Rings are important objects in mathematics. A ring is a set together with two binary operations: addition and multiplication. These operations have properties of the usual addition and multiplication. The differences are that the multiplication may not be commutative and it might not be possible to divide by elements different from zero. It the multiplication is commutative and division is possible, then we call the ring a field. The best known example of a ring is the set $\mathbb{Z}$ of integers, and the best known example of a field is the set $\mathbb{Q}$ of rational numbers. If a ring contains a set, which is a field (with the same operations), then we call it an algebra over this field. The set $\mathbb{Q}[X]$ of polynomials with rational coefficients is an example of an algebra.

A module over a ring R is a set M with a binary operation called addition, such that we can multiply the elements of M by the elements of R. If R is an algebra over a field K, then we call a module M finite dimensional, if there exist finitely many elements $m_1, \ldots, m_d$ of M such that every other element of M can be obtained from these elements by performing addition and multiplication by elements of K. We call the smallest d with this property the dimension of M. If a sequence $m_1, \ldots, m_d$ realizes this minimum, then we call it a basis of M.

Fix an algebra R of dimension e over a field K. If d is a positive integer, then we can associate with a module M a sequence of ed^2 elements of K, which describes the multiplication of the elements of M by the elements of R. The set of all sequences, which can be obtained in this way, is described by polynomial equations, hence is an affine variety. This set is called the variety of d-dimensional R-modules and denoted by $\operatorname{mod}_R(d)$. A sequence associated with M depends on the choice of a basis of M. We denote by $\mathcal{O}_M$ the set of all possible sequences we may get for M and $\overline{\mathcal{O}}_M$ denotes the smallest affine subvariety of $\operatorname{mod}_R(d)$ containing $\mathcal{O}_M$.

The main aim of our project is to study geometric of varieties $\operatorname{mod}_R(d)$ and $\overline{\mathcal{O}}_M$. The problems we want to study are of geometric nature. However, we plan to investigate them viewing the points of the studied varieties as modules over algebras. This will allow us to use methods of representation theory, which are often of homological nature. Homological properties of modules often correspond to geometric properties of the corresponding points. This observation has been used previously by many authors in geometric studies. We plan to continue this line of research and develop new methods, which should allow us to get deeper results.

We also plan to study homological problems connected with algebras. An important homological invariant associated with an algebra is its bounded derived category. We will study equivalences of the bounded derived categories for the derived discrete algebras. Our aim will be to prove they are standard.