A function $h\colon G \to \mathbf{R}$ on a group G is called a homomorphism if it satisfies the equation $h(a) - h(ab) + h(b) = 0$ for all $a, b \in G$. Typically there is only few homomorphism on G and there are not particularly interesting. It is a trend in contemporary mathematics to consider classical objects up to a small defect. It turns out, that if we look at functions $q\colon G \to BR$ such that there exists a number C such that $|q(a) - q(ab) + q(b)| < C$ for all $a, b \in G$, the situation is radically different. Functions q as above are called quasimorphisms. Often a group admits infinitely many linearly independent quasimorphisms. They are used to study properties of a group and are closely related to bounded cohomology.

Our aim is to use quasimorphisms to study a variety of problems coming from dynamics and geometric group theory. We want to answer questions related to groups of diffeomorphisms preserving volume, relations between quasimorphismsms and entropy, conjugacy invariant norms or bi-invariant orders on groups.

One of a leitmotiv of our project are conjugacy invariant norms. They appear naturally in the context of groups which are not finitely generated (like groups of diffeomorphisms) and classical tools of geometric group theory are not available. The examples are fragmentation norm or Hofer norm. Quasimorphisms then proved to be a useful tool to study such norms.

To solve project objectives we plan to use techniques we developed in our previous research. They are mostly techniques inspired by geometric group theory (e.g. complexes of non-positive curvature, group actions, mapping class groups), also those related to dynamical systems.

We plan to attack both old and well known problems, which were not year considered with relation to quasimorphisms. At the same time, we develop general methods which ideally shall be used by other mathematicians.