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# Assignment 1

1. What type of Machine Learning Algorithms would be used to allow your bipedal bot to walk in various terrains?
    - The best Machine Learning algorithm to allow a robot to walk in unknown terrain is **Reinforced Learning**, where the robot can learn from response of the terrain to optimize itself
    - **Reinforcement learning** is the kind exhibited by humans—babies learn to walk by trying new movements. They do not get the whole process at once but remember steps that lead to walking.
  2. What is the difference between online learning and out-of-the-core learning?
    - **Online machine learning is a method of machine learning** in which data becomes available in a sequential order and is used to update the best predictor for future data at each step, as opposed to batch learning techniques which generate the best predictor by learning on the entire training data set at once.
    - It is used in the area where it is computationally infeasible to train over the entire dataset.
    - **Out-of-core learning refers to a set of algorithms** working with data that cannot fit into the memory of a single computer, but that can easily fit into some data storage such as a local hard disk or web repository.
    - It can **train over the entire dataset**.
  3. What is the importance of a train-dev set in machine learning?
    - A validation data set is a **data-set** of examples used to **tune the hyper parameters of a classifier**. It is sometimes also called the development set or the "dev set". An example of a **hyper parameter for artificial neural networks** includes the number of hidden units in each layer.
    - It is used to **choose the best model** of a training algorithm.
    - It also helps in **avoiding or minimizing over-fitting** and simultaneously **controls the learning rate**.
  4. If suppose your model is poorly generalizing the unseen data, what possibilities are there, and how you will solve those situations?

Models that has been **trained too well on training data** will be **unable to generalize**. This creates a **generalization error**, we can reduce this error by
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using a **larger model** that may be required to use regularization during training that keeps the weights of the model small.

- These techniques reduce over fitting.
- Lead to **faster optimization** of the model.
- Better **overall performance**.

5. What is data leakage and what can go wrong if you tune your hyperparameters on the test set?

**Data Leakage** is when the model somehow knows the patterns in the test data during its training phase. It mostly happen when there is no particular train and test data splitting.

If we use test data for hyper parameter tuning we actually give the model a chance to see the test data and to develop a bias towards this test data.

