CSCI 310 : Advanced Algorithms

Kris Ghosh
Fall 2020

College of Charleston

Who am I?

1. I am Kris Ghosh (rhymes with "Bose")
2. Ph.D in Computer Science from University of Cincinnati.
3. Research in broadly.. Software Engineering.
4. Courses Taught: CS1, Algorithms, Software Engineering and Programming Languages.
5. Office: 315 HWE.
6. Email: ghoshk@cofc.edu
7. Office Hours: TBD.

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Why learn about Algorithms

- Computer Scientists
  - Foundational theory for the field
- Computer Engineers/Developers
  - Significant impact on application performance and correctness.
- Logistical planning in general
  - Scheduling? Sorting? Routing? Puzzles and games?

Why are you taking Advanced Algorithms

- Learn Problem Solving Skills.
- Required Class in Bachelors Program in CS/Data.
- Professional Prep: interview for software engineering/data engineering internships/jobs.
  Email etiquette- Refrain from text-speak and minimize the use of "Hey"

Motivational Problems

- https://www.youtube.com/watch?v=xi5dWND499g
- https://www.youtube.com/watch?v=pc5WSJkFk24

You need to understand

- Discrete Math and Logic
- Proof Techniques.
- Programming.

Most Importantly- **Think and Write** precisely to find a correct and efficient solution for a Given Problem!!

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Learning Outcomes (See syllabus for details)

- Analyze the running time complexity of the non-recursive algorithms
- Analyze the running time complexity of the recursive algorithms.
- Apply algorithmic technique such as divide and conquer, dynamic programming, greedy techniques, backtracking, branch and bound, approximation techniques to solve problems
- Identify algorithmic techniques appropriate to new problems
- Design, write and test programs for undirected and directed graph using Graph ADT.
- String Algorithms includes Naïve Pattern matching, Knuth-Morris-Pratt Algorithm and Boyer-Moore Algorithm and analysis of time complexity.
- Distinguish tractable, intractable and unsolvable problems and analyze basic complexity theory concepts such as Class-P, Class- NP and NP-Completeness.
- Approximation Algorithms and Analysis of Time Complexity

Course Materials

Knowledge about

- Assignments/Slides will be available on OAKS.
- Textbook- Introduction to The Design and Analysis of Algorithms- Levitin
- Reference: Kleinberg and Tardos edition.

Grading

- Grade Distribution
  Midterm Exam (2 Exams) 40%
  Final Exam (Comprehensive) 25%
  Homework and Assignments 15%
  Quizzes (Pop/Announced) 10%
  Attendance 5%
  Participation and Scribes 5%
- Top 70% of the Quizzes will be taken into consideration for final grade.
- *You get the grade that you earn, so be sure that you earn a grade you like.*

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Quizzes

- Quizzes may be announced/pop.
- Assessment for you- How well you are understanding the concepts?
- Assessment for myself- How effective I am teaching?

Scribes

- 3 students will be selected for each lecture. The schedule- who will scribe the notes and when will be uploaded.
- These students will create notes based on the lecture.
- The three students will discuss so that nothing talked in the class is missed.
- The final *scribe* notes will be uploaded within 24 hours of the lecture.
- Students may discuss online on the scribe if anything is terse or less detailed.

Benefits: You get to compare your notes with another set of notes and learn what you missed. It will increase participation in class.

Course Expectation

- Assignments may often require several hours for a perfect solution.
- At least 6-9 hours of study time a week is expected in this course. This is a 3 credit hour course.
- It will be a rewarding experience with the completion of the semester.
- Typically, emails are replied within 2-3 hours during the weekdays beginning from 8am-11pm.

Algorithm

An *algorithm* is a sequence of unambiguous instructions for solving a problem. i.e for obtaining a required output for any legitimate input in a finite amount of time.

Assignment-1 Get-To-Know-You

It is uploaded on OAKS.

Reading

- Chapter 1 and Chapter 2
- Appendix A and Appendix B.