

CS575 Project Proposal

A team of N students should implement $N+1$ nontrivial algorithms that are more advanced than the algorithms in the lecture slides. (Implementing any algorithms already in the lecture notes are unacceptable and won't be counted toward the $N+1$ requirement.) For this project, you can use any programming language or tools of your preference. For more information, please refer to the document titled "Sample Projects" on Brightspace.

Team members:

- (1) Harshitha Guru Raj
- (2) Karthick Gunasekar
- (3) Yashaswi Dattatreya Hasarali

What problems do you want to work on?

1. Implementation of Red Black tree
2. Page Ranking - HyperLink Induced Topic Search(HITS) Algorithm
3. Pattern Searching - Boyer Moore Algorithm
4. Cat and Mouse - MiniMax Algorithm

Why is it an important/interesting problem?

- Red Black tree is a self balancing binary search tree that maintains some balance while insertion and deletion. The Red black tree can reduce the search time and maintain the time complexity around $O(\log n)$.
- HyperLink Induced Topic Search(HITS) Algorithm does more than a text search. It helps us to discover and rank the web pages based on our search. So that whenever a particular search is made we will be able to find the truly relevant pages for the given query.
- Pattern Searching/Matching tend to occur in day to day activities. Such as while searching a particular content or finding the occurrences of the particular text in a document , or in a browser, or in Database.
- Cat and Mouse is a two player game based on Decision Making algorithm, which provides an optimal move for the player assuming that the opponent is also playing optimally.

Why is it significant (non-trivial) in terms of implementation?

- In a Red Black tree the nodes are represented with either red or black color, these colors are used to ensure that the tree remains balanced during insertion and deletion.
- HITS Algorithm uses hubs and authorities to define a recursive relationship between web pages. HITS Algorithm , like PageRank, makes use of the link structure of the Web graph

in order to decide the relevance of the pages. But unlike PageRank, HITS only operates on a small subgraph from the web graph and this subgraph is query dependent.

- The Boyer Moore Algorithm does preprocessing over the pattern so that the pattern can be shifted by more than one. And the algorithm uses a combination of two approaches: Bad Character Heuristic, Good Suffix Heuristic.
- MiniMax Algorithm is a decision making algorithm, it also uses the BackTracking Algorithm for decision making and finding the next optimal move. The Algorithm also uses recursion to search through the game-tree.

Why is it doable this semester? (Describe your plan, strength, familiarity with the language/tool of your choice, etc.)

- Strength - Each of us have a handful of work experience in Web Application Development, Android Application Development, and Back End Development.
- Familiar with algorithms, development tools(Anaconda, VS Code) , and programming languages such as C, JAVA, Python, Javascript.
- Plan - spend 5 hours weekly each, 15 hours total.