▸ ARNOLD BECKMANN, *Feasible computation on general sets.*
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Polynomial time computation on finite strings is a central notion in complexity theory. Polynomial time in more general settings has been considered by several authors. In this talk we will discuss a proposal to define feasible computation on general sets. Our approach is based on the Bellantoni-Cook scheme characterizing polynomial time on finite strings in terms of "safe recursion" [1] — we denote our class as safe recursive set functions (SRSF). We establish an exact characterization of the functions that can be computed by SRSF functions on hereditarily finite sets. Namely, using a natural interpretation of finite strings as sets, we prove that the problems decided by safe recursive set functions are exactly those computed by an alternating exponential time Turing machine with polynomially-many alternations. This complexity class has been considered before, and is known to exactly characterize the complexity of validity in the theory of the real numbers as an ordered additive group by Berman [2]. We also give characterizations of the safe recursive functions acting on arbitrary sets using Gödel's L-hierarchy of constructible sets and refinements of it. As a corollary, we prove that the safe recursive set functions on binary omega-sequences are identical to those defined to be computable in "polynomial time" by Schindler [3].

This is joint work with Samuel R. Buss and Sy-David Friedman.

[1] Stephen Bellantoni and Stephen Cook, *A new recursion-theoretic characterization of the polytime functions*, ***Computational Complexity***, vol. 2 (1992), no. 2, pp. 97–110.

[2] Leonard Berman, *The complexity of logical theories*, ***Theoretical Computer Science***, vol. 11 (1980), pp. 71–77.

[3] Ralf Schindler, P $\neq$ NP *for infinite time Turing machines*, ***Monatshefte für Mathematik***, vol. 139 (2003), no. 4, pp. 335–340.