Gergő Pintér

Title: Degeneracy points of quantum systems - from a singularity theoretical approach

Abstract: We investigate finite dimensional quantum systems, like electronic band structure of solid materials or spin systems depending on an external magnetic field.

These systems are described by parameter dependent Hamiltonian, i.e. a map from a manifold to the space of the Hermitian matrices. At the degeneracy points some eigenvalues of the Hamiltonian coincide. The investigation of the degeneracy points reduces to the question how do the Hamiltonian map and the variety of the degenerate matrices intersect each other. We can use the tools of the singularity theory, like the local degree, local multiplicity, the left-right and contact equivalences of germs and the corresponding codimensions, Thom-Boardman classification.

The spaces we study are also endowed with complex vector bundles with canonical Chern connection, whose curvature play very important role in the physical theories. The main goal is to describe the characteristic forms and characteristic numbers near the degeneracy set.

In the talk I introduce some results and open problems.

Joint work with György Frank, András Pályi, Dániel Varjas, Péter Vrana.