Learning: Field of study that gives computers the ability to learn without being explicitly programmed.
- Tom Mitchell (1998) Well-posed Learning Problem: A computer program is said to *learn* from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E.

"A computer program is said to *learn* from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E."

Suppose your email program watches which emails you do or do not mark as spam, and based on that learns how to better filter spam. What is the task T in this setting?

- ◯ Classifying emails as spam or not spam.
- ◯ Watching you label emails as spam or not spam.
- ◯ The number (or fraction) of emails correctly classified as spam/not spam.
- ◯ None of the above—this is not a machine learning problem.

Where We Use Machine Learning?

- **Recommendations**
  - Intelligent machine learning algorithms analyze your activity and compare it to the millions of other users to determine what you might like to buy or binge watch next.
  - More than 80 percent of TV shows on **Netflix** are found through its recommendation engine. Due to its impact on customer retention, Netflix uses Machine learning to recommend new series.
- **Spam Detection**
- **Image Processing**
- **Natural Language Processing**
- **Text Analysis**
- **Voice recognition**
- **Cancer prediction**

Real-World Examples of ML and AI

1. Siri & Cortana

Voice recognition systems such as Siri and Cortana use machine learning and deep neural networks to imitate human interaction. As they progress, these apps will learn to ‘understand’ the nuances and semantics of our language.

2. Facebook

The social network’s algorithms recognise familiar faces from your contact list, using some impressive technology.

3. Spotify

Much like Netflix, Spotify uses machine learning to figure out your likes and dislikes and provides you with a list of related tracks.

Machine Learning Algorithms

- **With respect to given correct answers**
- Supervised Learning
- Unsupervised Learning

- **With respect to parametrization**
- Parametric learning
- Non-parametric learning

Credits

As I wrote in the syllabus, I am following the lectures of Prof. Andrew NG from Stanford University in Coursera and capture the slides from his online lecture. Please visit the following page for that lecture:

https://www.coursera.org/learn/machine-learning