Program Structure and Syllabus of B.TECH HONORS DEGREE IN DATA SCIENCE

Computer Science and Engineering-Data Science

R20 Regulations

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B.TECH HONORS DEGREE IN DATA SCIENCE

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PC	Data Science	3	0	2	4
2		PC	Data Wrangling and Visualization	3	0	2	4
3		PEC	1.Natural language Processing 2.Deep Learning 3.Predictive analytics using R Programming 4.Sentiment Analysis	3	1	0	4
4		Project	Project work	0	0	12	6
			TOTAL	9	1	16	18

**** Any other relevant course offered by MOOCs and approved by BoS**

Data Science

B.Tech (Honors -DS)					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
PC		L	T	P	C	CIE	SEE	Total
		3	0	2	4	40	60	100

Course Objectives

1. To gain a foundational understanding of data science.
2. To understand the data exploration analysis in data science.
3. To understand and use basic machine learning algorithms for predictive modeling.
4. To understand and use the various graphics in R and Tableau for data visualization.
5. To understand the ethical and privacy issues in data science.

Course Outcomes

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Explain the significance of exploratory data analysis (EDA) in data science.
3. Apply basic machine learning algorithms for predictive modeling.
4. Learn to persuade effective visualization of given data.
5. Reason around ethical and privacy issues in data science conduct and apply ethical practices.

UNIT I

Introduction To Data Science: What is Data Science, Big Data and Data Science hype – and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets needed, Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model, Introduction to R.

UNIT II

Exploratory Data Analysis And The Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study.

UNIT III

Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbors (k-NN), k-means, Motivating application: FilteringSpam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam.

UNIT IV

Data Visualization: Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Introduction to Tableau. Creating own visualization of a complex dataset.

UNIT V

Data Science And Ethical Issues: Discussions on privacy, security, ethics, A look back at Data Science, Next-generation datascientists.

Text Book

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline.O'Reilly. 2014.
2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.

Reference Books

1.Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning,Second Edition. ISBN 0387952845. 2009.
2.Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
3.Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
4.https://docs.google.com/file/d/0B6iefdnF22XQeVZDSkxjZ0Z5VUE/edit?pli=1

DATA WRANGLING & VISUALIZATION

B.Tech (Honors -DS)					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
PC		L	T	P	C	CIE	SEE	Total
		3	0	2	4	40	60	100

Course Objectives

1. To introduce the basic concepts of data wrangling using Python
2. To obtain the input data from a variety of sources
3. To extract the data and convert it into representations suitable for data analytics
4. To visualize the data

Course Outcomes

At the end of this course, students will be able to:
1. Use the panda's library
2. Load, store data in different file formats
3. Clean and prepare the data
4. Plot and Visualize data
5. Do data aggregation

UNIT I

Getting started with pandas: Introduction to pandas Data Structures, Series, Data Frame, Index Objects. Data Loading, Storage, and File Formats: Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, JSON Data

UNIT II

Data Loading, Storage, and File Formats: XML and HTML: Web Scraping, Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files, Interacting with Web APIs, Interacting with Databases

UNIT III

Data Cleaning and Preparation: Handling Missing Data, Filtering Out Missing Data, Filling In Missing Data, Data Transformation, Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers, String Manipulation, String Object Methods, Regular Expressions

UNIT IV

Plotting and Visualization: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration, Plotting with pandas and seaborn, Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Other Python Visualization Tools, Conclusion

UNIT V

Data Aggregation and Group Operations: GroupBy Mechanics, Iterating Over Groups, Selecting a Column or Subset of Columns, Grouping with Dicts and Series, Grouping with Functions, Grouping by Index Levels, Data Aggregation, Column-Wise and Multiple Function Application, Returning Aggregated Data Without Row Indexes, Pivot Tables and Cross-Tabulation.

