

Machine Learning Study Guide (AIMA 19.1-19.6)

Artificial Intelligence

1 Machine Learning

According to Tom Mitchell, machine learning is the study of algorithms that

- improve their performance P
- at some task T
- with experience E .

A well-defined learning task is given by $\langle P, T, E \rangle$.

1. Formulate the following problems according to Tom Mitchell's machine learning problem specification (see [Machine Learning Slides](#)) and the specification our textbook. For each of the following problems specify:
 - The task T ,
 - The performance measure P ,
 - The experience E ,
 - The target function $f : \mathcal{X} \rightarrow \mathcal{Y}$, that is,
 - the input space \mathcal{X} , and
 - the output space \mathcal{Y} .

Remember that a function maps a domain to a co-domain, and these domains are sets.

- (a) Medical diagnosis: A patient walks in with a medical history and some symptoms, and you want to identify the problem.

2. Approximating a function $\mathbf{X} \mapsto \mathbf{y}$ given a set of instances \mathbf{X} and associated labels \mathbf{y} is an example of ...
3. Predicting the price of a house given its characteristics, e.g., number of rooms, square footage, etc., is an example of ...
4. Predicting the object contained in an image from a finite list of options is an example of ...

2 Supervised Statistical Machine Learning

1. In a supervised learning problem, you are given a labeled data set with which to develop and train a classifier. What is the most important step in the process before choosing a model/hypothesis class and training the classifier?
2. What does *training* mean in the context of statistical machine learning?
3. What is a *hyperparameter*?
4. Distinguish between *tabular data* and *unstructured data*.