PERIYAR UNIVERSITY

SALEM  636 011

M.Sc. DEGREE

COMPUTER SCIENCE-DATA ANALYTICS

REGULATIONS AND SYLLABUS

(Effective from the Academic year 2019-2020 and thereafter)
Regulations

Effective from the Academic year 2019 - 20

1. OBJECTIVE OF THE PROGRAMME

To Develop the Post Graduates in COMPUTER SCIENCE-DATA ANALYTICS with strong knowledge of theoretical COMPUTER SCIENCE-DATA ANALYTICS subjects who can be employed in research and development units of industries and academic institutions.

2. ELEIGIBILITY FOR ADMISSION

A candidate who has passed B.Sc Computer Science/B.C.A/B.Sc Computer Technology/B.Sc Information Science/Technology degree of this University or any of the degree of any other University accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M. Sc COMPUTER SCIENCE-DATA ANALYTICS degree examination of this University after a course of study of two academic years.

3. DURATION OF THE PROGRAMME

The programme for the degree of Master of Science in COMPUTER SCIENCE-DATA ANALYTICS shall consist of two Academic years divided into four semesters. Each semester consist of 90 working days.
M. Sc Computer Science-Data Analytics Syllabus under CBCS Pattern effect from 2019-2020 Onwards

Periyar University, Salem

**CURRICULUM AND SCHEME OF EXAMINATIONS**

Two year M. Sc-COMPUTER SCIENCE-DATA ANALYTICS Programme

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Credits</th>
<th>Hours Per Week</th>
<th>Examinaton Duration (hrs)</th>
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**Semester-I**

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| Elective-03 | 4 | 4 | 3 |   |   |     |

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| Non-major Elective / | 4 | 4 | 3 | 25 | 75 | 100 |</p>
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| Elective-05 | |
|-------------| |
| 4  4  3     | |

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### Elective Courses (EC) **

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** The Elective Courses may be updated a per the current trends in Computer Science by their respective boards

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Periyar University, Salem
M. Sc- COMPUTER SCIENCE-DATA ANALYTICS
SYLLABUS
SEMESTER-I

COURSE- 19UPCSC3C01 Credits: 4

DESIGN AND ANALYSIS OF ALGORITHMS

Course Objective:

- To learn effective problem solving methodologies in Computing applications
- To analyze the algorithmic procedure efficiently and to determine the computational complexity of algorithms
- To learn stepwise procedure to solve problems.
- Students can solve problems by a model of computations

Unit I


Unit II


Unit III

Unit IV


Unit V

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: Least Cost searchhod - 0/1 Knapsack Problem.

Text Book:


References:

1. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcropft, Ullman , LPE
3. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem- TMH.
COURSE- 19UPCSC3C02

ADVANCED WEB TECHNOLOGY

Course Objective:

- To explore the backbone of web page creation by developing .NET skill.
- To enrich knowledge about HTML control, web control classes and ADO.NET
- To understand the need of usability, evaluation methods for web services
- Apply the knowledge of ASP.NET object, ADO.NET data access and SQL to develop a client server model.
- Recognize the difference between Data list and Data grid controls in accessing data.

Unit - I

Overview of ASP.NET - The .NET framework – Learning the .NET languages: Data types – Declaring variables- Scope and Accessibility- Variable operations- Object Based manipulation- Conditional Structures- Loop Structures- Functions and Subroutines. Types, Objects and Namespaces: The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spaces and assemblies. Setting Up ASP.NET and IIS

Unit - II

Unit - III


Unit - IV

Web Services - Web services Architecture : Internet programming then and now- WSDL–SOAP- Communicating with a web service-Web service discovery and UDDI. Creating Web services : Web service basics- The StockQuote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service- Using the proxy class- An example with TerraService.

Unit - V


Text Book


Reference Books


M. Sc Computer Science-Data Analytics Syllabus under CBCS Pattern effect from 2019-2020 Onwards
Periyar University, Salem

COURSE- 19UPCSC3C03

Credits: 4

ADVANCED DATABASE MANAGEMENT SYSTEMS

Course Objective:

- To acquire Knowledge of Database Models, Applications of Database Models and Emerging Trends
- To learn Various Data models and Database Architecture
- To learn Knowledge patterns, Object Oriented Databases

Unit-I


Unit-II

Distributed and Object based Databases: Architecture - Distributed data storage - Distributed transactions - Commit protocols - Concurrency control - Query Processing. Complex Data Types - Structured Types and Inheritance - Table Inheritance - array and Multiset - Object Identity and Reference Types - Object Oriented versus Object Relational.

Unit-III


Unit-IV

Unit-V


Text Books


Reference Books


COMPILER DESIGN

Course Objective:

- To learn principles, algorithms and techniques used to construct various phases of compiler.
- To acquire knowledge about finite automata, regular expressions, context-free grammars, compiler parsing techniques, Syntax Directed definitions and translation scheme
- To understand intermediate machine representations and actual code generation

Unit - I


Unit - II

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers.