Text Books:

1.Wes McKinney. Python for Data Analysis: Data Wrangling with pandas, NumPy and IPython. O'Reilly, 2017, 2nd Edition

2.Jacqueline Kazil and Katharine Jarmul. Data Wrangling with Python. O'Reilly, 2016

Reference Books

1. Data Science Essentials in Python: Collect, Organize, Explore, Predict, Value. Dmitry Zinoriev, The Pragmatic Programmers LLC, 2016

2. TyeRattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel, and Connor Carreras. Principles of Data Wrangling: Practical Techniques for Data Preparation. O'Reilly, 2017

3. Python Data Analytics – Data Analysis and Science using Pandas, matplotlib and the Python Programming Language. Fabio Nelli, Apress, 2015

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NATURAL LANGUAGE PROCESSING

B.Tech (Honors -DS)					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
PEC		L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. To learn the fundamentals of Natural Language Processing
2. To understand the use of CFG and PCFG in NLP
3. To understand the role of semantics of sentences and pragmatics
4. To apply the NLP techniques to IR applications

Course Outcomes

1. To model the language using N-grams.
2. To implement a shallow processing models to tackle morphology/syntax of a language.
3. To Examine Syntagmatic and Paradigmatic relations be used for processing the real-time applications.
4. To apply the algorithms for Discourse Analysis.

UNIT I

Introduction : Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Text Normalization, Minimum Edit Distance, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors

UNIT II

Word Level Analysis : Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III

Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT IV

Semantics And Pragmatics : Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V

Discourse Analysis And Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC)

Text Books

1.Daniel Jurafsky, James H. Martin ,"Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.

2.Deepti Chopra, Nisheeth Joshi, Iti Mathur "Mastering Natural Language Processing with Python" First Edition, Packt Publishing, 2016

Reference Books

1. James Allen, "Natural Language Understanding", 2nd Edition, Benjamin, Cummings publishing company, 1995.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python" , First Edition, OReilly Media, 2009
3. Rajesh Arumugam, Rajalingappaa Shanmugamani, "Hands-On Natural Language Processing with Python" , Packt Publishing Ltd., 2018
4. http://www.pdfdrive.com/natural-language-processing-with-python-e1251452.html
5. https://learning.oreilly.com/library/view/hands-on-natural-language/9781789139495

DEEP LEARNING

B.Tech (Honors -DS)					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Prerequisites:

Basic Mathematics, P&S, Python and Machine Learning

Course Objectives

1. To Give an exposure to Supervised Deep Learning for working with Linearly Non Separable Data
2. To provide understanding of Mathematical, Statistical and Computational challenges of building improved neural net representations. .
3. To Know the application of Convolution Neural Networks for High-Dimensional data, such as image and other data types
4. To Explore Deep Recurrent and Memory Networks for Sentiment Analysis, Machine Translation and Computer Vision tasks

Course Outcomes

1. Implement Deep Neural Networks for solving Classification and Regression Problems (L3)
2. Apply Regularization Methods to improve the way neural networks learn.(L3)
3. Analyze different optimation algorithms for training deep neural models(L4)
4. Apply the concepts of the Deep Convolution Neural networks for Image classification (L3)
5. Solve the sequence learning problems using Deep Recurrent Neural Networks and Memory Networks (L3)

UNIT I

Introduction to Neural Networks: Challenges Motivating Deep Learning, AI vs ML vs DL, Applications of Deep Learning, Perceptron Model, Sigmoid Neuron Model, Feed Forward Neural Networks, Learning with Gradient Descent, Working of Backpropagation Algorithm, Loss Functions: Squared Error Loss, Perceptron Loss, and Cross Entropy Loss, Output Layer Functions: Sigmoid and Softmax Functions

UNIT II

Regularization for Deep Learning: Bias and Variance Tradeoff, Regularization Need for Overfitting, Techniques of Regularization: L2 Regularization, L1 Regularization, Drop Out, Data Augmentation, and Early Stopping, Weight Initialization, Hyper-Parameters Tuning: Learning Rate and Batch Size.

