Modern Complexity Theory (CS1.405)

Instructors:

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Welcome to Modern Complexity Theory

Course Contents

- Turing machines, equivalence of reasonable models of computation, non-determinism, algorithms, decision versus optimization problems, reduction between problems.
- The complexity classes P, NP, Co-NP and Exp, completeness for NP, Cook's theorem, some well-known NP-complete problems, classes FP, FNP.
- Classes PSPACE, NSPACE and PSPACE-complete, Savitch's theorem, logarithmic space, classes PolyL, L, NL, Co-NL and NL-complete.
- Space and time hierarchy, EXPSPACE-completeness, alternating Turing machines and the polynomial hierarchy, relativization and oracle Turing Machines.
- Advanced Topics: Definitions and relationships between PH, RP, BPP, NC including theorems like Karp-Lipton, Adleman's theorem, Derandomization Techniques.
- One-way functions, public-key cryptography and its connection with NP-hard problem.
- Case study for real-life applications using NP-Compleness.

Preferred Textbooks and References

- M. Sipser (2014), Introduction to Theory of Computation, Cengange Learning.
- S. Arora and B. Barak (2000), Computational Complexity: A Modern Approach, Cambridge University Press.
- C. Moore and S. Mertens (2011), The Nature of Computation, Oxford University Press.
- C. Papadimitriou (1994), Computational Complexity, Addison Wesley Longman.

Grading and Examinations Policy

INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY
HYDERABAD

Grading Method:: Relative

- Mid Semester: 30%
- End Semester: 50% (full syllabus)
- Assignments: 20%
- All examinations are OFFLINE, and closed books and notes

Thank You!!!