Unit - III


Unit - IV

Unit - V


Text Book


Reference Books

COURSE- 19UPCSC3C05       Credits: 4

ALGORITHM - LAB

1. Apply the divide and conquer technique to arrange a set of numbers using merge sort.
2. Apply the divide and conquer technique to implement Strassen"s matrix multiplication Algorithm
3. Compute the transitive closure of a given directed graph using Warshall"s Algorithm.
4. Implement 0/1 knapsack problem using Dynamic programming
5. Find minimum cost spanning tree of a given undirected graph using Kruskal"s Algorithm.
6. Find minimum cost spanning Tree of a given undirected graph using Prim"s Algorithm.
7. Implement 8 Queen"s problem using backtracking
8. Implement Knapsack problem using backtracking
9. Solve Dijkstra"s Algorithm using greedy technique
10. Solve subset sum problem using backtracking
COURSE-19UPCSC3C06

ADVANCED WEB TECHNOLOGY - LAB

Course Objective:

- Learn how to create websites using Asp.Net
- Implement the advanced web concepts using Asp.Net and Ado.Net
- Learn to use Asp.Net web controls
- Design web applications using Asp.Net and Ado.Net

List of Programs:

Programs using ASP.NET Server controls

1. Create a website for a bank and include types of navigation.
2. Write a program to perform Asp.Net State.
3. Design Image Mapping using Asp.Net
4. Create the following using web controls
   a) Money conversion
   b) Temperature conversion
5. Write a program to create an advertisement using Ad rotator.
6. Create a user control that contains a list of colors. Add a button to the Web Form which when clicked changes the color of the Form to the color selected from the list.
7. Create a user control that displays the current date and time. Include it in a Web Form and refresh it each time a button is clicked.
8. Create a user control that receives the user name and password from the user and validates them. If the user name is “Radiant” and the password is “asp.net” then the user is authorized, otherwise not.
Programs using ADO.NET and ASP.NET

1. Create a web application to insert 3 records inside the SQL database table having following fields(DeptId, DeptName, EmpName, Salary). Update the salary for any one employee and increment it to 15% of the present salary. Perform delete operation on 1 row of the database table.
2. Create a Web App to display all the Empname and Deptid of the employee from the database using SQL source control and bind it to GridView. Database fields are(DeptId, DeptName, EmpName, Salary)

Course Outcomes:

- Apply .NET concepts to design and develop web applications
- Create a basic website using Asp.Net concepts
- Design web page and connect to the backend databases
- Applying different functionalities in Asp.Net and Ado.Net
COURSE- 19UPCSC3C07

Credits: 4

DISTRIBUTED OPERATING SYSTEM

Course Objective:

- To study core concepts of distributed operating system.
- To understand hardware, software and communication in distributed OS
- To learn the distributed resource management components.
- Practices to learn concepts of OS and Program the principles of Operating Systems

Unit I


Unit II


Unit III

Unit IV


Unit V


Text Books


2. Distributed Operating System – Andrew S. Tanenbaum, PHI.

Reference Books


COURSE- 19UPCSC3C08

Credits: 4

ADVANCED JAVA PROGRAMMING

Course Objective

- To deepen student"s programming skills by analyzing the real world problem and implement the concepts in real time projects
- To learn the ethical, historical, environmental and technological aspects of Advanced Java Programming and it impacts the social and economic development of society

Unit-I

Design Patterns: Introduction to Design patterns - Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern- Adapter Pattern- Proxy Pattern-Decorator Pattern- Command Pattern- Template Pattern - Mediator Pattern-Collection Framework – Array List class – Linked List class – Array List vs. Linked List - List Iterator interface - Hash Set class Linked Hash Set class-Tree Set class Priority Queue class - Map interface-Hash Map class - Linked Hash Map class -Tree Map class - Comparable interface - Comparator interface-Comparable vs. Comparator

Unit-II


Unit-III

JDBC -Introduction - JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database and Table with JDBC - Working with Database Metadata; Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and Inet address classes.
Unit-IV


Unit-V

Lambda Expressions- Method Reference- Functional Interface- Streams API, Filters- Optional Class- Nashorn- Base 64 Encode Decode- JShell(RPEL)- Collection Factory Methods- Private Interface Methods- Inner Class Diamond Operator- Multi resolution Image API.

Text Books


Reference Books

COURSE- 19UPCSC3C09  

CRYPTOGRAPHY AND NETWORK SECURITY

Course Objective:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- To know about the malicious software & firewalls.

Unit I


Unit II


Unit III

**Unit IV**


**Unit V**


**Text Books**


**Reference Books**


COURSE- 19UPCSC3C10

Credits: 4

ADVANCED JAVA LAB

Course Objective:

- To enable the students to implement different java packages.
- To develop the students with the skills to implement different java tools.

Use JAVA Programming Language to implement the following:

1. To create applets incorporating the following Features:
   a. Create a color palette with matrix of buttons
   b. Set background and foreground of the control text area by selecting a color from color palette.
   c. In order to select Foreground or background use check box control as radio buttons
   d. To set background images

2. Use GridLayout to design a calculator and simulate the functions of simple calculator.

3. To create Input output and Random files

4. To develop chat application with datagram sockets and datagram packets.

5. To invoke servlet from HTML forms.

6. To invoke servlet from Applets.

7. To invoke servlet from JSP.

8. Simple client/server application.

9. JDBC to interact with database.

10. To create multiple chat applications using TCP packets.
**DATA ANALYTICS USING R - LAB**

**Course: 19UPCSC3C11**  
**Credits: 2**

**Objectives:**

- To implement mathematical aggregation operators in “R-script”.
- To understand the Statistical operations in “R”.

1. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using in R.

2. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames in R.

3. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept in R.

4. To perform statistical operations (Mean, Median, Mode and Standard deviation) using R.

5. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization

6. To perform dimensionality reduction operation using PCA for Houses Data Set

7. To perform Simple Linear Regression with R.

8. To perform K-Means clustering operation and visualize for iris data set

9. Write R script to diagnose any disease using KNN classification and plot the results.

10. To perform market basket analysis using Association Rules (Apriori).
Course Objectives:
- To get familiar with the image acquisition process and color image processing models.
- To analyze the functionalities of spatial and frequency filters for image enhancement.
- To investigate the various edge detection models and their applications.
- To learn the concept of image compression and analyze the various compression techniques.
- To identify the requirements of various image segmentation methods and object recognition models for various real-time applications.

UNIT – I

UNIT–II

UNIT-III

UNIT-IV
UNIT – V


Text Book:

   - Unit – I (Chapters: 2.3-2.5, 6.1-6.5,6.8)
   - Unit – II (Chapters:3.5-3.7,4.11.3)
   - Unit – IV (Chapters:8.1,8.1.6,8.2.1,8.2.3,8.2.10,8.1.7)
   - Unit – V (Chapters:10.2.2,10.2.7,10.3,10.4,10.5,10.6,6.7,9.2-9.6,12.2-12.3)

   - Unit – II (Chapters:7.2) Unit – III (Chapters:9.4)

Reference Books

COURSE CODE – 19UPCSC3C13  
CREDITS: 4

INTERNET OF THINGS

Course Objectives:
• To get familiar with the evolution of IoT with its design principles
• To outline the functionalities and protocols of internet communication
• To analyze the hardware and software components needed to construct IoT applications
• To identify the appropriate protocol for API construction and writing embedded code
• To realize various business models and ethics in Internet of Things

UNIT – I

UNIT – II

UNIT – III

UNIT-IV

UNIT – V
Text Book:

1. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014. (Chapters : 1, 2, 3, 4, 5, 6, 7, 9, 10, 11)

Reference Books:

COURSE CODE – 19UPCSC3C14

MACHINE LEARNING

Course Objectives:
- To understand the relationship between the target and one or more predictors
- To implement regression for developing a statistical model to predict the target
- To understand the basic concept of classification and construct a binary classification model
- To outline the various models used for developing classification models
- To identify the optimization problem to be solved by the evolutionary or heuristic search algorithm

UNIT – I
Simple Linear Regression: Introduction to Simple Linear Regression-The Least-Squares Estimates- Dangers of Extrapolation- The Coefficient of Determination, r- Standard Error of the Estimate s- Correlation Coefficient r-ANOVA Table for Simple Linear Regression- Outliers, High Leverage Points, and Influential Observations- Population Regression Equation- Verifying the Regression Assumptions- Inference in Regression- t-Test for the Relationship Between x and y -Confidence Interval for the Slope of the Regression Line - Confidence Interval for the Correlation Coefficient ρ -Confidence Interval for the Mean Value of y Given x - Prediction Interval for a Randomly Chosen Value of y Given x - Transformations to Achieve Linearity-Box-Cox Transformations

UNIT – II
Multiple Regression and Model Building: Introduction to Multiple Regression- The Population Multiple Regression Equation-Inference in Multiple Regression-Regression with Categorical Predictors, Using Indicator Variables-Adjusting R2: Penalizing Models for Including Predictors that are not Useful- Sequential Sums of Squares- Multicollinearity- Variable Selection Methods- An Application of Variable Selection Methods- Using the Principal Components as Predictors in Multiple Regression.

UNIT – III

UNIT-IV
NAIVE BAYES AND BAYESIAN NETWORKS: Bayesian Approach-Maximum a Posteriori (Map) Classification- Posterior Odds Ratio- Balancing the Data- Naïve Bayes Classification- Interpreting the Log Posterior Odds Ratio-Zero-Cell Problem - Numeric Predictors for Naïve Bayes Classification-
WEKA: Hands-on Analysis Using Naïve Bayes- Bayesian Belief Networks - Clothing Purchase Example- Using the Bayesian Network to Find Probabilities.

UNIT – V


Reference Books:
1. Bertt Lantz, Machine Learning with R: Expert techniques for predictive modeling, 3rd Edition, April 15, 2019,
COURSE CODE: 19UPCSC3C15*

IMAGE PROCESSING - LAB

Course Objectives

- To understand the concepts of Image Processing.
- To develop the programming skills in Python.

