Opened: Thứ Tư, 24 tháng 1 2024, 6:14 PM
Due: Thứ Năm, 28 tháng 3 2024, 6:14 PM

Studying well-known algorithms at an advanced level is a multifaceted process requiring a deep understanding of theory and practice. It can lead to a deeper appreciation of the algorithm's elegance and utility and may inspire you to contribute to its improvement or application in novel ways. So, in this assignment, each group has to choose from 1-3 algorithms from the following list:

[1] J Chugh. Types of machine learning and top 10 algorithms everyone should know. URL: Types of Machine Learning and Top 10 Algorithms Everyone Should Know (oracle.com), 2018.
[2] Barry A. Cipra. The best of the 20th century: Editors name top 10 algorithms. SIAM news, 33(4):1–2, 2000.
[3] Jack Dongarra and Francis Sullivan. Guest editor's introduction to the top 10 algorithms. Computing in Science & Engineering, 2(01):22–23, 2000.
[4] Nick Higham. The top 10 algorithms in applied mathematics, 2016.
[5] J Le. A tour of the top 10 algorithms for machine learning newbies. Retrieved December, 19:2018, 2018.
[6] Timothy Masters. Advanced algorithms for neural networks: a C++ sourcebook. John Wiley & Sons, Inc., 1995.
[7] Xingdong Wu, Vipin Kumar, J Ross Quinlan, Joydeep Ghosh, Qiang Yang, Hiroshi Motoda, Geoffrey J McLachlan, Angus Ng, Bing Liu, Philip S Yu, et al. Top 10 algorithms in data mining. Knowledge and information systems, 14:1–37, 2008.

to study some ***advanced aspects*** of them as indicated below (the number of algorithms you choose should depend on your team's capability (no. of team members, your team competence, the difficulty of the algorithms you choose, etc.) and fill in the form AACO5127SEM232Assmtby April 3, 2024. You may select other algorithms from other sources that fit your preferences, but you need my approval before you do your assignment; please indicate this in Column F of the form above if this is the case.

Requirements and Instructions:

I. Write a technical report in as detail as possible in English by LaTeX (see template at https://www.overleaf.com/read/gfwjzgtfbxmz, but you may use other templates at https://www.overleaf.com/gallery/tagged/report). This technical report should address the following aspects:

1. **Introduction**:

    - Begin with a thorough understanding of the algorithm's purpose, history, and the problem it aims to solve.

    - Identify the algorithm's key characteristics, strengths, and weaknesses.

2. **Backgrounds**:

    - Present the mathematical foundations of the algorithm, including its formal definition and any relevant equations or proofs.

    - Present the math backgrounds for the algorithm's complexity analysis, including time and space complexity.

    - Explore the data structures used within the algorithm and how they impact its performance.

    - Understand why specific data structures were chosen and their trade-offs.

3. **The Algorithms**:

- Present the algorithm with a description in steps, pseudocode, a flow chart, and a toy example.

- Identify the design paradigm(s) employed by the algorithm (e.g., divide and conquer, dynamic programming, greedy algorithms, etc.)

- Analyze how the chosen strategy contributes to the algorithm's efficiency and correctness.

- Investigate any optimization techniques applied to the algorithm, such as pruning, memorization, or heuristics.
- Assess how these optimizations affect the algorithm's behaviour (if any).

4. **Complexity Analysis and Proof of Correctness**:

- Perform a detailed analysis of the algorithm's time and space complexity.
- Consider best-case, worst-case, and average-case scenarios.

- Understand the implications of complexity on practical use.

- Analyze its performance and adapt it as needed for specific use cases.

- Prove the correctness of the algorithm using mathematical induction, loop invariants, or other formal methods.

- Explore corner and potential edge cases to ensure the algorithm behaves as expected.

5. **Implementations, Applications, and Case Studies**:

- Implement the algorithm in your preferred programming language(s). DO NOT ADD THE CODE TO THE REPORT.

- Explore different implementation techniques, trade-offs, and optimizations.

- Benchmark your implementations against other algorithms or existing libraries.

- Investigate real-world applications of algorithms in various fields such as computer science, engineering, finance, and more to gain practical experience.

- Understand how the algorithm solves specific problems in these domains.

