Research interests of Roman Bezrukavnikov

My research interests lie in the field of representation theory of algebraic groups (and related objects), especially the algebro-geometric methods of their study. The central project I am trying to develop concerns with the study of perverse sheaves (or D-modules) on (generalized) affine flag varieties of a simple algebraic group. I have proved (partly joint with S. Arkhipov) a result, which relates the derived category of such sheaves to the derived category of coherent sheaves on the Steinberg variety of the Langlands dual group (see [9]). This result should be viewed as a step in the direction of the geometric theory of local Langlands correspondence (somewhat similarly to the situation in the class field theory in 1920s, there are deep results and conjectures concerning the global geometric Langlands correspondence (due to Beilinson-Drinfeld, Gaitsgory and others), while no precise conjectures beyond the analogue of the Satake isomorphism are known in the local case). On the other hand, perverse sheaves on the affine Grassmanian are related to representations of quantum groups at a root of unity, and a standard analogy connects those to representations of algebraic groups in a prime characteristic. Thus the above mentioned results imply (or inspire) some Theorems about those representations.

Another project deals with more classical (though related) objects of representation theory, namely smooth representations of reductive p-adic groups. In the spirit of Bernstein's algebraic approach to the theory, I found an algebraic (homological) interpretation of Arthur's local trace formula for p-adic groups. This interpretation yields some results on homological properties of such representations, but I hope it can also shed light on deeper aspects of harmonic analysis (related to the phenomenon of stability).