List of Experiments

1. Write a Python program using different Morphological Operations
2. Write a Python program using different Edge Detection Methods
3. Write a Python program using the concepts of Histogram Equalization to improve the contrast of images
4. Write a Python program to find objects in an image using Template Matching concepts
5. Write a Python program using Marker-based Image Segmentation using Watershed algorithm
6. Write a Python program using GrabCut algorithm to extract foreground in images Interactive Foreground Extraction
7. Write a Python program for implementing the concepts of Harris Corner Detection
8. Write a Python program for implementing the string match features in one image with others using the Brute-Force matcher method.
9. Write a Python program for implementing the hand-written data OCR with the SVM algorithm
10. Write a Python program for implementing the data clustering concept using K-means algorithm

Reference Website

M. Sc Computer Science-Data Analytics Syllabus under CBCS Pattern effect from 2019-2020 Onwards

Periyar University, Salem

COURSE CODE: 19UPCSC3C16 *

MACHINE LEARNING - LAB

Credits: 2

Objectives:

- To implement mathematical aggregation operators in “R-script”.
- To understand the Statistical operations in “R”.

List of Experiments

1. To get the input from the user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using in R.
2. To perform data import/export (.CSV, .XLS, .TXT) operations using dataframes in R.
3. To get the input matrix from the user and perform Matrix addition, subtraction, multiplication, inverse transpose, and division operations using vector concept in R.
4. To perform statistical operations (Mean, Median, Mode, and Standarddeviation) using R.
5. To perform data pre-processing operations i) Handling Missing data ii) Min- Max normalization
6. To perform dimensionality reduction operation using PCA for Houses DataSet
7. To perform Simple Linear Regression with R.
8. To perform K-Means clustering operation and visualize for iris data set
9. Write R script to diagnose any disease using KNN classification and plot the results.
10. To perform market basket analysis using Association Rules (Apriori).
LIST OF ELECTIVES

COURSE: 19UPCSC3E01

Credits: 4

DISCRETE MATHEMATICS FOR COMPUTING

(Theorems and Proofs are not expected)

Course objective

- To understand the applications of functions and relations
- To understand the basic concepts of mathematical logic and predicate calculus
- To understand the concept of method of induction
- To develop the skills in solving recurrence relations.

Unit-I


Unit-II


Unit-III

Formulation as Recurrence Relations-solving recurrence Relation by Iteration-solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two-Solving Linear Non homogeneous Recurrence Relations. Permutations-Combinations-Permutations with repetitions-Combinations with repetition-permutations of sets with indistinguishable objects.
M. Sc Computer Science-Data Analytics Syllabus under CBCS Pattern effect from 2019-2020 Onwards

Periyar University, Salem

**Unit-IV**

Definition and examples-properties of lattices –lattices as algebraic systems- Sub lattices and lattice Isomorphism-special classes of lattice –distributive lattices and Boolean algebras.

**Unit-V**


**Course outcome**

On successful completion of the course, students will

- solve problems in mathematical logic
- identify and apply basic concepts of set theory, arithmetic, logic, proof techniques, binary relations, graphs and trees
- solve recurrence relations
- construct lattice applications
- understand the applications of Graph Theory in Computer Science.

**Text Book**


**Unit 1:**(2.1-2.11) **Unit 2:**(1.3-1.7, 4.1-4.2, 5.1-5.5)**Unit 3:**(6.1-6.5,3.1-3.6) **Unit 4:**(8.1-8.6) **Unit 5:**(10.1-10.5 and 10.8)

**Reference Books**

STTISTICAL COMPUTING

COURSE 19UPCSC3E02 Credits: 4

Course Objective:

- To understand the applications of various correlation methods
- To study and model the sampling concepts
- To acquire knowledge on Hypotheses test

Unit-I

Correlation - Definition of Correlation- Scatter Diagram- Kari Pearson"s Coefficient of Linear Correlation- Coefficient of Correlation and Probable Error of r- Coefficient of Determination - Merits and Limitations of Coefficient of Correlation- Spearman"s Rank Correlation.

Unit-II


Unit-III


Unit-IV

Sampling and Sampling Distributions - Data Collection- Sampling and Non-Sampling Errors - Principles of Sampling-- Merits and Limitations of Sampling-Methods of Sampling- Parameter and Statistic- Sampling Distribution of a Statistic- Examples of Sampling Distributions- Standard Normal - Student"s t - Chi-Square (x2) and Snedecor"s F- Distributions.
Unit-V

Statistical Inference- Estimation and Testing of Hypothesis - Statistical Inference- Estimation- Point and interval- Confidence interval using normal - t and $\chi^2$Distributions- Testing of Hypothesis- Significance of a mean - Using t Distribution.

Text Book


Reference Books

M. Sc Computer Science-Data Analytics Syllabus under CBCS Pattern effect from 2019-2020 Onwards

Periyar University, Salem

COURSE - 19UPCSC3E03

Credits: 4

FUNDAMENTALS OF DATA SCIENCE

Course Objective:

- To learn about the fundamental science of data and concepts of big data
- To learn the lifecycle of the data analytics and data analytics using R
- To learn advanced data analytics methods and big data analytics

Unit - I

Introduction to Big Data Science- Definition of Big Data - Big data characteristics & considerations - Data repositories- analyst perspective - Business drivers for analytics - Typical analytical architecture - Business Intelligence Vs Data science - Drivers of Big data analytics - Role of data scientist in Big data ecosystem - Applications of Big data analytics.

