MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V , Bhopal)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CLOUD COMPUTING AND VIRTUALIZATION
DC- 150611

Course Objectives:

1. To Provide the basics of cloud computing concepts along with virtualization techniques.
2. To provide overview of the field of Cloud Computing, and an in-depth study into its enabling technologies and main building blocks.
3. To develop the skills needed to become a practitioner or carry out research projects in this domain.

Unit I - Introduction:

Definition and evolution of cloud computing, Cloud components, Essential characteristics, advantages and limitations of cloud computing, Issues in cloud computing, Virtualization: Need of virtualization, Features of Virtualization, limitations, Classification of virtualization: Hardware virtualization, Desktop virtualization.

Unit II – Virtualization Concepts:

Server Virtualization: Introduction, types of server virtualization, Virtual machine basics, types of virtual machines, hypervisor concepts and types, Utility Computing, Elastic Computing, Virtualization applications in enterprises, Pitfalls of virtualization, Multitenant software, Virtualization security management, Datacenter Virtualization, Client Virtualization, Cloud Virtualization.

Unit III – Cloud Architecture:

Cloud architecture, Layers in cloud architecture, Service Models: Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Application as a Service, Functions as a Service, features and benefits of each. Deployment Models: Public clouds, Private clouds, Community clouds, Hybrid clouds.

Unit IV – Cloud Storage & Security:

Introduction to Storage Systems, Data in the cloud: Relational databases, Cloud Storage Concepts, Cloud file systems: GFS and HDFS. Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB), Cloud Object Storage, Features and functions of cloud computing platforms, Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud: Cloud computing security architecture.

Unit V – Tools and Techniques:

Distributed Programming for the Cloud, Map-Reduce and extensions: Parallel computing, The Map-Reduce model, Example/Application of MapReduce, Introduction to Simulators, CloudSim simulator, GreenCloud simulator, VMWare Simulator, Oracle Virtual Box. Case Study: AWS.

COURSE OUTCOMES:

After successful completion of the course, the learners would be able to:

1. Build the fundamental ideas behind Cloud Computing, the evolution of the paradigm, and introduce the virtualization concepts.
2. Understand ideas and principles of Virtualization and its applications.
3. Describe fundamental concepts of cloud infrastructures and Service Oriented Architecture.
4. Illustrate the fundamental concepts of cloud storage and cloud security.
5. Study of various tools and technologies for implementing applications of Cloud.

Reference Books:-

- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
- Kai Hawang, Geoferrey C Fox, “Distributed and Cloud Computing”, Elseveir publication, 2012
- David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

List of Experiments for Cloud Computing And Virtualization

1. Study of Cloud Service Models
2. Working with Goggle Drive to make spreadsheet and notes
3. Installation and configuration of Hadoop
4. Installation and configuration of Justcloud
5. Working and installation of CloudSim
6. Working and installation of GreenCloud
7. Working and installation of VMWare
8. Working and installation of Oracle Virtual Box
9. Working and installation of Google App Engine
10. Working and installation of Microsoft Azure
11. Study of Amazon Web Services

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

List of Skill Based Mini Projects for Cloud Computing and Virtualization

1. Cloud-Enabled Attendance System
2. Cloud-Enabled Bookstore System
3. Online Blood Bank System
4. Cloud-Based Bus Pass System
5. Online Education System
6. Cloud-Enabled Data Leak Detection System Using SQL Injection
7. Online Chatbot System
8. Cloud-Based File Storage System using Hybrid Cryptography
9. Cloud-Based Rural Banking
10. Cloud-Based Smart Traffic Management System

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIGITAL IMAGE PROCESSING

DC-150612

COURSE OBJECTIVES:

1. To understand the fundamentals of image acquisition, image processing in spatial and frequency domain.
2. To understand image transforms used in digital image processing.
3. To know about the image restoration techniques and methods used in image processing.

Unit – I:

Introduction and Fundamental: Introduction to Image Processing Systems, Digital Image fundamentals: Components of Digital Image Processing Systems, Image Model, Image Geometry, Sampling and Quantization of Images, Classification of Digital Images, Zooming and Shrinking, Relationship between pixels.

