One of the final stages in the evolution of massive stars (up to about 8 - 10 M_{Sol}) are neutron stars. They are characterized by very small size (radius of about 10 km) and high masses (1.4 - 2.5 M_{Sol}), it gives first approximation to the density of the object (about 10^{14}-10^{15} g / cm^3) - one teaspoon of such matter would weigh 6 billion tons. It is not possible to get such high densities in laboratories, this is why examination of neutron stars is so important in physics of dense matter. The structure of neutron stars is not known to us, there are loads of equations of state describing the state of matter forming these objects (relationship between pressure and density, temperature and other physical parameters affecting on the pressure of matter). One of these equations of state is the equation of strange quark matter, stars build of this matter are called strange quark stars. These stars are characterized by higher compactness than neutron stars (taking the same mass strange quark stars are smaller, about 7km in radius). This is because their main building components are unbound quarks (in other equations of state quarks are bound in nucleons like neutrons), which occupy smaller volume.

The main aim of our project is to study the effect of differential rotation on the maximum mass of strange quark stars. In that kind of rotation different layers of the star rotate with different angular velocities depending on the distance from the center. Compact stars can rotate differentially right after their birth, eg. in supernovae explosions, or after merger of two neutron stars in a binary system. The maximum mass is a crucial parameter being a boundary between stable neutron stars and black holes. Such studies are also relevant for the analysis of future observations of gravitational waves, where the correct interpretation of the data needs full spectrum of theoretical models.