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## Master Machine Learning in Python

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CONTENT

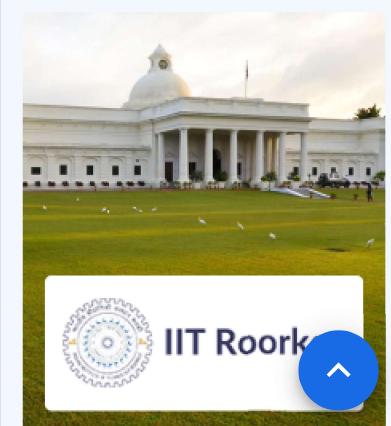
ASSESSMENTS

### Course Overview

Overview



Know Your Faculty



E&ICT IIT  
Roorkee:

## Pre Requisites



## Discussion

### Ask your Course Queries here



## Machine learning - Introduction



### Introduction to Machine learning - Part 1



20m

### Introduction to Machine learning - Part 2



26m

## Linear Regression - Intro



### Concepts of machine learning and Importance



22m

### Feature or Mathematical Space



14m

### Supervised machine learning - Introduction



13m

### Linear regression and Pearson's coefficient



20m

▶ Linear regression - Mathematical concept



12m

## Reference Material & Links

📎 Slides - Introduction to ML Linear Regression.pdf



📎 Doc - Linear Regression for Begginers.pdf



🌐 Concepts of machine learning

[VISIT](#)

🌐 Supervised machine learning

[VISIT](#)

## Assessments

⚡ Quiz - 1



Your Marks: 10/10

## Applying Linear Regression on a DataSet



▶ Summary and Lab exercise of linear regression



5m

## Exploratory Data Analysis

- ▶ Descriptive analysis on the dataset ✓  
21m
- ▶ Analyse the Distribution - Dependent column ✓  
11m
- ▶ Missing Values Imputation ✓  
10m
- ▶ Bivariate analysis ✓  
16m
- 📎 Linear Regression.ipynb ⬇
- 📎 Car-mpg- Dataset.csv ⬇

## Building Linear Regression Model

- ▶ Building model using all Information ✓  
24m

## Linear Regression Model on a Dummy Data

- ▶ Understand the data and relationship between variables ✓  
11m
- 📎 Data- Linear Model.xlsx ⬇

 Error Analysis and Adjusted RSquare

20m



 Fluke correlation

5m



## Reference Material & Links

 Doc - Linear Regression.pdf



 Regression and correlation

[VISIT](#)

## Assessments

 Quiz 2

Your Marks: 5/10



 Practice Exercise-1

## Additional Videos - Regression Deep Dive (Optional) - Learning Material ^

 Linear Regression Concepts

14m



 Linear Regression - Theoretical concepts - Assumptions



29m

- ▶ Significance of stochastic disturbance term 

5m

- ▶ Multi Collinearity 

22m

- ▶ Heteroscedasticity of disturbance 

5m

- ▶ Loss function(Mean square loss) 

15m

- ▶ Gradient Descent 

18m

- ▶ Regularization models (shrinkage models) 

30m

- ▶ Hands-on Lasso-Ridge regression model 

10m

- 📎 Ridge\_Lasso\_Regression.ipynb 

- 📎 car-mpg.csv 

- ▶ Error function in terms of contour graph 

11m

## Reference Links & Material

 Linear Regression for Beginners.pdf	
 LinearRegression_Theory.pdf	
 Introduction to Gradient Descent	<a href="#">VISIT</a>
 Gradient Descent Algorithm	<a href="#">VISIT</a>
 Quick read about linear regression	<a href="#">VISIT</a>

## Classification Models - Logistic Regression & Naive Bayes



 Classification Algorithm - Logistic Regression	
18m	
 Logistic Regression Model and Sigmoid Function	
25m	
 Logistic regression, Confusion Matrix, Precision and Recall: Hands on	
46m	
 pima-indians-diabetes .data	