Unit – II:

Image Enhancement in spatial Domain: Introduction, Basic Gray Level Function, Piecewise Linear Transformation, Contrast Stretching, Histogram Specification, Histogram Equalization, Local Enhancement using arithmetic and logical operation- Image Subtraction, Image averaging, Image Smoothing: Smoothing Spatial Filters, Smoothing Linear Filters, Image Sharpening.

Unit – III:

Image Enhancement in Frequency Domain: Introduction to Fourier Transform, Filters: Low Pass and High Pass, Gaussian Filters, Homomorphic Filtering, **Image Restoration:** Model of Image Degradation/Restoration process, Noise Models, Noise Reduction in Spatial and Frequency Domain, Inverse Filtering, Mean Filters, Least Mean Square (Wiener) Filtering, FIR Wiener Filter.

Unit – IV:

Morphological Image Processing: Logic operation involving binary images, Dilation and Erosion, Opening and Closing, Morphological Algorithms: Boundary Extraction, Region filling, Extraction of connected components, Convex Hull, Thinning and Thickening.

Unit –V:

Image Registration: Introduction, Geometric Transformation, Plane to plane Transformation, Mapping, **Image Segmentation:** Introduction, Region Extraction, Pixel based approach, Multilevel Thresholding, Local Thresholding, Region based approach, Region growing, Splitting and Merging, Edge and line detection, Corner Detection, Detection of Discontinuities, Edge and boundary detection.

RECOMMENDED BOOKS:

1. Digital Image processing, Rafael C Gonzalez, Richard E Woods, Pearson Education.
2. Fundamental of Digital Image processing, K. Jain, Pearson education.
3. Digital Image Processing, S. Esakkirajan, S. Jayaraman, T. Veerakumar, Tata McGraw- Hill Education.

COURSE OUTCOMES: After completing the course, the student will be able to:

CO1: Explain different modalities and current techniques in image acquisition.

CO2: Classify spatial and frequency domain techniques used in image processing.

CO3: Apply image processing techniques to enhance visual images

CO4: Analyze the constraints in image processing when dealing with real problems.

CO5: Evaluate various enhancement, restoration and retrieval techniques of image processing.

CO6: Design a system using the mathematical models and principles of digital image processing for real world problems.

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LIST OF EXPERIMENT

1. Program to read an image and display it on the screen.
2. Program to determine image negative.
3. Read an image and perform different filtering operations (Average, Median etc.)
4. Program to create motion blur.
5. Program performs gray level slicing without background.
6. Program to perform brightness enhancement and brightness suppression of an image.
7. To create a vision program to find histogram value and display histograph of a grayscale and color image.
8. Read an RGB image and segment it using threshold method.
9. Read a colour image and separate the colour image into red green and blue planes.
10. Perform gamma correction for the given colour image
11. Program to perform different image conversion techniques
12. To create a color image and perform read and write operation
13. Code to implement watermarking in spatial domain.
14. Code to generate different levels of Gaussian Pyramid.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Skill Based Mini Project

1. Read multiple images from a folder and show them using sub plotting operation.
2. Read an image given by the user and perform different filtering operations (Average, Median etc.)
3. Implement Smart selfie using image processing techniques.
4. Object detection (eg. Face mask, Number plate etc.)
5. Bookshop management system using Image processing techniques
6. Real time sentiment analysis.
7. Apply image segmentation techniques on original image given by the user.
8. Implement a GUI to enhance the image using Histogram equalization techniques.
9. Implement a GUI for Edge detection (Sobel, Prewitt, Canny etc.)

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

MACHINE LEARNING

150613

COURSE OBJECTIVES:

1. To understand types of issues and challenges that could be solved by machine learning.
2. To be able to understand wide variety of learning models and use them.
3. To be able to evaluate and optimize these models

Unit – I:

Introduction to Machine Learning: Learning, Traditional Vs Machine Learning, Types Of ML, Classification and Regression model, Challenges faced by ML, Steps of developing an ML model, Bias and Variance, Underfitting and Overfitting, Regularization, Data visualization, Outlier, Testing and validating, K cross validation, Hyperparameter tuning, Model Selection.