- Study case examples where the algorithm has been used to solve complex problems.

- Analyze the strategies and adaptations applied in these cases.

6. **Discussion and Conclusion**:

- Explore advanced topics related to the algorithm, such as parallelization, distributed computing, or hardware acceleration

- Discuss some recent research developments and improvements.

- Identify any open research problems or challenges related to the algorithm.

- Consider how advancements in the field could impact the algorithm's future development.

- Compare the studied algorithm with other algorithms solving similar problems.

- Analyze the pros and cons of different approaches.

- Consider the ethical implications of the algorithm, mainly if it is used in sensitive or critical applications.

II. Prepare slides by Beamer (see templates and samples available at https://www.overleaf.com/gallery/tagged/presentation) explaining your group's works thoroughly.

The number of slides should not be lengthy (at most 30 slides, preferably 20-25 slides or less) and should have adequate content for your work. All groups must give presentations with a reporting time of no more than 45 minutes for each group, record it with your team's faces (see an example at
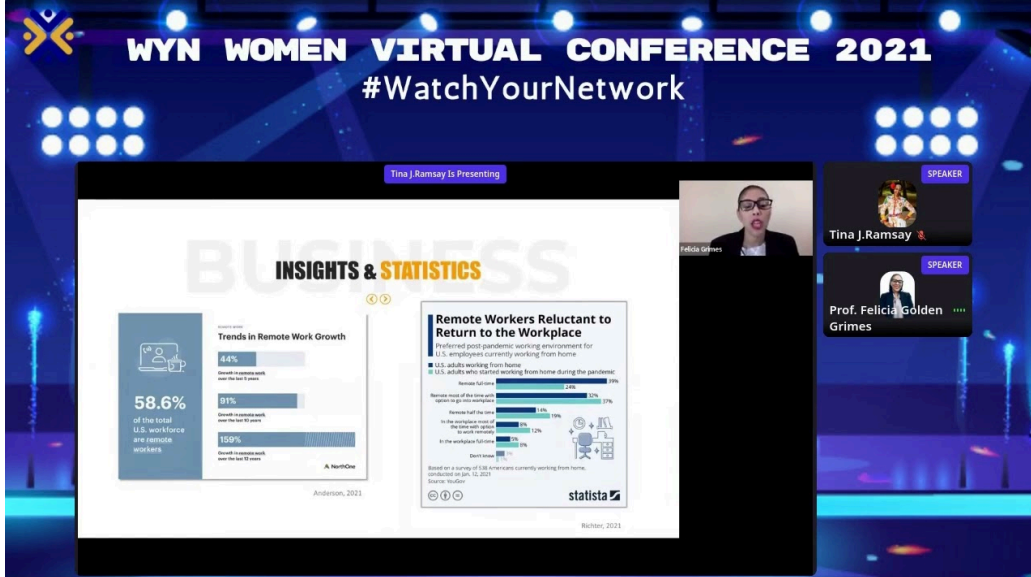
), and submit the link together with the assignment (selected teams will have a chance to give presentations during the two last lectures (scheduled as make-up lectures and will take place in April 2024). You will be provided with all the other groups' content before the presentation day. Based on that, each group must prepare at least two questions and two comments/suggestions for all other groups to give the presentation on another day.

All of the meeting minutes of your group must be presented on the information pages - the first pages of the report, and consist of the % of each member's effort/workload on the whole (total effort is 100%) on the first line of the minute.

Please compress all materials relating to your work as mentioned above in one .zip file, and only the team leader submit it to the e-learning site of this course. You will have over five weeks to do this project, ending on April 3, 2024 (hard deadline; there will be no extension.) Note that plagiarism is strictly prohibited and will be handled accordingly.

The final exam will require some basic technical background related to this assignment. Therefore, team members must work together so that all of you understand all aspects of the project. The team leader should organize the team to meet this requirement.

Trạng thái bài nộp

Trạng thái bài nộp	No submissions have been made yet
Trạng thái chấm điểm	Chưa chấm điểm
Thời gian còn lại	Bài tập quá hạn nộp: 56 Các ngày 23 giờ
Chỉnh sửa lần cuối	-
Đăng tải các bình luận.	▸ Các bình luận (0)