Speaker: Takayuki Kihara

Title: Computability theoretic methods in descriptive set theory

Abstract: The speaker recently found several new applications of computability theory to descriptive set theory. We first apply computability theory to the decomposability problem on Borel measurable functions. This problem dates back to Luzin's famous problem on decomposability of Borel measurable functions, and also to late developments by Jayne, Rogers, Solecki, et al. Recently, the generalization problem on the Jayne-Rogers Theorem was asked by Andretta, Motto Ros, Pawlikowski, Sabok, et al. We will give a partial answer to this problem by using techniques from computability theory such as the Shore-Slaman Join Theorem and the Friedberg Jump Inversion Theorem on the Turing degrees, the non-uniformity feature of the enumeration degrees, the almost totality of the continuous degrees, etc. Second, we apply computability theory to the finite level Borel isomorphism problem on metrizable compacta. This is equivalent to the problem on the ring-theoretic classification of the Banach algebras of finite class Baire functions on such spaces (endowed with the supremum norm and the pointwise ring operation) based on Jayne's work on the Baire class variant on the Gel'fand-Kolmogorov theorem. We solve the finite level Borel isomorphism problem by using notions from computability theory such as degree spectra, Scott ideals (omega-models of weak Koenig's lemma), etc. We also mention the relationship between our solution to the finite level Borel isomorphism problem and Pol's solution to Alexandrov's old problem on infinite dimensional topology.