**Linear Regression**

After learning about the important libraries, now you are ready to start your journey of machine learning.

**1. Supervised vs. Unsupervised Machine Learning**

Each type of machine learning model serves different purposes and is chosen based on the nature of the problem and the type of data available. By understanding these basic categories, we can better select and apply the appropriate ML techniques to real-world problems.

Recommended to watch at 2X

* [What is Machine Learning?](https://youtu.be/XtlwSmJfUs4?si=5n6aB220kPeJYlQN)
* [Supervised Learning 1](https://youtu.be/sca5rQ9x1cA?si=ex3vuimTkJIAroZe)
* [Supervised Learning 2](https://youtu.be/hh6gE0LxfO8?si=s3Ni3qN_CUY87mmI)
* [Unsupervised Learning 1](https://youtu.be/gG_wI_uGfIE?si=2QOIlKa1OM_phnEV)
* [Unsupervised Learning 2](https://youtu.be/_0bhZBqtCCs?si=2wK_W4aubLNXZh0p)

**2. Regression Model**

In this module you will learn about linear regression. It will seem quite simple but advised to listen carefully and practise the things you are taught. Give time to understand the optional labs mentioned in the videos.

* [Linear Regression 1](https://youtu.be/dLc-lfEEYss?si=Ptr0SgDIrZPLwYW8)
* [Linear Regression 2](https://youtu.be/KWULpBYzIYk?si=6wAylXMUiuN-iPYp)
* [Optional Lab : Model Representation](https://github.com/greyhatguy007/Machine-Learning-Specialization-Coursera/blob/main/C1%20-%20Supervised%20Machine%20Learning%20-%20Regression%20and%20Classification/week1/Optional%20Labs/C1_W1_Lab03_Model_Representation_Soln.ipynb)
* [Cost Function 1](https://youtu.be/CFN5zHzEuGY?si=pvA5xLMfW_oVsApL)
* [Cost Function 2](https://youtu.be/peNRqkfukYY?si=xolqXp-fwkLDqY9n)
* [Cost Function 3](https://youtu.be/bFNz2u0hl9E?si=76e_BT57XE_hvA74)
* [Cost Function 4](https://youtu.be/L5INhX5cbWU?si=F_ivtQmiqeNU3bnv)
* [Optional Lab : Cost Function](https://github.com/greyhatguy007/Machine-Learning-Specialization-Coursera/blob/main/C1%20-%20Supervised%20Machine%20Learning%20-%20Regression%20and%20Classification/week1/Optional%20Labs/C1_W1_Lab04_Cost_function_Soln.ipynb)

**3. Training with Gradient Descent**

In this module, we are going to provide an overview of gradient descent, a fundamental optimization algorithm widely used in machine learning to minimize functions and improve model performance.

* [Gradient Descent 1](https://youtu.be/WtlvKq_zxPI?si=EPKHXj529fwJd-GU)
* [Gradient Descent 2](https://youtu.be/w_2vCijLiiM?si=L_HR-2NN1GpnnBrB)
* [Gradient Descent 3](https://youtu.be/PKm61nrqpCA?si=2-lZfYDIb9WOI0EP)
* [Learning Rate](https://youtu.be/k0h8emRAAHE?si=2HEtFo4n03NV6lSk)
* [Gradient Descent for LR](https://youtu.be/RGL_XUjPkGo?si=HF0sB7aXBbOsji8I)
* [Running Gradient Descent](https://youtu.be/tHDDbqYfflM?si=5iXFZTfpicf2wwuM)
* [Optional Lab : Gradient Descent](https://github.com/greyhatguy007/Machine-Learning-Specialization-Coursera/blob/main/C1%20-%20Supervised%20Machine%20Learning%20-%20Regression%20and%20Classification/week1/Optional%20Labs/C1_W1_Lab05_Gradient_Descent_Soln.ipynb) (Take this one seriously!)

**4. Multiple Linear Regression**

In this module, we are going to provide an overview of multiple linear regression, a statistical technique used to model the relationship between one dependent variable and multiple independent variables.

* [Multiple Features](https://youtu.be/jXg0vU0y1ak?si=TX3xr55v3TNSXF4_)
* [Vectorisation 1](https://youtu.be/U6zuBcmLxSg?si=j23VaM2TRPX4NC_8)
* [Vectorisation 2](https://youtu.be/uvTL1N02f04?si=RliYfKn2G69IVSZ_)
* [Optional Lab : Vectorsation](https://github.com/greyhatguy007/Machine-Learning-Specialization-Coursera/blob/main/C1%20-%20Supervised%20Machine%20Learning%20-%20Regression%20and%20Classification/week2/Optional%20Labs/C1_W2_Lab01_Python_Numpy_Vectorization_Soln.ipynb) (Go through it once for revision)
* [Gradient Descent for MR](https://youtu.be/YjpCQof9tI8?si=CDWQydaNV1DpGb1C)
* [Optional Lab : MR](https://github.com/greyhatguy007/Machine-Learning-Specialization-Coursera/blob/main/C1%20-%20Supervised%20Machine%20Learning%20-%20Regression%20and%20Classification/week2/Optional%20Labs/C1_W2_Lab02_Multiple_Variable_Soln.ipynb) (Try to solve the problem statement first)
* [Feature Scaling 1](https://youtu.be/YVtP5UGdgXg?si=0__uhJjcL4eduQdZ)
* [Feature Scaling 2](https://youtu.be/gmJqLGrUscg?si=1KhP7-uxC4qLZAFn)
* [Checking Gradient for Convergence](https://youtu.be/5g4H5_gsTpU?si=PzegloLpm9yeCyh7)
* [Choosing the Learning Rate](https://youtu.be/P_9hNBVRldM?si=WSbgWxmNj3M-UrqN)
* [Optional Lab : Feature Scaling](https://github.com/greyhatguy007/Machine-Learning-Specialization-Coursera/blob/main/C1%20-%20Supervised%20Machine%20Learning%20-%20Regression%20and%20Classification/week2/Optional%20Labs/C1_W2_Lab03_Feature_Scaling_and_Learning_Rate_Soln.ipynb) (Apply feature scaling first in the model)
* [Feature Engineering](https://youtu.be/ecOdZlY9jsQ?si=2VAGLer97_NSYir2)
* [Polynomial Regression](https://youtu.be/IFkRKJ5iBDE?si=EkfR0KKOGd7FBG20)
* [Optional Lab : Feature Engineering](https://github.com/greyhatguy007/Machine-Learning-Specialization-Coursera/blob/main/C1%20-%20Supervised%20Machine%20Learning%20-%20Regression%20and%20Classification/week2/Optional%20Labs/C1_W2_Lab04_FeatEng_PolyReg_Soln.ipynb)

As now you all are capable of making a regression model so here is an interesting problem for you all. But before that think whether feature scaling always improves the accuracy (reduces the cost more) and speed of the model? Search about it.

After Learning the above-mentioned Linear Regression Model, Do Try out the following Assignment and the solution will be shared Next-Week. You can Download the files by directly clicking on them and Use Jupyter notebook or any Navigator of your Convenience to view and Try out the Assignment.

**Linear Regression Assignment:** 

**Training Data:**  **Test** **Data:**