

# CSC320: Lecture Notes

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## Week 1

### Types of Machine Learning

- **Supervised Learning:** Have labeled examples of the correct output/behaviour
- **Unsupervised Learning:** no labeled examples – instead, looking for “interesting” patterns in the data
- **Reinforcement Learning:** (not covered) learning system (agent) interacts with the world and learns to maximize a scalar reward signal

### Implementing Machine Learning Models and Systems

- Step 1: Understand the problem (is it prediction, learning a good representation).
- Step 2: Formulate the problem mathematically (create notation for your inputs and outcomes and model).
- Step 3: Formulate an objective function that represents success for your model.
- Step 4: Find a strategy to solve the optimization problem on pencil and paper.
- Step 5: Translate the algorithm into code.
- Step 6: Analyze, iterate, improve design choices in your model and algorithm

### Nearest Neighbor Methods

#### Supervised Learning

We are given a training set consisting of inputs and corresponding labels.

**Step 1:** Task is to build a system that can use the provided training set in order to make predictions on new data.

Task	Inputs	Labels
object recognition	image	object category
image captioning	image	caption
document classification	text document	category
speech-to-text	audio waveform	text

Table 1: Examples of supervised learning tasks with their inputs and corresponding labels

#### Step 2:

- Create mathematical notation for the problem - Understand how to represent data.
- Represent inputs as input vectors in  $\mathbb{R}^d$ .