Unit - II

Data Analytics Lifecycle -Need of Data analytic lifecycle - Key roles for successful analytic projects - various phases of Data analytic lifecycle: Discovery - Data Preparation - Model Planning - Model Building - Communicating Results - Operationalization.

Unit - III

Basic Data Analytics methods using R: Introduction to R: GUI of R - Getting data into & out of R - Data types in R - Basic operations - Basic statistics - Generic functions - Data visualization using R - Data exploration & presentation - Statistics for model building & evaluation.

Unit - IV

Advanced Analytics- Theory & Methods: Clustering - Association Rules - Apriori algorithm - Linear Regression - Logistics Regression - Naïve Bayesian classifiers - Decision Trees
Unit - V

Advanced Analytics –Big Data: Time series analysis - Text analysis - Technology and Tools: MapReduce and Hadoop- Communicating and Operationalizing an Analytics Project - Creating the Final Deliverables

Text Books


Reference Books

COURSE - 19UPCSC3E04

Credits: 4

Data Visualization Techniques

Course Objective:

- To develop skills to both design and critique visualization
- To understand why visualization is an important part of data analysis
- To understand the components involved in visualization design
- To understand the type of data impacts the type of visualization

Unit-I

Data Preparation: Importing Data - Text files - Excel spreadsheets - Statistical packages - Databases - Cleaning Data: Selecting variables - Selecting observations - Creating/Recoding variables - Summarizing data - Using pipes - Reshaping data - Missing data - Introduction to ggplot2 - ggplot - geoms - grouping scales - facets - labels - themes - Placing the data and mapping options - Graphs as objects

Unit-II


Unit-III

Unit- IV


Unit- V


Text Book


   Chapters: 1-13 https://rkabacoff.github.io/datavis/

Reference Book

COURSE - 19UPCSC3E05  

Credits: 4

PREDICTIVE ANALYTICS

Course Objective:

- To learn fundamentals of data, predictive analytics methods and techniques.
- To understand given problem and analyze the results efficiently

Unit - I


Unit- II


Unit- III

Unit- IV

Developing a Roadmap: Convincing Your Management to Adopt Predictive Analytics-Preparing Data: Listing the Business Objectives -Processing Your Data-Structuring Your Data - Building a Predictive Model: Getting Started-Developing and Testing the Model-Going Live with the Model- Visualization of Analytical Results: Visualization As a Predictive Tool-Evaluating Your Visualization-Visualizing Your Model"s Analytical Results.

Unit-V


Text book

COURSE– 19UPCSC3E06

Credits: 1

Predictive Analytics Lab

Implement the followings in R studio

1. Perform basics of R programming such as data types, operators, matrices, lists and functions
2. Calculate exploratory data analysis in R
   a. Graphical representation of variables
   b. Dealing with Continuous and Categorical variables
3. Data manipulation in R
   a. Manipulating in rows and columns (Filtering and sorting)
   b. Merging datasets
   c. Reshaping data
4. Perform simple summary statistics of the dataset using R
5. Solve real-world problem using machine learning algorithm of Linear(Multiple)
6. Solve the problem using Decision Tree for the given dataset
7. Cluster the target variable using the K-means clustering algorithm
8. Calculate the Random Forest to find the optimum value of model parameters
9. Solve the classification problem using Logistic Regression for the given dataset
10. Calculate the Naive Bayes for the given dataset
TEXT ANALYTICS

Course Objective:

- To interpret the basics of text analysis.
- To infer about text mining - text analytics and web analytics.
- To illustrate the domains that makes up text analytics and web analytics.

Unit - I

History of Text Mining 6: Roots of text mining - Information extraction and text mining - Development of enabling technology in text mining - Sentiment analysis and opinion mining.

Unit - II

Basics of Text Analytics 6: Definition - Business challenges addressed: information organization and access - Discovery of patterns – Discovery.

Unit - III

Seven Practice Areas of Text Analytics 6: Seven practice areas of text analytics - Finding the appropriate solution to a problem - Overall relationship - Visualizing the domains of text analytics.

Unit - IV


Unit - V

Future of Text and Web Analytics 9: Text analytics and text mining - Future of web analytics - Future of text mining - Integration of web analytics with standard business intelligence tools – New areas that may use text analytics.
Text Books

COURSE - 19UPCSC3E08

Credits: 1

Text Analytics Lab

Implement the followings in python:

1. Perform Text-Wrangling and pre-processing textual data using python
2. Calculate number of words, number of characters, average word length and number of stop words
3. Remove the words using Tokenization (Stop words removal, punctuations, etc.) for text data.
4. Calculate N-grams and term frequency for multiple words in the dataset
5. Calculate Inverse Document Frequency and Term Frequency - InverseDocument Frequency (TF-IDF) for words
6. Perform sentiment analysis of few tweets in python
7. Convert the text into vectors using words embedding techniques
8. Write code that groups document by topic
9. Solve using supervised model for text data
10. Solve using the unsupervised model for text data
M. Sc Computer Science-Data Analytics Syllabus under CBCS Pattern effect from 2019-2020 Onwards

Periyar University, Salem

COURSE - 19UPCSC3E09

Credits: 4

WEB ANALYTICS

Course Objective:

- To learn effective problem solving methodologies in Computing applications
- To provide overview and establish the need for web analytics.
- To understand and apply metrics to analyze the web data.
- To provide exposure to usage of web analytic tools.