Unit – II:

Model optimization and Evaluation: Parametric and non- Parametric model, Learner performance evaluation, confusion matrix, Recall, accuracy, precision, Model optimization, Cost/Loss Function, Derivative of cost function and non-derivative cost function, Gradient descent, Mini-batch Gradient Descent (sckit-learn), Stochastic Gradient descent(sckit-learn), Momentum(sckit-learn).

Unit – III:

Supervised Machine Learning Algorithim with python: Model Complexity vs Dataset Size, Supervised Machine Learning Algorithms, k-Nearest Neighbors, Linear Regression, RMSE, Logistic Regression, Log Loss**,** Support Vector Machine, Hinge Loss, Kernel Trick, polynomial Kernal, Decision Trees, Gini impurity.

Unit – IV:

Ensemble Learner with python: Ensemble learner, Bagging, Pasting **,** Voting Classifiers, Out-of-Bag, Evaluation, Random Patches and Random Subspaces , Random Forests , Extra-Trees, Boosting , AdaBoost, Gradient Boosting, Stacking.

Unit –V:

Unsupervised Machine Learning with python: The Curse of Dimensionality, Projection, Manifold Learning Principal component analysis, Clustering , K-Means, Limits of K-Means, Clustering for Image Segmentation, Clustering for Preprocessing, Clustering for Semi-Supervised Learning, DBSCAN.

RECOMMENDED BOOKS:

1. Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow by Aurélien Géron
2. Introduction to Machine Learning with Python by Andreas C. Müller & Sarah Guido, O'reilly
3. Machine Learning For Absolute Beginners: A Plain English Introduction (Second Edition)" by Oliver Theobald
4. Machine Learning For Dummies" by John Paul Mueller and Luca Massaron
5. Machine Learning in Action" by Peter Harrington

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE OUTCOMES: After completing the course, the student will be able to:

CO1: Define basic concepts of Machine Learning.
CO2: Illustrate various techniques for learner evaluation and optimization using python
CO3: Implement various types of supervised machine learning algorithm using python
CO4: Apply ML ensemble model to solve real world problem using python
CO5: Apply unsupervised ML techniques to solve real world problems using python

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LIST OF EXPERIMENT

1. Perform exploratory data analysis and visualization after importing a .CSV file.
    - Handle missing data by detecting and dropping/ filling missing values.
    - Transform data using different methods.
    - Detect and filter outliers.
    - Perform Vectorized String operations on Pandas Series.
    - Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.
2. Recognize data Skew-ness, outliers both using statistical function and Graphical representation.
3. Write a Python program to implement Simple Linear Regression to predict if male or female based on Height.
4. Implement Various Regression algorithm for House Price Prediction (USA housing Dataset) and compare there accuracy using scikitlearn
    - Linear Regression
    - Polynomial Regression
    - Support Vector machine
5. Implement Logistic regressor using softmax on iris dataset using sckitlearn.
6. Implement Regularized Regression for house price prediction and evaluate there accuracy using sckitlearn.
    - Ridge Regression
    - Lasso Regression
7. Implement Various Classification algorithm for iris data set and evaluate there performance.
    - Navie Bayes Classifier
    - Logistic Regression
    - Support vector Machine
    - Decision tree
8. Implement Various ensemble on housing and iris dataset and evaluate there performance
    - Voting classifier
    - Random Forest (Bagging and pasting)
9. Implement principle component analysis on any choosen dataset/
10. Implement various clustering algorithm on choosen dataset
    1. K-Mean
    2. DBSCAN

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Skill Based Mini Project

1. Implement a regressor for any Medical disease diagnosis.
2. Implement a Cervical Cancer Risk Classifier
3. Regression model for Video Game Sales Prediction
4. Regression model for predicting if song will be popular
5. Regression model for Customer Behavior Analysis
6. Regression model to predict health insurance cost
7. Titanic Survival Prediction
8. Spam and not Spam Classifier
9. Spotify Music Recommendation System
10. Target Customer segmentation.