 <a href="#">Logistic Regression - Pima Diabetes.ipynb</a>	
 <a href="#">Bayes' theorem</a>	
4m	
 <a href="#">Introduction to Naive Bayes' Classifier</a>	
20m	
 <a href="#">Naive Bayes' Classifier and examples</a>	
17m	
 <a href="#">Hands on Exercise - Naive Bayes Context</a>	
1m	
 <a href="#">Hands on Exercise - Naive Bayes- Explanation</a>	
22m	
 <a href="#">Dataset- PIMA -indians-diabetes-.csv</a>	
 <a href="#">Naive Bayesian- Pima Diabetes.ipynb</a>	

## Reference Material & Links

 <a href="#">Slides - Logistic Regression.pptx</a>	
 <a href="#">Slides - Naive Bayes.pptx</a>	

-  Doc- Logistic Regression Intermediate.pdf 
-  Logistic Regression [VISIT](#)
-  Naïve Bayes' Classifier [VISIT](#)
-  Naïve Bayes' Example [VISIT](#)

## Assessments

-  Quiz 3   
Your Marks: 6/10
-  Practice Exercise-2

Learn through Kaggle Competition - Make your submission - Optional 

## Regression Problems

-  How Much Did It Rain? [VISIT](#)
-  Inventory Demand [VISIT](#)

 Property Inspection Prediction

[VISIT](#)

 Restaurant Revenue Prediction

[VISIT](#)

 TMDB Box Office Prediction

[VISIT](#)

## Classification Problems

 Employee Access Challenge

[VISIT](#)

 Titanic: Machine Learning from Disaster

[VISIT](#)

 San Francisco Crime Classification

[VISIT](#)

 Classify Customer Satisfaction

[VISIT](#)

 Trip Type Classification

[VISIT](#)

 Categorize the cuisine

[VISIT](#)

## Additional - Learning Material



 Additional Material - Linear Regression.pdf



-  Additional Material - Logistic Regression.pdf 
-  Additional Material - Naive Bayes.pdf 
-  Additional Material - KNN Classifier.pdf 
-  Additional Material - Support Vector Machine.pdf 

## Ensemble Techniques



-  Decision Trees - Introduction   
51m
-  Decision Trees - Hands on exercise   
21m
-  credit.csv 
-  Credit- Decision Tree.ipynb 
-  Ensemble methods-2   
8m
-  Bagging   
10m

	Bagging - Hands on exercise	
	10m	
	DT- Ensemble-Bagging.ipynb	
	Boosting	
	8m	
	Types of Boosting	
	8m	
	Adaboosting - Hands on exercise	
	10m	
	Gradient Boosting - Lab exercise	
	3m	
	DT_Ensemble.ipynb	
	Random Forest	
	8m	
	Random Forest - Hands on exercise	
	5m	

## Reference Material & Links

- Slides- Ensemble Methods.pdf
- Slides - Decision Tree.pdf
- Slides - Random Forest.pdf
- Ensemble methods: bagging and boosting [VISIT](#)
- Decision tree [VISIT](#)
- Random forest [VISIT](#)
- Pruning [VISIT](#)

## Assessments

- Practice Exercise 3
- Quiz - 4   
Your Marks: 10/10

## Unsupervised Learning

- Unsupervised learning\_Clustering-2

8m

- ▶ Clustering - Types and Distance 

9m

- ▶ Clustering - Distance calculations 

13m

- ▶ K-means Clustering 

19m

- ▶ Elbow Method 

7m

- ▶ Visual analysis for Clustering 

16m

- ▶ Hands on exercise - K-means clustering 

33m

- 📎 Dataset-technical\_support.csv 

- 📎 tech\_supp\_analysis.ipynb 

## Reference Material & Links

- 📎 Slides- Unsupervised Learning.pdf 

 Unsupervised learning:[VISIT](#)

 K-means clustering[VISIT](#)

 K-means clustering[VISIT](#)

## Assessments

 Quiz - 5 

Your Marks: 5/10

## PCA

 Principal Component Analysis 

21m

 Principal Component Co-variance Matrix 

13m

 PCA for Dimensionality Reduction-2 

5m

 Hands on exercise - PCA 

26m

 Dataset-car-mpg.csv 

 PCA\_car\_mpg.ipynb



## Reference Material & Links

 Slides - Unsupervised Learning.pdf



 Slides- PCA.pdf



 Hierarchical Clustering

[VISIT](#)

