The Standard Model (SM) describes what matter is made of and how it holds together. It rests on two basic ideas:

- all matter is made of particles,
- these particles interact with each other by exchanging other particles associated with fundamental forces.

The basic grains of matter are fermions and the force carriers are bosons. In this project we will focus on the measurement of the top quark mass and properties and its consequences for the SM. We plan to analyse the fundamental interactions described within the Standard Model of particle physics at the Large Hadron Collider (LHC-CERN) and to search for potential deviations from the SM by studying the production of the single top quark as well as top quark pairs. One should observe that the top quark is the heaviest among the quarks and its mass is close to that of the ytterbium atom. The proposed investigations will be performed in the framework of the SM and that the Physics Beyond Standard Model (BSM). These processes are very interesting from the point of view of a possible precise measurement of the top quark mass and constraining models exploited by the BSM phenomenology. The Large Hadron Collider (LHC), located at CERN, Geneva, can be considered a top factory enriched by excellent performance of its detectors and large amount of data accumulated by the experiments. The study of exclusive and semi-exclusive top production and single top production can be analysed in many sectors to improve the understanding of the Standard Model also by adding new dedicated channels enlarging the study domain. Furthermore, the single top analysis can be considered as belonging to the class of precise investigations or observation of rare processes.