

Introduction To Machine Learning

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What is Machine Learning?

- ▶ A branch of computer science with algorithms are created that can learn from data, find patterns in the data, and make predictions about future values of the data set.
- ▶ The models are able to **generalize** a data set and those generalizations and patterns to create new data.
- ▶ Machine learning algorithms are *trained* by adjusting their parameters depending on the data they are given.

How Does Machine Learning Relate to Artificial Intelligence?

- ▶ Machine learning is a subset of Artificial Intelligence
 - ▶ Machine learning is using artificial intelligence to do data science

Types of Machine Learning

- ▶ **Supervised Learning**
 - ▶ Algorithms is trained to match an input to an output
 - ▶ Algorithm is given both x and y data sets
- ▶ **Unsupervised Learning**
 - ▶ Algorithm finds patterns from only the x (input) data
- ▶ **Reinforcement Learning**
 - ▶ Algorithm learns from being penalized or rewarded for doing specific tasks
 - ▶ Used mostly in robotics

Types of Machine Learning Problems

- ▶ **Regression:** Given a y data set which could have any number of possible values, create a function which can map an input to the correct output value
 - ▶ Example: Linear Regression
- ▶ **Classification:** Given a y data set which has a finite number of possible values, create an algorithm which can make an input to the correct category
 - ▶ Example: k-Nearest Neighbors
- ▶ **Clustering:** Given the inputs of a data set (the x data) determine how many categories the data could fall into
- ▶ **Dimensionality Reduction:** Given the inputs to a data set (the x data) determine:
 - ▶ Which inputs are not needed and can be removed OR
 - ▶ Combine multiple inputs into a single value

The Machine Learning Workflow

- ▶ **Data Preprocessing**
- ▶ **Train-Test Split**
- ▶ **Train the Machine Learning Algorithm**
- ▶ **Test the Machine Learning Algorithm**
- ▶ **Evaluate the Performance**
- ▶ **Improve the Algorithm**