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Computability Theory
Special Session A14

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Computability is a fundamental notion of mathematics. Interest in effectiveness is already apparent in the famous Hilbert problems, in particular, the second and tenth, and in early 20th century work of Dehn, initiating the study of word problems in group theory. The formal definition of computability was given by Turing, Gödel, and others in the 1930s. Problems are classified according to various logical hierarchies, giving precise complexity measurements, which closely relate computational and definitional complexity.

Since its inception, and perhaps especially so in the past 30–40 years, computability theory has seen many fascinating and dramatic developments, growing to encompass many new subfields. These include:

- Algorithmic randomness: The study of randomness for individual objects such as reals.
- Computable model theory: The study of computational aspects of mathematical structures.
- Reverse mathematics: The search for optimal axioms to prove mathematical theorems.
- Reducibility and degree structures: The study of the Turing degrees, and more generally of various notions of comparison of computability-theoretic strength.

Likewise, the subject has found links to other mathematical disciplines inside and outside of logic. This includes, for instance, work on enumeration degrees that has revealed deep and surprising relations to general topology, and work on algorithmic randomness that is closely tied to symbolic dynamics and geometric measure theory. Inside logic there are relations to model theory, set theory, effective descriptive set theory, and proof theory.

In some of these cases the bridges to seemingly distant mathematical fields have yielded completely new proofs or even solutions of open problems in the respective fields. In others, previously disparate areas have found common tools and questions, resulting in what are now essentially merged fields. An example of the latter is reverse mathematics and computable analysis, which have become deeply intertwined through new developments over the past decade.

The special session will cover the majority of areas of modern computability theory, including all those mentioned above.

For more information visit `www.computability.org/umi-ams`.

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