13TH HEIDELBERG LAUREATE FORUM
SEPTEMBER 13–18, 2026

Master Classes

Gilles Brassard
Alan Turing and Me

Alan Turing is one of the greatest mathematicians of the 20th century, as well as the founding father of computer science. I am therefore very proud to have received the ACM award that bears his name. However, rather than talk about the work that earned me this accolade, I'm going to tell you a surprising story: In Turing's foundational 1936 paper, in which he introduced what is known today as the Turing machine, he gave an inappropriate definition for computable real numbers. Indeed, according to his definition, multiplication by three and addition would not be computable! But alas, even with the contemporary standard definition of computable real numbers, testing for equality to zero remains undecidable. All of this is related to the fascinating intuitionistic mathematics of Brouwer, about which I shall not presume any prior knowledge.

This is joint work with Sophie Berthelette and Xavier Coiteux-Roy based on https://doi.org/10.1016/j.tcs.2024.114573.

Mark Braverman
Algorithmic Mechanism Design in the Age of AI

Modern optimization achieves remarkable results, but it consistently breaks down when inputs come from strategic, self-interested agents – the fundamental challenge of mechanism design. Strategic manipulation cannot be solved simply by scaling up compute or applying gradient descent. Without formal mathematical frameworks for incentives, systems like social media ranking often rely on deliberate opacity to deter gaming. Unfortunately, this opacity breeds unintended consequences, such as content farms, rather than solving the core issue.

Building transparent mechanisms to align these incentives is famously difficult, heavily constrained by classical impossibility theorems and computational hardness. We will discuss the theoretical background behind these roadblocks and explore recent approaches to bypassing them. Specifically, we will look at how bridging optimization with online learning can help us build general-purpose mechanism design tools that scale alongside modern computational methods.

Yu Deng
Critical Problems in Statistical Physics and PDEs
Natural systems can be classified by scaling into subcritical, critical, and supercritical ones. This philosophy applies to both deterministic and random systems. In general, subcritical problems are simpler, and critical ones may have very different behavior. In this lecture I will discuss recent progress on critical problems in different contexts including particle systems, wave turbulence, random data problems, and SPDE.

Yael Tauman Kalai
Zero-Knowledge Proofs
Zero-knowledge proofs are among the most surprising and powerful ideas in modern cryptography. They allow one to prove that a statement is true without revealing anything beyond its validity. In this masterclass, we will learn how such seemingly paradoxical proofs can be constructed.

Jacob Tsimerman
Moduli Spaces

Moduli spaces are ways of parametrizing mathematical objects of interest. For example, the projective line parametrizes likes through the origin in the plane. Such moduli spaces can be used to study families of the underlying objects and give a unified way of understanding their phenomena. However, these spaces don't always exist, and they aren't always nice!

We'll give many introductory examples of what these spaces look like, how they might be singular or otherwise pathological, when they might not exist, and how they can be useful. The focus will be on examples and intuitions, with almost no care given to proofs.

Jeffrey David Ullman
Big-Data Algorithms That Are Not Machine Learning

We shall discuss four interesting algorithms for managing large datasets: (1) Locality-sensitive hashing, (2) Counting distinct elements in a stream, (3) Sampling streams, (4) Counting triangles in a graph.

Efim Zelmanov
Career Prospects for a Mathematician

We will discuss career paths for young mathematicians and the current state of our profession. I would much prefer this to be a dialogue rather than a monologue.