Unit - I


Unit - II


Unit - III


Unit - IV

Unit - V


Reference Books

MARKET ANALYTICS

Course Objective:

- To learn effective problem solving methodologies in Computing applications
- To introduce the principles and strategic concepts of marketing analytics.
- To understand cost concepts (TOTAL HOURS - fixed - variable) - profit margins - and lifetime value of the customer.
- To get an overview of the benefits and objectives of quantitative marketing.

Unit - I


Unit - II


Unit - III


Unit - IV

Product - Service and Price Analytics: Product and Service Analytics - Conjoint analysis and product/service metrics - Price Analytics - Pricing techniques and assessment.
Unit - V

Distribution and Promotion Analytics: Distribution Analytics - Analytics-based channel evaluation and selection - Promotion Analytics - Promotion budget estimation and allocation. Sales Analytics and Analytics in Action: Sales Analytics - Metrics for sales - profitability - and support- Analytics in Action - Pivot tables and data-driven presentations.

Text Books

COURSE - 19UPCSC3E11  

Credits: 4

OPERATIONS RESEARCH

Course Objective

- To understand the concept of optimization
- To develop mathematical model of real life cases
- To study Optimization algorithms

Unit - I

Linear Programming Problem (LPP): Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem.

Unit - II

Algebraic Solution: Simplex algorithm - Simplex methods - solving problems with slack variable

Unit - III


Unit - IV

Replacement Problem: Replacement policy for equipment that deteriorate gradually - Replacement of item that fail suddenly-Individual and group replacement - Problems in mortality and staffing.

Unit - V

Text Books

   House Pvt.Ltd. - 2
COURSE – 19UPCSC3E12

Credits: 1

Operations Research Lab

Problems to be performed using OR/Statistical packages

1. Solution of Transportation Problem.
2. Solution of Assignment Problem
5. Project planning (Deterministic case-CPM).
6. Project planning (Probabilistic case-PERT).
7. Crashing of the Project.
9. Simplex problem
10. Solution of shortest path problem.
ELECTIVE- 19UPCSC3E13  
Credits: 4

OPTIMIZATION TECHNIQUES

Course Objective:

- To learn effective problem solving methodologies in Computing applications

Unit - I


Unit - II

Common Methods: Genetic algorithms - Evolution strategies - Evolution programming - Genetic programming - Classifier systems - Swarm Intelligence.

Unit - III

Basic Data Structures and Operators: Genetic Representation - Search operators - Selection schemes - Selection pressure and its impact on evolutionary search. Advanced Features: Constraint handling - Co-evolution and speciation - Parameter Adaptation and Control.

Unit - IV

Evolutionary Computation Approaches: Evolutionary multi-objective optimization - Parallel evolutionary algorithms - Dynamic optimization - Hybrid evolutionary algorithms.

Unit - V

Applications: Knapsack problem - Minimum spanning tree - Travelling Salesman Problem - Scheduling - Robotics and automation - Inventory Control.
Reference Books

1. Xinjie Yu and Mitsuo Gen - "Introduction to Evolutionary Algorithms" - Springer - New York - 2010.
ELECTIVE- 19UPCSC3E14

Credits: 4

Probability and Stochastic Process

Course Objective:

- To learn the basic methodology of “probabilistic thinking” and to apply it to probabilistic problems in signal processing and Communication Engineering;
- To understand basic concepts of probability theory - random variables - Conditional probability and conditional expectation - joint distribution and independence - mean square estimation.
- To understand the difference between time averages and statistical averages

Unit - I


Unit - II

monotonic Transformations of Continuous Random Variable - Transformation of a Discrete Random Variable.

**Unit - III**


**Unit - IV**


**Unit - V**

Text books


Reference Books


COURSE - 19UPCSC3E15

CREDITS - 4

LINEAR PROGRAMMING

Course Objective:

- To learn effective problem solving methodologies in Computing applications
- To introduce methods of optimization to engineering students.
- To know numerous application in civil - environmental - electrical (control) engineering - and industrial engineering.
- To maintain a balance between theory - numerical computation - problem setup for solution by optimization software - and applications to engineering systems.

Unit - I


Unit - II


Unit - III

**Unit - IV**


**Unit - V**


**Text Books**

COURSE - 19UPCSC3E16

Big Data Analytics

Course Objective:

- To understand the basic concepts of big data
- To learn Hadoop, MapReduce, Hive, HBase and Pig

Unit - I Fundamentals of Big Data

Understanding Big Data: Concepts and Terminology – Big Data Characteristics – Types of Data – Case Study Background – Drivers for Big Data Adoption: Information and Communication Technology – Big Data Analytics Lifecycle

Unit - II Fundamentals of Hadoop


Unit - III HDFS and MapReduce

Choosing Key and Value Types for MapReduce Jobs – The Relationship of Input Keys to Output Keys – Sorting Keys and Values – Sort and Shuffle Process – MapReduce Job Configuration and Submission

Hadoop Distributed File System – MapReduce Framework – Setting the Environment – Hadoop Cluster Modes – Running a MapReduce Job with the MR1Framework - Running a MapReduce Job with the Yarn Framework – Running Hadoop Streaming

