1106-94-627 **Venkatesan Guruswami*** (guruswami@cmu.edu). *Polar codes: Reliable communication with complexity polynomial in the gap to Shannon capacity.*

Shannon's monumental 1948 work laid the foundations for the rich fields of information and coding theory. The quest for efficient coding schemes to approach Shannon capacity has occupied researchers ever since, but the theoretical problem of approaching capacity arbitrarily closely with polynomial complexity remained open except in the special case of erasure channels.

In 2008, Arikan proposed a novel method for constructing capacity-achieving codes based on channel polarization. In this talk, I will begin by briefly surveying Arikan's celebrated construction of polar codes, and then discuss our proof (with P. Xia) that, for all binary-input symmetric memoryless channels, polar codes enable reliable communication at rates within $\epsilon > 0$ of the Shannon capacity with block length (delay), construction complexity, and decoding complexity all bounded by a **polynomial** in the gap to capacity, i.e., by poly$(1/\epsilon)$. Polar coding gives the *first explicit construction* with rigorous proofs of all these properties; previous constructions were not known to achieve capacity with less than $\exp(1/\epsilon)$ decoding complexity. More recently, in work with A. Velingker, we also extended this result for channels with non-binary inputs from a prime-sized alphabet. (Received September 03, 2014)