UNIT III

Optimization for Training Deep Models: Challenges to Train Deep Neural Networks: Vanishing Gradient Problem, Exploding Gradient Problem, and Unstable Gradient Problem, Optimization Algorithms: Momentum Based Gradient Descent, Nesterov Based Gradient Descent, AdaGrad, RMSProp, and Adam, Parameter Initialization Strategies

UNIT IV

Convolutional Neural Networks: Convolution Operation: 1D Convolution Operation, 2D Convolution Operation, 2D Convolution with a 2D Filter, Padding and Stride, Motivation: How Convolution Operation related to Neural Networks, Max Pooling, CNN Architectures: Alexnet, and VGGNet, Batch Normalization, Drop Out.

UNIT V

Recurrent Neural Networks: Introduction to Sequential Model Problems, Recurrent Neural Network Model, Computing radients in RNN, Challenge of Long- Term Dependencies, The Long Short Term Memory and other Gated RNNs.

Text Books

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning (1st Edition), MIT Press,2017, ISBN 978-0262035613.
2. Michael A. Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.

Reference Books

1. Bharath Ramsundar & Reza Bosagh Zadeh, Tensor Flow for Deep Learning, O'Reilly Media ,2018
2. Francois Chollet, Deep Learning with Python (1st Edition), Manning Publications Company, 2017. ISBN 978-1617294433.
3. Aurélien Géron, Hands-on Machine Learning with Scikit-Learn and TensorFlow (2nd Edition), O'Reilly Media, 2019. ISBN 978-9352139057.
4. http://faculty.neu.edu.cn/yury/AAI/Textbook/Deep%20Learning%20with%20Python.pdf
5. http://www.deeplearningbook.org/

6. https://www.pdfdrive.com/deep-learning-with-applications-using-python-chatbots-and-face-object-and-speech-recognition-with-tensorflow-and-keras-e184016771.html
7. https://www.pdfdrive.com/tensorflow-for-deep-learning--e187559485.html

PREDICTIVE ANALYTICS WITH R PROGRAMMING

B.Tech (Honors -DS)					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
PEC		L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Prerequisites:

Basics of Statistics, Machine Learning and Basic knowledge in any Programming language

Course Objectives

1. After taking the course, students will be able to
1. Use R for statistical programming, computation, graphics and modeling,
2. Write functions and use R in an efficient way
3. Fit some basic types of statistical models
4. Use R in their own research,

Course Outcomes

1. Understand the basics in R programming in terms of constructs, control statements, functions,
2. Access online resources for R and import new function packages into the R workspace
3. Import, review, manipulate and explore ,summarize data-sets in R
4. Apply the R programming from a statistical perspective
5. Apply R Graphics and Tables to visualize results of various Statistical operations on data.

UNIT I

Basics of R: Introduction, R-Environment Setup, Help functions in R, Vectors – Scalars – Declarations

Basic Data Types: Vectors – Scalars – Declarations, Creating and Naming Vectors, Vector Arithmetic, Vector Sub setting,

Matrices: Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Arrays -Class.

UNIT II

Factors: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Common functions used with factors

Data Frame: Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Sub setting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors, applying functions to lists

Conditionals and Control Flow: Arithmetic and Boolean operators and values, Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

UNIT III

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R, Cumulative Sums and Products, Calculus in R, Input and Output Operations.

UNIT IV

Apply Family in R: Introduction, Using Apply in R, Using Lapply in R, Using Sapply, Using Tapply in R: Split Function, Using Mapply in R,

Charts and Graphs: Introduction, Pie Chart: Chart Legend, 3D Pie Chart, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

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UNIT V

Interfacing

Data Interfaces: Introduction, CSV Files: Syntax, Importing a CSV File, Excel Files: Syntax, Importing an Excel file, Binary Files: Syntax, XML Files, Web Data, Databases.

