

1135-68-3224

**Avi Wigderson\*** ([avi@ias.edu](mailto:avi@ias.edu)). *Alternate Minimization and Scaling algorithms: theory, applications and connections across mathematics and computer science.*

This 3-lecture series will revolve around a common heuristic for general optimization problems called *alternate minimization*, and natural *scaling algorithms* which capture many of them. Recent attempts to formally analyze their performance in natural settings have uncovered a surprisingly rich web of connections between diverse areas of mathematics and computer science, all of which contribute and benefit from this interaction.

In this first lecture I will give the general set-up, and examples of problems for which these algorithms are relevant. I will then survey some of the different areas they touch, and how. In mathematics, these include non-commutative algebra, invariant theory, quantum information theory and analysis. In computer science they include optimization, algebraic complexity and pseudorandomness.

In the next two lectures I will survey aspects of two central problems to both math and CS, *Proving algebraic identities* and *Proving analytic inequalities*, influenced by the study above.

All three lectures are designed to be independent of each other. They require no special background knowledge. Lecture notes can be found at <http://www.math.ias.edu/~avi/PUBLICATIONS/CCC-17-tutorial-lecture-notes.pdf> (Received September 27, 2017)