In the last three decades a good deal of attention has been given to multivariate polynomial inequalities (in particular, Bernstein, Markov and Remez type inequalities) as well as their various generalizations. Such inequalities come from approximation theory, but at the present time they have numerous applications also in differential analysis, complex analysis, convex geometry or differential equations.The aim of our project is to explore multivariate polynomial inequalities in connection with o-minimal structures. Recall that the usual techniques in the study of polynomial inequalities are mostly based on (pluri)potential theory. Our approach to proposed problems will be unconventional, because we will extensively use the theory of o-minimal structures, for example subanalytic geometry, in order to obtain new results, which seem to be unavailable via standard methods of approximation theory, analysis or pluripotential theory.

The theory of o-minimal structures is a fairly new branch of mathematics linking model theory with geometry, "tame" topology and analysis. It comes from logic and from the theory of semialgebraic, semianalytic and subanalytic sets originated in the seminal works of S. Łojasiewicz, A. Gabrielov, H. Hironaka, E. Bierstone and P. Milman and many other researchers. In the 1980's Lou van den Dries had noticed that many properties of semialgebraic sets and maps could be derived from a few simple axioms defining o-minimal structures. This was the beginning of the theory of o-minimal structures which is now rapidly developing.

I believe that our results will contribute significantly to multivariate approximation theory. I also expect that some of our ideas and techniques will eventually find their other uses and that our work will shed light on some important open problems concerning multivariable polynomial inequalities.