CSC2401 - Computational Complexity **Fall 1997**

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Office hours: To be announced

Lectures: T 1-3 in GB405

Textbook: "Computational Complexity", Christos Papadimitriou, Addison-Wesley.

Additional Reference: "Pseudorandomness and Cryptographic Applications", Michael Luby, Princeton Computer Science Notes.

Marking Scheme: Approximately 3 Assignments

Topics:

- Turing machines ; time and space complexity
- Hierarchy theorems
- Non deterministic Turing machines
- Reducibilities and completenesss
- $\mathcal{P}$ vs $\mathcal{NP}$
- The polynomial hierarchy and $\mathcal{PSPACE}$
- SAT either not in quasi linear time or not in log space.
- Provably difficult problems (e.g. theory of real closed fields)
- Randomized algorithms and complexity class (e.g. $\mathcal{BPP}$)
- Parallel time complexity classes
- $\mathcal{L}$ vs $\mathcal{NL}$; $\mathcal{NL}$ = co-$\mathcal{NL}$
- Non uniform complexity classes; circuit complexity, branching programs
- Almost all lower bounds and exponential circuit size lower bound for $\mathcal{EXPSPACE}$ complete problems
- Applications to pseudo randomness and cryptography
- Non uniformity vs randomness