Unit - IV Hive and HBase

Apache Hive: Setting the Environment – Configuring Hadoop, Hive – Starting HDFS, Hive Server, CLI – Creating and Using a Database– Creating a Managed Table – Loading data into a Table – Creating a Table using LIKE – Adding Data into a Table from Queries – Adding Data using INSERT INTO TABLE - Adding Data using INSERT OVERWRITE – Creating a table using CREATE TABLE AS SELECT – Altering, Truncating and Dropping a Table– Creating an External
Table – Apache HBase: Setting the Environment - Configuring Hadoop, Hive and HBase – Starting the HBase and HBase Shell – Creating HBase Table – Adding Data to a Table – Listing all Tables – Getting a Row of Data – Scanning a Table – Counting the Number of Rows in a Table – Altering a Table – Deleting a Table Row, Column – Disabling and Enabling a Table – Truncating and Dropping a Table – Determining If Table Exists – Creating a Hive External Table stored by HBase

Unit - V Pig


Text Books


Reference Books

COURSE – 19UPCSC3E17

CREDITS- 1

BIG DATA ANALYTICS LAB

1. Implement File System Shell Commands for HDFS in HadoopEnvironment
2. Write a MapReduce program using single reduce function for findingMaximum and Minimum Number
3. Write a MapReduce program using multiple reduce function for WordCount in a given Text Document
4. Write a MapReduce program for Matrix Multiplication
5. Write a MapReduce program using multiple reduce function for MatrixMultiplication
6. Implement the following using Pig Latin
   6.1 Input and Output Operations
   6.2 Relational Operations
7. Implement the following using Pig Latin
   a. User-Defined Functions
   b. Advanced Relational Operations
8. Implement the following using Hive commands
   a. Handling the Database
   b. Creating and Manipulating Table
9. Implement the following using Hbase commands
   a. Creation of Tables
   b. Table Manipulation
10. Create a Hive External Table stored by HBase in Hive
INFORMATION RETRIEVAL

Course Objective:

- To understand the basics of information retrieval process.
- To evaluate the performance of IR system.
- To explore information sharing on semantic web.
- To understand the various applications of Information Retrieval giving emphasis to multimedia and distributed IR - web Search.

Unit - I


Unit - II


Unit - III

Unit - IV


Unit - V


Text Books

2. C.J. Rijsbergen - "Information Retrieval" - (www.dcs.gla.ac.uk).

Reference Books


Course objective

- To get introduced to language processing technologies for processing the text data.
- To understand the role of Information Retrieval and Information Extraction in Text Analytics.
- To acquire knowledge on text data analytics using language models.

Unit-I


Unit-II

Reading unstructured data - Representing text data - Part of speech tagging – Syntactic representation - Text similarity - WordNet based similarity- Shallow parsing –Semantic representation.

Unit-III

Information retrieval and Information extraction - Named Entity Recognition – Relation Identification-Template filling.

Unit-IV


Unit-V

Tools – Natural Language Tool kit, Apache OpenNLP. Applications of Text Analytics – Applications in Social media - Life science - Legal Text–Visualization -Case studies.
Text Books


Outcomes

- Students will be able to:
- Process the text data at syntactic and semantic level.
- Extract the key information from Text data.
- Analyze the text content to provide predictions related to a specific domain using language models.
COURSE – 19UPCSC3E20  
CREDITS- 1

NATURAL LANGUAGE COMPUTING LAB

Implement the following in Python

1. Word Tokenization
2. Sentence Tokenization
3. Stop Word Removal
4. Stemming
5. Frequencies of distinct words
6. Remove digits from a given sentence
7. Identify and remove special characters from a given sentence
8. Word n-gram generation from a given sentence
9. Identification of keywords from a given document
10. Document Classification
Image and Video Analytics

Course objective

- To teach the fundamentals of digital image processing, image and video analysis.
- To understand the real time use of image and video analytics.
- To demonstrate real time image and video analytics applications and others.

Unit-I

Digital image representation- Visual Perception- Sampling and Quantization-
Basic Relations between Pixels- Mathematical Tools Used in Digital Image
Processing: Fundamental Operations –Vector and Matric Operations- Image
Transforms (DFT, DCT, DWT, Hadamard).

Unit-II

Fundamentals of spatial filtering: spatial correlation and convolution-
smoothingblurring- sharpening- edge detection - Basics of filtering in the
frequency domain: smoothing-blurring- sharpening--Histograms and basic
statistical models of image.

Unit-III

Colour models and Transformations – Image and Video segmentation-Image
and video demonising- Image and Video enhancement- Image and Video
compression.

Unit-IV

Object detection and recognition in image and video-Texture models Image and
Video 25 classification models- Object tracking in Video.

Unit-V

Applications and Case studies- Industrial- Retail- Transportation & Travel-
Remote sensing-Video Analytics in WSN: IoT Video Analytics Architectures.
Reference Books


Outcomes

Students will be able to:

- Describe the fundamental principles of image and video analysis and have an idea of their application.
- Apply image and video analysis in real world problems.
COURSE - 19UPCSC3E22

SOCIAL NETWORKING AND MINING

Course objective

- To understand the components of the social network.
- To model and visualize the social network.
- To mine the users in the social network.
- To understand the evolution of the social network.
- To mine the interest of the user.

