



# Birla Institute of Technology & Science, Pilani

## Pilani Campus

Centre for Software Development, SDET  
Unit

Second Semester 2018-2019

### COURSE HANDOUT

---

<b>Course Title:</b>	Data Analytics with Python
<b>Instructors:</b>	Rahul Bothra ( <a href="mailto:r2016015@pilani.bits-pilani.ac.in">r2016015@pilani.bits-pilani.ac.in</a> ) Aman Kumar Sharma ( <a href="mailto:h20180137@pilani.bits-pilani.ac.in">h20180137@pilani.bits-pilani.ac.in</a> )
<b>Timings:</b>	Wednesdays and Fridays (5:30 to 7:00 pm)
<b>Venue:</b>	NAB Room 6108

## 1. Course Description

Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome. Machine learning is so pervasive today that you probably use it dozens of times a day without knowing it.

In this course, you will learn about machine learning techniques, and gain practice implementing them and getting them to work for yourself. More importantly, you'll learn about not only the theoretical underpinnings of learning but also gain the practical know-how needed to quickly and powerfully apply these techniques to new problems.

The course has **no prerequisites**.

Topics include:

(i) Introduction to Machine Learning and Python, (ii) Supervised learning (parametric / non-parametric algorithms, support vector machines, kernels, neural networks), (iii) Unsupervised learning (clustering, dimensionality reduction, deep learning). (iii) Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI). The course will also draw from case studies and applications so that you'll also learn how to apply learning algorithms to text understanding (web search, anti-spam), computer vision, and other areas.

## 2. Text Books / Reference Links

T1. Guido Van Rossum. “[Python 3.7.2 Documentation](#)“

T2. Andreas Muller, “Introduction to Machine Learning with Python: A Guide for Data Scientists”

### 3. Reference Books

**R1.** Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”

**R2.** Ian Goodfellow, Yoshua B., Aaron C., “Deep Learning”

### 4. Course Plan:

Lecture Schedule:

#	Lecture	Reference
1 - 2	Introduction to Machine Learning and Python; <ul style="list-style-type: none"><li>- Applications of Machine Learning,</li><li>- Why Python?</li><li>- Revision of linear algebra and probability theory</li></ul>	Class notes
3 - 7	Understanding Python Syntax and Development Practices; <ul style="list-style-type: none"><li>- Data Types in Python</li><li>- Object-Oriented Programming</li><li>- Using modules and Libraries</li><li>- Understanding git and Linux</li></ul>	Parts of T1
8 - 10	Supervised Learning; <ul style="list-style-type: none"><li>- Linear models for regression and its applications</li><li>- Generalization, Overfitting, and Underfitting</li><li>- Supervised Machine Learning Algorithms</li></ul>	T2 [Ch 2]
11 - 13	Unsupervised Learning; <ul style="list-style-type: none"><li>- Types of Unsupervised Learning and the challenges</li><li>- Dimensionality Reduction, Feature Extraction</li><li>- Clustering - Partition based, hierarchical and density based</li></ul>	T2 [Ch 3]
15 - 16	Model Evaluation and Improvement <ul style="list-style-type: none"><li>- Cross-Validation</li><li>- Grid Search</li><li>- Evaluation Metrics and Scoring</li><li>- Summary and Outlook</li></ul>	T2 [Ch 5]
17 - 18	Selected Topics <ul style="list-style-type: none"><li>- Pre preprocessing of data;<ul style="list-style-type: none"><li>- Curse of dimensionality</li><li>- Cleaning of data</li><li>- Feature selection</li></ul></li><li>- Association rule mining</li><li>- Anomaly Detection</li></ul>	Class Notes

19 - 20	Case Studies; Discussion over the choices of algorithms used in different examples (eg: Spam detection, object recognition)	Class Notes
---------	--	-------------

## 5. Evaluation Schedule

Component	Duration	Weightage(%)	CB/OB
2 quizzes	TBA	20	TBA
Mid Sem Exam	90 mins	25	CB
Project	-	20	OB
Comprehensive Exam	180 mins	35	OB + CB

## 6. Make-up Policy

Make-up shall be granted in genuine cases with prior notification to the Instructor In charge

## 7. Notices

All notices shall be put upon Nalanda and CSIS Notice Board, and may also be sent via mail