Department of Computer Science and Engineering

DATA STRUCTURES
900106 (OC-1)

COURSE OBJECTIVES

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit-I

Introduction to Data Structures: Algorithms & their Characteristics, Asymptotic Notations. Arrays and its Representations, Index to Address Translation. **Linked List:** Introduction, Implementation of Linked List, Operations, Circular Linked List, Doubly Linked List, Polynomial Manipulation using Linked List.

Unit-II

Stacks: Concepts and Implementation of Stacks, Operations on Stack, Conversion of Infix to Postfix Notation, Evaluation of Postfix Expression, Recursion.

Queues: Concepts and Implementation, Operations on Queues, Dequeue, Priority Queues, Circular Queues and Application.

Unit-III

Trees: Types, Terminology, Binary Tree -Representations, Traversal, Conversion of General Tree to Binary Tree, Binary Search Tree, Threaded Binary Tree and Height Balanced Tree.

Unit-IV

Graphs: Background, Graph Theory Terminologies, Representation of Graphs- Sequential & Linked Representation, Path Matrix, Graph Traversals- BFS, DFS, Spanning Trees, Applications of Graph.

Unit-V

Searching & Sorting: Linear Search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort and Heap Sort, Comparison between Sorting Techniques, Hashing and Collision Resolution Techniques.

RECOMMENDED BOOKS

- Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2nd Edition.
- An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.
- Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. outline the basics of algorithms and their performance criteria.

CO2. explain the working of linear/non-linear data structures.

CO3. identify the appropriate data structure to solve specific problems.

CO4. analyze the performance of various data structures & their applications.

CO5. evaluate the time/space complexities of various data structures & their applications.

CO6. design the optimal algorithmic solutions for various problems.

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Department of Computer Science and Engineering

PYTHON PROGRAMMING
900107 (OC-1)

COURSE OBJECTIVES

- To understand the structure and components of a python program.
- To learn the basic construct of python programming for implementing interdisciplinary research-based problems.
- To plot data using appropriate python visualization libraries for analysis.

Unit I

Introduction to Python: Setting Up Programming Environment, Running Python Programs from a Terminal, Variables and Simple Data Types: Variables, Strings, Numbers and Maths, Comments, Conditional Statements, Introducing Loops, Working of Input Function.

Unit II

Tuples and Lists: Tuples, Lists, List Operations, Using If Statements with Lists, Organizing a List, Working with Lists: Looping through Entire List, Making Numeric Lists, Working with Part of List. Dictionaries and Sets: Simple Dictionary, Looping Through a Dictionary, Nesting, Example with a Dictionary, Fibonacci and Dictionaries, Global Variables, Defining a Set, Set Operations.

Unit III

Functions: Defining a Function, Passing Arguments, Return Values, Passing a List, Passing an Arbitrary Number of Arguments, Storing Functions in Module, In- Built Functions, Lambda Functions. **Classes and Inheritance:** Object Oriented Programming, Creating and using a Class, Working with Class Instances, Methods, Inheritance, Importing Classes, Python Standard Library.

Unit IV

Files and Exceptions: Reading from a File, Writing to a File, File Operations, Assertions, Exceptions, Exception example. **Debugging:** Programming Challenges, Classes of Tests, Bugs, and Debugging, Debugging examples.

Unit V

Data Visualization: Installing Matplotlib, Plotting a Simple Line Graph, Random Walks, Making Histogram. **Graphical User Interfaces:** Event-Driven Programming Paradigm; Tkinter Module, Creating Simple GUI; Buttons, Labels, Entry Fields, Dialogs; Widget Attributes - Sizes, Fonts, Colors, Layouts, Nested Frames.

RECOMMENDED BOOKS

- Python Crash Course: A Hands-On, Project-Based Introduction to Programming, By Eric Matthes.
- Learn Python the Hard Way: 3rd Edition.
- T.R. Padmanabhan, Programming with Python, Springer, 1st Ed., 2016.
- Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, 1st Ed., 2012.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. understand basic python programming constructs
CO2. analyze various data structures available in python
CO3. implement the Object-oriented programming paradigm in Python
CO4. apply the different File handling operations
CO5. design GUI Applications in Python
CO6. construct graphical representation of data using python packages

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