Our closest galactic neighborhood is called the Local Group. It is built of the well known large spiral galaxies: the Milky Way and the Andromeda galaxy as well as of a smaller Triangulum spiral M33 and tens of dwarfs which owe this name to their small sizes and low luminosities in range of thousands or millions of Solar luminosities. Navertheless, as shown by multiple studies, their masses are not low. Estimates of the dynamical mass, i.e. mass enclosed within a given radius which, under the assumption of dynamical equilibrium, is needed to support observed velocities of stars suggest that the contribution of stars to the total mass content does not exceed few percent. It is thought that most of the galactic mass comes from another, yet undetected component of the Universe: dark matter which unlike the baryonic matter interacts only with the gravitational forces.

The aim of the project „Advanced models of dwarf galaxies with orbit superposition method" is the development of an advance method of modeling dwarf galaxies based on the approach constructed within my doctoral thesis. My work has shown that the so called orbit superposition method possesses a huge potential in recoving parameters of galaxies which cannot be observed directly: the distribution of dark matter and shapes of stellar orbits. What is more, these parameters are not independent which severely complicates building theoretical models.

The extended method, which I will develop, will use additional data available with observations:

- distinction of multiple stellar populations. A single population consists of stars of similar age and chamical abundances. Since populations are born in various environmental conditions (e.g. in a result of a merger of galaxies), their spacial distribution and kinematics are different;
- proper motions, i.e. velocities in the plane of the sky. They are measured with shifts in positions of stars in observations separated by few years.

Even though such data are already available for few objects, they have not found extansive applications. In my opinion they will strongly constrained modeled parameters improving the accuracy of obtained results.

For results to be trustworthy, it is necessary to test the adopted method on mock data. I will make use of data from the Illustris project, from which I will select a sample of dwarf-like objects. Thanks to tests on controlled data I will formulate general conclusions concerning the accuracy of recovered parameters and determine sources of systematic errors and their impact on final results.

I will also apply my approach to the real observational data for the Fornax and Sculptor dwarf spheroidal galaxies and potentially other objects if suitable data will be available.

Interestingly, my method may also find the application in studies of globular cluster which are not embedded in dark matter haloes but possibly host intermediate massive black holes in their centers. Large amount of proper motions available for globular clusters will help in modeling mass distribution and determining the existence of IMBHs for which the mechanism of growth is not yet understood.