ACA PROJECT REPORT
MINI PROJECTS (Mentor - Anuj Nagpal)

Link To github repo here

Introduction

Project was aimed at getting an introduction to various fields of Computer Science including DS and algorithms, Competitive Coding , Web Scraping , Machine Learning, Learning Latex , cybersecurity , Web Development, getting used to Linux(ubuntu) and utilities like git, bash, sed, awk and mastering commonly used languages C++ and Python. The Project was divided in mainly 2 Task Lists where each task aimed at teaching one of the above.

Tasks :-

Task List 0 (Getting started) :-

I) Learning C++ :-

Learnt C++ Language through the tutorial that was provided.

II) Installing and setting up ubuntu :-

Installation and setting up ubuntu. Getting familiar with Linux.

III) Opening a homepage directory on iitk server : -

Opened the homepage directory on iitk server. Setup my homepage on homepage directory.

IV) Writing C programs for Calculating nth Fibonacci Number :-

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Revised recursion and sorting. Wrote C programs for calculating fibonacci numbers through iterations and recursion. Compared their execution time using ctime.h (O(2^n) vs O(n)) . Wrote a C program which calculated fibonacci number through matrix multiplication. Comparing its execution time.(O(logn))

Task List 1 :-(Starting with algorithms)

I) Learning Binary Search Tree :- Link to task folder

Learnt a new data structure binary search tree through given lecture slides and implemented it to solve given problem.

II) Learning Stacks :- Link to task folder

Learnt a new data structure stacks through given lecture slide and implemented it to solve given problem.

III) Introduction to Graph Theory (Preparing for next task) :- link to task folder

Learnt basic graph theory through given lecture to be used in next task.

IV)Learning Python(Preparing for next task) :-

Learnt Python from tutorialspoint as a pre-requisite for upcoming task.

Task List 2 :- (The Final Task List)

I) Learning git :-

Learnt how to use git from here and here and made a git repo for aca_project.

II) Learning Graph Algorithms :- link to task folder

Learnt Graph Algorithms BFS,DFS , Dijiktra's Algorithm using the given lecture slides. And made a C++ program which takes input a map and solves a query for shortest path between 2 points.

Usage : - first line of input takes 3 integers n m and q where n is no of points in map, m is no of edges in m and q is no of queries. Next m lines contain 2 strings ai,bi and a integer wi denoting m edges between ai and bi with edge length wi.

Next q lines are q queries which contain 2 integers u and v . After each line of query we get an output which denotes shortest path from u to v.

Note:- Graph must be connected.

III) Diving into Competitive Coding:-

Learned and practice competitive coding with help of shared guide.

IV)Built tic tac toe game on python:- link to task folder

Built a tic tac toe game in python. Simply run the python file to play game(Python tictactoe.py) and follow in game instructions.

V)Web Scraping:- link to task folder

Wrote a python script which outputs link to all videos of a youtube playlist in a txt file using urllib2 and beautifulsoup libraries.

Usage:- if you want links to videos of any other youtube playlist change the playlist link in file scrape.py. To run execute:- Python scrape.py ><outputfile.txt>

VI) WEB D:- link to task folder

Leant Html and CSS and made a website which is similar to Prof. Vinay Namboodri's Site with "Arbitrary " Earth Science Content.

VII) Bash Scripting:- link to task folder

Leant Bash Scripting, Sed , Awk, Grep ,etc. Created a bash script which converts the given .txt file into corresponding .csv file using Awk Command.

Usage:- Simply run the bash script using bash TxtToCsv.sh . To change input/output files replace csey16.txt with input filename and result.csv with output file name.

VIII) Wargames:- link to task folder

Played bandit wargame and completed first 12 levels as was told to. Password to Level 1 to Level 13 are here.

IX) Intro to Machine Learning:- link to task folder

Learnt basics of machine learning through given lecture slides and implemented k means classifier on mnist dataset and plotted the accuracy vs no of training examples graph.

Usage:- Open the directory in octave and type ml in command line.

X)Latex :-link to task folder

Learnt Latex through ShareLatex Tutorial on youtube. Learnt Sharelatex beamer and made a presentation on eigenvalues and eigenvectors chapter from lecture slide of Prof A.K.Lal by writing a latex code and generating pdf output.

To compile the latex document run following:- Latex Practice.tex

To generate pdf output:- Pdflatex Practice.tex

Conclusion:-

It was a fun projected that helped me learn the basics of various things like machine learning, competitive coding ,etc. And motivated me to explore more in these fields.Thanks to Anuj for making this project a lot more fun than i expected !.