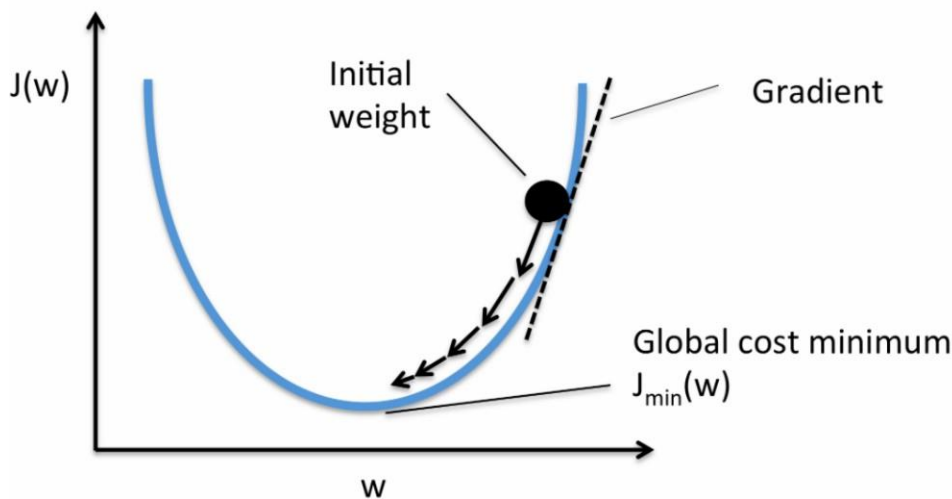


## PROBLEM 4 Learning in AI

In this project task, you will explore and compare the performance of two fundamental learning algorithms, namely the Perceptron Learning Rule and the Gradient Descent Delta Rule, in the context of analyzing the classification of iris flowers species. The Perceptron Learning Rule and the Gradient Descent Delta Rule are both essential algorithms in the realm of machine learning, each with its own strengths and limitations. The project aims to understand how these algorithms behave when applied to a real-world dataset and to explore ways to improve their performance.



### Objective:

- To analyze and compare the performance of the Perceptron Learning Rule and the Gradient Descent Delta Rule in classifying iris flowers species.
- To experiment with different activation functions and learning rates to optimize the accuracy of the models.

### Tasks:

1. Implement the Perceptron Learning Rule and the Gradient Descent Delta Rule from scratch.
2. Utilize the provided dataset of iris flowers species for training and testing.
3. Experiment with different activation functions to observe their impact on model accuracy.
4. Divide the dataset into training and testing sets **using a 80/20 ratio** and evaluate the models' accuracy on both sets.
5. Adjust the learning rates of the models to minimize loss and achieve comparable accuracies.
6. Document the process, results, and observations for each algorithm.

**Questions:**

1. What are the key differences between the Perceptron Learning Rule and the Gradient Descent Delta Rule?
2. How does the choice of activation function influence the performance of the models?
3. What strategies can be employed to adjust the learning rate for optimal model training?
4. Discuss the implications of using different ratios for splitting the dataset into training and testing sets.
5. What challenges did you encounter while implementing the algorithms from scratch, and how did you overcome them?
6. Reflect on the strengths and limitations of each algorithm based on your experimentation.

Dataset Link:

<https://archive.ics.uci.edu/dataset/53/iris>