Aspects of Algebraic Topology: From Pure Mathematics, to Combinatory, and to Applied Mathematics

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Abstract: Algebraic topology studies the global organization of certain classes of mathematical structures by associating algebraic invariants such as vector spaces and linear maps between them in a homotopically invariant way. This makes topology into a useful mathematical formalism for understanding qualitative geometric and combinatorial questions. Algebraic topology has a great deal of mathematical machinery such as e.g. homology for studying different kinds of hole structures. Modern algebraic topology is a broad and vibrant field which has seen recent progress on classical problems as well as exciting new interactions with applied mathematics. During my talk, I will underline this aspect of strength of algebraic topology and its applicability to geometric topology, graph theory, and topological data. Precisely, I will address thickenings, graph coloring, and high dimensional nonlinear cloud data set coming from the analysis of images problems respectively. I will share with the audience my findings and my future research projects.