The project lies within algebraic geometry. It is a part of mathematics that deals with solutions of systems of polynomial equations. However, its methods have applications in many other areas of mathematics, including differential equations, topology and representation theory. The problems considered in the proposal lie exactly on the border with these areas.

Some of the problems that we plan to consider are related to linear differential equations with polynomial coefficients and their analogues in case of fields of positive characteristic. Many such problems concerning algebraic theory of regularity are still completely open in positive or mixed characteristic and we plan to attack some of them. The study of differential equations appears in the project also through the study of foliations on algebraic varieties.

Other parts of the project are related to studying variation of algebraic objects in families. This will be considered in different directions: study of algebraic objects on a fixed variety and study of algebraic objects in families of algebraic varieties.

Solutions to some of the considered problems should have important applications and deepen our understanding of differential equations on algebraic varieties. Solutions to other problems should help us to understand singular objects that often appear in algebraic geometry even if one is interested mainly in studying smooth objects.