Statistical Applications: Introduction, Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering, Correlation and Covariance, T-Tests,-ANOVA.

Text Books

1. 1. R Programming for Data Science by Roger D. Peng

The Art of R Programming by Prashanth singh, Vivek Mourya, Cengage Learning India R for Everyone, Lander, Pearson

REFERENCE BOOKS:

1. R Cookbook, PaulTeetor, Oreilly.
2. R in Action,Rob Kabacoff, Manning

SENTIMENT ANALYSIS

B.Tech (Honors -DS)					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
PEC		L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Prerequisites:

Data mining, Natural Language Processing

Course Objectives

1. To learn the fundamentals of Sentiment analysis and Opinion Mining
2. To understand the use of Sentiment analysis.
3. To understand the role of Sentiment analysis and Opinion Mining
4. To apply the Sentiment analysis in applications

Course Outcomes

1. To apply the Sentiment analysis for **Document** level analysis (L3)
2. To model the Sentiment analysis (L3)
3. To implement a shallow processing models to tackle morphology/syntax of a language (L3)
4. To Examine Syntagmatic and Paradigmatic relations be used for processing the real-time applications (L4)
5. To apply the algorithms for Sentiment Analysis (L3)

UNIT I

Introduction: What is Sentiment analysis, Types of Sentiment Analysis, Why Is Sentiment Analysis Important, Many Facets of Sentiment Analysis, Affective Computing and Sentiment Analysis Sentiment Analysis Applications, Different Levels of Analysis, Sentiment Lexicon and Its Issues, Natural Language Processing Issues, Opinion Spam Detection.

The Problem of Sentiment Analysis: Opinion Definition, Sentiment Analysis Tasks, Opinion Summarization, Opinion Summarization, Opinion Summarization.

UNIT II

Document Sentiment Classification: Sentiment Classification Using Supervised Learning, Sentiment Classification Using Unsupervised Learning, Sentiment Rating Prediction Cross-Domain Sentiment Classification, Cross-Language Sentiment Classification.

Sentence Subjectivity and Sentiment Classification: Subjectivity Classification, Sentence Sentiment Classification,4.3 Dealing with Conditional Sentences, Dealing with Sarcastic Sentences, Cross-language Subjectivity and Sentiment Classification, Using Discourse Information for Sentiment Classification.

UNIT III

Aspect-based Sentiment Analysis: Aspect Sentiment Classification, Basic Rules of Opinions and Compositional Semantics. Aspect Extraction, Identifying Resource Usage Aspect, Simutaneous Opinion Lexicon Expansion and Aspect Extraction, Grouping Aspects into Categories, Entity, Opinion Holder and Time Extraction, Coreference Resolution and Word Sense Disambiguation.

UNIT IV

Sentiment Lexicon Generation: Dictionary-based Approach, Corpus-based Approach Desirable and Undesirable Facts.

Opinion Summarization: Aspect-based Opinion Summarization, Improvements to Aspect-based Opinion Summarization, Contrastive View Summarization, Traditional Summarization, Analysis of Comparative Opinions.

UNIT V

Opinion Search and Retrieval: Web Search vs. Opinion Search, Existing Opinion Retrieval Techniques.

Opinion Spam Detection: Types of Spam and Spamming, Harmful Fake Reviews, Individual and Group Spamming, Types of Data, Features and Detection, Supervised Spam Detection, Unsupervised pam Detection, Spam Detection based on Atypical Behaviours, Spam Detection Using Review Graph, Group Spam Detection.

