Savitribai Phule Pune University
Home
Fourth Year of Computer Engineering (2019 Course)
410255: Laboratory Practice V

Teaching Scheme	Credit	Examination Scheme
Practical: 2 Hours/Week	01	Term Work: 50 arks Practical: 50 Marks

Companion Course: High Performance Computing(410250), Deep Learning(410251)

Course Objectives:

- To understand and implement searching and sorting algorithms.
- To learn the fundamentals of GPU Computing in the CUDA environment.
- To illustrate the concepts of Artificial Intelligence/Machine Learning(AI/ML).
- To understand Hardware acceleration.
- To implement different deep learning models.

Course Outcomes:

CO1: Analyze and measure performance of sequential and parallel algorithms.
CO2: Design and Implement solutions for multicore/Distributed/parallel environment.
CO3: Identify and apply the suitable algorithms to solve AI/ML problems.
CO4: Apply the technique of Deep Neural network for implementing Linear regression andclassification.
CO5: Apply the technique of Convolution (CNN) for implementing Deep Learning models.
CO6: Design and develop Recurrent Neural Network (RNN) for prediction.

Guidelines for Instructor's Manual

Laboratory Practice V is for practical hands on for core courses High Performance Computing and Data Learning. The instructor's manual is to be developed as a hands-on resource and as ready reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction and Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, references among others.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal may

consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software and Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, Algorithm/Database design, test cases, conclusion/analysis). Program codes with sample output of allperformed assignments are to be submitted as softcopy.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness reserving weightage for successful mini-project completion and related documentation.

Guidelines for Practical Examination

- Both internal and external examiners should jointly frame suitable problem statements for practical examination based on the term work completed.
- During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement.
- The supplementary and relevant questions may be asked at the time of evaluation to test the student‟s for advanced learning, understanding of the fundamentals, effective and efficient implementation.
- Encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising boost to the student's academics.

Guidelines for Laboratory Conduction

- List of recommended programming assignments and sample mini-projects is provided for reference.
- Referring these, Course Teacher or Lab Instructor may frame the assignments/mini-project by understanding the prerequisites, technological aspects, utility and recent trends related tothe respective courses.
- Preferably there should be multiple sets of assignments/mini-project and distribute among batches of students.
- Real world problems/application based assignments/mini-projects create interest among learners serving as foundation for future research or startup of business projects.
- Mini-project can be completed in group of 2 to 3 students.

- Software Engineering approach with proper documentation is to be strictly followed.
- Use of open source software is to be encouraged.
- Instructor may also set one assignment or mini-project that is suitable to respective course beyond the scope of syllabus.

Operating System recommended :- 64-bit Open source Linux or its derivative
Programming Languages: Object Oriented Languages
C++/JAVA/PYTHON/R
Programming tools recommended: Front End: Java/Perl/PHP/Python/Ruby/.net, Backend : MongoDB/MYSQL/Oracle, Database Connectivity : ODBC/JDBC

Suggested List of Laboratory Experiments/Assignments

410250: High Performance Computing

Any 4 Assignments and 1 Mini Project is Compulsory

Group 1

1.	Design and implement Parallel Breadth First Search and Depth First Search based on existing algorithms using OpenMP. Use a Tree or an undirected graph for BFS and DFS .
2.	Write a program to implement Parallel Bubble Sort and Merge sort using OpenMP. Use existing algorithms and measure the performance of sequential and parallel algorithms.
3.	Implement Min, Max, Sum and Average operations using Parallel Reduction.
4.	Write a CUDA Program for : 1. Addition of two large vectors 2. Matrix Multiplication using CUDA C
5.	Implement HPC application for AI/ML domain.

Group 2

6.	Mini Project: Evaluate performance enhancement of parallel Quicksort Algorithm using MPI
7.	Mini Project: Implement Huffman Encoding on GPU
8.	Mini Project: Implement Parallelization of Database Query optimization
9.	Mini Project: Implement Non-Serial Polyadic Dynamic Programming with GPU Parallelization

410251: Course Code : Deep Learning

Any 3 Assignments and 1 Mini Project is Compulsory

Group 1

1.	Linear regression by using Deep Neural network: Implement Boston housing price prediction problem by Linear regression using Deep Neural network. Use Boston House price prediction dataset.
2.	**Classification using Deep neural network** (Any One from the following) 1. Multiclass classification using Deep Neural Networks: Example: Use the OCR letter recognition datasethttps://archive.ics.uci.edu/ml/datasets/letter+recognition 2. Binary classification using Deep Neural Networks Example: Classify movie reviews into positive" reviews and "negative" reviews, just based on the text content of the reviews. Use IMDB dataset
3.	Convolutional neural network (CNN) (Any One from the following) • Use any dataset of plant disease and design a plant disease detection system using CNN. • Use MNIST Fashion Dataset and create a classifier to classify fashion clothing into categories.
4.	**Recurrent neural network (RNN)** Use the Google stock prices dataset and design a time series analysis and prediction system using RNN.
Group 2	
5.	Mini Project: Human Face Recognition
6.	Mini Project: Gender and Age Detection: predict if a person is a male or female and also their age
7.	Mini Project: Colorizing Old B&W Images: color old black and white images to colorful images

@The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	1	-	2	1	-	-	-	-	-
CO2	1	2	1	-	-	1	-	-	-	-	-	1
CO3	-	1	1	1	1	1	-	-	-	-	-	-
CO4	3	3	3	-	3	-	-	-	-	-	-	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-
CO6	3	3	3	3	3	-	-	-	-	-	-	-
CO7	3	3	3	3	3		-	-	-	-	-	-