CSIE 5118: Introduction to communication complexity

(Semester 2, 2016–2017)

Instructor

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Course website

We will try to use CEIBA this time.

Description

The goal of this course is to get acquainted with some basic tools of communication complexity. The focus is the two-party model introduced by *Yao* in 1979. In the setting there are two players *Alice* and *Bob*. Each of them holds some data which are unknown to the other. Suppose they want to compute a function on the data found in both of them. Communication complexity deals with the fundamental question: How many times do *Alice* and *Bob* have to communicate with each other in order to compute the function?

Tentative syllabus

	Week	Topic	Remarks
A	1	Preliminaries	–
B	2	Deterministic protocols	–
	3	Fooling sets	–
	4	Rank lower bound	HW 1 out.
	5	–	–
C	6	Nondeterministic protocols	HW 1 due.
	7	Det. and nondet. protocols	–
	8	Ranks and covers	HW 2 out.
	9	–	–
D	10	Randomized protocols	HW 2 due.
	11	Det. and randomized protocols	–
	12	Distributional complexity and discrepancy	–
	13	Asymmetric communication and variable partition model	HW 3 out.
	14	–	–
E	15	Applications on networks and VLSI	HW 3 due.
	16	Applications on data structures	–
	17	Applications on Turing machines	HW 4 out.
	18	–	HW 4 due.

Prerequisite

Some essential prerequisites: basic discrete mathematics, some probability theory and some mathematical maturity, i.e., comfortable with reading and writing mathematical proofs.

Textbook

Communication complexity by E. Kushilevitz and N. Nissan.

Grading

- Four assignments weigh 20% each.
- Participation in the class weighs 20%.