Text Books

1. Bing Liu. *Sentiment Analysis and Opinion Mining*, Morgan & Claypool Publishers, May 2012.
2. Eric Cambria, Dipankar Das, Sivaji Bandyopadhyay, Antonia feraco. A Practical guide to Sentiment Analysis

REFERENCE BOOKS:

1. Liu, Bing. Sentiment Analysis: Mining Opinions, Sentiments, And Emotions, Cambridge University Press.
2. Basant Agarwal, Richi Nayak, Namita Mittal, Srikanth Patnaik Deep Learning-Based Approaches for Sentiment Analysis (Algorithms for Intelligent Systems), 1st ed. 2020 Edition

Data Science Lab

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
PCC LAB		L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Pre requisites

Basics of Python Programing, Basics of R programming and Statistics and probability

Course Objectives

1. To acquire in-depth understanding of the data analysis, machine learning and other advanced data science techniques.
2. To empower students with tools and techniques for handling, managing, analyzing and interpreting data.
3. To strengthen the analytical and problem solving skill through developing real time applications.
4. To gain practical experience in programming tools for data sciences and machine learning.

Course Outcomes

At the end of this course, students will be able to:

1. Understand data science concepts and various use cases in different industries [L2]
2. Apply statistics and probability for data science. [L3]
3. Develop R and Python Code for Data Science solutions [L6]
4. Create powerful business dashboards with Tableau [L6]

Programming Languages/Tools:

- R
- Tableau

- Python

Week 1

1. Introduction to Data Science with using Python / Revisiting of Jupiter/Installation of Libraries.

Week 2

2. Apply accessing and importing and exporting data using Python.

Week 3

3. Apply data preprocessing: Data manipulation and data cleaning using Python.

Week 4

4. Apply Machine Learning - Linear regression using Python.

Week 5

5. Apply Machine Learning - Logistic Regression using Python.

Week 6

6. Introduction to R tool for data analytics science / Revisiting of Installing R Libraries.

Week 7

7. Exploratory Data Analysis and apply statistics analysis and visualization using R

Week 8

8. Apply K-means clustering (supervised Learning) on given datasets using R.

Week 9

9. Apply K-NN (unsupervised learning) on given datasets using R.

Week 10

10. Data Visualization using tableau / Installation of Tableau / Introduction to Tableau interface.

Week 11

11. Create and connect to data/Visual analytics/mapping/creating dashboards and stories.

DATA WRANGLING & VISUALIZATION LAB

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
PCC LAB		L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Pre requisites

- Some basic knowledge of R is expected
- Basic Python knowledge

Course Objectives

1. Visualize data
2. Understand what plots are suitable for a type of data you have
3. Understand the data before you make a plot
4. Apply exploratory data analysis techniques with R and ggplot2
5. Visualize data by creating various graphs using R base package, lattice and ggplot2 packages

REQUIRED TOOLS

R and R studio, Python

Week 1

1. **Types of graphs using the base R package:** Base Graphics -Single Continuous Variable: Histogram, Density Plot, Box-Whisker Plot

Week 2

2. Single Discrete Variable: Bar Chart, Two Continuous Variables: Scatter Plot.

Week 3

3. Two Variables: One Continuous, One Discrete: Box-Whisker Plot, Pie Chart, Dot Chart, Strip Chart .

Week 4

4. Two Variables: Both Discrete: Mosaic Plot, Stacked Bar Plot, Time series: Line Charts

Week 5

5. Types of graphs covered in the Lattice package Lattice package: Histogram, Density Plot, Box-Whisker Plot.

Week 6

6. Graphs covered in GGPlot2 package: Commonly Used Graphs: Bar Chart, Scatter Plot, Dot Chart, Strip Chart

Week 7

7. Exploratory data analysis (EDA) (statistical plots for exploring one continuous or one discrete variable)

Week 8

8. EDA for exploring two or more variables (different statistical plots)

Week 9

9. Introduction to Matplotlib.

Week 10

10. Making line and Scatter plots.

Week 11

11. Adding Labels, Titles, Axis Ticks, and Changing Line Styles

Week 12

12. Adjusting Plot Sizes, Adding a Legend, and Saving the Plots.

Week 13

13. A case study to select a diamond - to explain ggplot()