

abstract

COMPUTER SCIENCE AND DISCRETE MATHEMATICS SEMINAR I

Topic:

Speaker:

Affiliation:

Date:

Time/Room:

In a sequence of recent papers, Sudan and coauthors have investigated the relation between testability of properties of Boolean functions and the invariance of the properties with respect to transformations of the domain. Linear-invariance is arguably the most common such symmetry for natural properties of Boolean functions on the hypercube. Hence, it is an important goal to find necessary and sufficient conditions for testability of linear-invariant properties.

This is explicitly posed as an open problem in a recent survey of Sudan. We obtain the following results:

1. We show that every linear-invariant property that can be characterized by forbidding induced solutions to a (possibly infinite) set of linear equations can be tested with one-sided error.
2. We show that every linear-invariant property that can be tested with one-sided error can be characterized by forbidding induced solutions to a (possibly infinite) set of systems of linear equations.

We conjecture that our result from item (1) can be extended to cover systems of linear equations. We further show that the validity of this conjecture would have the following implications:

1. It would imply that every linear-invariant property that is closed under restrictions to linear subspaces is testable with one-sided error. Such a result would unify several previous results on testing Boolean functions, such as the results on testing low-degree polynomials and results

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on testing Fourier dimensionality.

2. It would imply that a linear-invariant property P is testable with one-sided error *if and only if* P is closed under restrictions to linear subspaces, thus resolving Sudan's problem.

Joint work with Elena Grigorescu and Asaf Shapira.