Lecture 1. Basics of quiver representations.

In this lecture I will discuss the basic notions related to quiver representations. I will look at the examples of quiver representations related to geometry. I will also discuss Gabriel Theorem classifying quivers of finite representation type and Auslander-Reiten theory using these examples. The only perequisites for the lecture are basic facts from linear algebra.

Lecture 2. Klyachko inequalities.

Several seemingly unrelated problems (constraints on eigenvalues of a sum of hermitian matrices, intersections of Schubert varieties in a grassmannian and tensor product decomposition of representations of general linear groups) have a common solution given by the set of inequalities discovered by Klyachko. I will discuss the approach to these inequalities based on quiver representations.

Lecture 3. Geometry of orbit closures for quiver representations.

Gabriel theorem says that a quiver has a finite representation type if and only if its underlying graph is a Dynkin quiver. In such cases it is interesting to study the geometry of the orbit closures in representation spaces under the natural action of product of general linear groups. The resulting varieties are natural generalizations of determinantal varieties. I will present recent results on the geometry of these orbits, in particular a theorem of Zwara on rational singularities for such orbits closures and desingularizations of these orbit closures constructed by Reineke.