 PCA

[VISIT](#)

 PCA

[VISIT](#)

## Assessments

 Quiz 6



Your Marks: 6/10

## Additional - Learning Material



 Additional Material - Agglomerative Clustering.pdf



 Additional Material - Principle Component Analysis.pdf



 Additional Material - Kmeans Clustering.pdf



## Feature Engineering and Cross Validation - Learning Material



 Introduction to Feature engineering-3



7m

 Hands on exercise - Feature engineering



50m

 Lab exercise - Feature Engineering



50m

 Cross validation concept and procedure-2



10m

 Implementing K Fold Cross Validation



7m

 Some salient features of K-fold-2



2m

 Hands-on Implementation of K-Fold Cross Validation Technique



10m

- ▶ Bootstrap Sampling Concept and Hands-on ✓  
16m
- ▶ Leave one out Cross Validation (LOOCV) Concept ✓  
3m
- ▶ Hands-on Implementation of LOOCV Technique ✓  
1m
- ▶ Up sampling and down sampling ✓  
7m
- ▶ Hands on exercise - Up-Sampling and Down-Sampling ✓  
28m

#### Files Used in the Videos

- ① DataSet- pima-indians-diabetes.csv ⬇
- ① imputed\_Pima\_class\_work.ipynb ⬇
- ① Data Set- car-mpg.csv ⬇
- ① Logistic\_up\_down\_sample\_Pima-1.ipynb ⬇
- ① Linear\_Regression\_auto\_mpg\_residual-checkpoint-1.ipynb ⬇

⌚	DecisionTreeRegressor-MPG.ipynb	
⌚	Bootstrapping_Confidence_Level.ipynb	
⌚	Hands on Exercise Feature Engineering_ pima-indians-diabetes.csv	
⌚	Hands On Exercise Model Tuning_ Car-mpg.csv	
⌚	Kfold_logistic.ipynb	
⌚	Linear_Regression_auto_mpg_residual-checkpoint-2.ipynb	
⌚	LOOCV_Introduction.ipynb	
⌚	RidgeLasso-Regression.ipynb	
⌚	Auto Mpg analytics..ipynb	

## Reference Material & Links

⌚	Cross Validation.pdf	
⌚	Sampling Upsample & Downsample.pdf	

 Feature engineering

[VISIT](#)

 Model Tuning

[VISIT](#)

 Practice Exercise -4

#### Additional Material - Model Performance (Optional) - Learning Material



 Model performance measures



21m

 ROC and AUC Concepts



25m

 Hands-on ROC-AUC concepts



8m

 Hands-on ROC Threshold Management for a Classification model



10m

 pima-indians-diabetes-2.csv



 ROC\_AUC.ipynb



 ROC\_Threshold\_Management.ipynb



## Model Performance Measures, ML Pipeline and Hyperparameter Tuning - Learning Material



### ▶ Model Tuning and Performance



15m

### ▶ Hyper parameters and Tuning



13m

### ▶ GridSearch



2m

### ▶ Hands on exercise on Hyper parameters using GridSearch



9m

### ▶ RandomizedSearch CV



6m

### ▶ Hands on exercise on RandomizedSearch CV and GridSearch CV



14m

## Files used in the Videos

### ① Pipeline\_Simple.ipynb



### ① pipeline\_introduction (1).ipynb



### ① GridSearchSimpleExample (1).ipynb



- (0) Pipeline\_GridSearchcv\_wisc\_bc\_data\_classwork (1).ipynb 
- (0) RandomizedSearchCV\_GridSearchCV.ipynb 
- (0) Decision\_Tree\_Regressor\_Concrete\_Regularization\_GridSearchCV.ipynb 
- (0) Models\_HyperParameters.ipynb 
- (0) wisc\_bc\_data.csv 
- (0) pima-indians-diabetes.data 

## Reference Materials & links

- (0) Pipelines.pdf 
- (0) Tuning the hyper parameters 
- (0) Pipeline 

## Quiz

- (0) Quiz- 7 

Your Marks: 12.33/20

## Project Overview



Project Overview-3

4m



Project Overview.pdf



Project

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Problem statement.pdf

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Data Set- "innercity.csv"



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