Unit-I


Unit-II


Unit-III

Mining Communities- Aggregating and reasoning with social network data- Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

Unit-IV

Text and Opinion Mining- Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.
Unit-V

Tools for Social Network Analysis- UCINET – PAJEK – ETDRAW – StOCNET – Splus – R – NodeXL – SIENA and RSIENA – Real world Social Networks (Facebook- Twitter etc.)

Text Books


Outcomes

- Students will be able to:
  - Work on the internal components of the social network.
  - Model and visualize the social network.
  - Mine the behavior of the users in the social network.
  - Predict the possible next outcome of the social network.
  - Mine the opinion of the user.
WEB INTELLIGENCE

Course objective

- To know the importance of qualitative data, get insights and techniques.
- To develop customer-centric approach in dealing with data.
- To know the principles, tools and methods of web intelligence.
- To apply analytics for business situations.

Unit-I

Web Analytics – Basics – Traditional Ways – Expectations – Data Collection –
Clickstream Data – Weblogs – Beacons – JavaScript Tags – Packet Sniffing –
Outcomes data – Competitive data – Search Engine Data.

Unit-II

Qualitative Analysis – Customer Centricity – Site Visits – Surveys –
Questionnaires – Website Surveys – Post visits – Creating and Running-
Benefits of surveys – Critical components of successful strategy.

Unit-III

Web Analytic concepts – URLs – Cookies – Time on site – Page views –
Understand standard reports – Website content quality – Navigation reports
(top pages, top destinations, site overlay). – Search Analytics – Internal search,
SEO and PPC – Measuring Email and Multichannel Marketing - Competitive
intelligence and Web 2.0 Analytics – Segmentation – Connectable reports.

Unit-IV

Google Analytics: Analytics - Cookies - Accounts vs Property - Tracking Code -
Tracking Unique Visitors - Demographics - Page Views & Bounce Rate
Acquisitions - Custom Reporting.

Unit-V

Goals & Funnels – Filters - Ecommerce Tracking - Real Time Reports -
Customer Data Alert - Adwords Linking - Adsense Linking -Attribution
Modeling - Segmentation - Campaign Tracking - Multi-Channel Attribution.
References:

1. Avinash Kaushik, “Web Analytics 2.0: The Art of Online Accountability and
4. can help you Understand your Users”, Morgan Kaufmann, 2013.

Outcomes:

Students will be able to:

- Know the concepts and terminologies related to web analytics.
- Explore various parameters used for web analytics and their impact.
- Explore the use of tools and techniques of web analytics.
- Get experience on websites, web data insights and conversions
DEEP LEARNING

Unit -I

Getting Yourself Ready for Deep Learning: Basics of linear algebra - Deep learning with GPU - Deep learning software frameworks - Setting up deep learning on AWS

Unit -II
Getting Started with Neural Networks: Multilayer perceptrons - How a network learns - Deep learning models - Practical examples

Deep Learning in Computer Vision: Origins of CNNs- Convolutional Neural Networks -Fine-tuning CNNs - Popular CNN architectures

Unit -III
NLP - Vector Representation: Traditional NLP - Deep learning NLP - Applications.


Unit -IV

Deep Reinforcement Learning: What is reinforcement learning (RL)? - Deep reinforcement learning - Implementing reinforcement learning

Unit - V
Deep Learning Hacks: Massaging your data - Tricks in training - Fine-tuning - Model compression

Deep Learning Trends: Recent models for deep learning - Novel applications
TEXT BOOK:


References


COURSE - 19UPCSC3E25  CREDITS- 4

BIOINFORMATICS

Course objective

- To understand Bioinformatics from computing perspective.
- To comprehend bioinformatics databases, file formats and its applications.
- To understand the applications of Bioinformatics

Unit -I


Unit -II


Unit -III

Sequence submission-Sequence submission tools-BANKIT-SEQUIN-WEBIN- SAKURA literature databases-PubMed and medline. Data mining and its techniques- data warehousing- Sequence annotation- principles of genome annotation- annotation tools & resources.

Unit -IV

Applications of bioinformatics-Applications of Bioinformatics-phylogenetic analysis-steps in phylogenetic analysis-microarrays-DNA and protein microarraysBioinformatics in pharmaceutical industry- informatics & drug-discovery – pharma informatics resources drug discovery and designing-SNP.
Unit - V

File formats-File formats-raw/plain format-NCBI-Genbank flat file format-ASN.1- GCGFASTA- EMBL- NBRF- PIR-swissprot sequence formats- PDB format-Introduction to structure prediction methods.

References:

Question Paper Pattern for Theory Examination

**Time:** Three Hours

**Maximum Marks:** 75

**Part - A (15 X 1 = 15 Marks)**
Answer **ALL** Questions Multiple Choice

**Part - B (2 X 5 = 10 Marks)**
Answer **ANY TWO** Questions out of **Five**

**Part - C (5 X 10 = 50 Marks)**
Answer **ALL** Questions
Either (or) Type Five Questions
(One question from Each Unit)