Gamma-ray bursts (GRBs) are one of the most powerful explosions in the Universe. As the name indicates, most of their radiation is emitted as gamma rays. GRBs can be, in the gamma range, brighter than all other gamma-ray objects visible in the sky combined. It is speculated that nearby GRBs could cause in the past mass extinctions on Earth. Fortunately, they do not happen very often.

Despite their spectacular properties, we do not fully understand how do they form. It is commonly accepted that most of them accompany the collapse of massive stars. However, some do not fit into this model; it is believed that they happen when two compact objects, like two neutron stars or a neutron star and a black hole, merge into one. Although, some observations suggest that part of the GRBs does not fit into any of these two basic formation models. This suggests that there might be yet another formation mechanism.

Such conclusions were derived from statistical analyses. Generally speaking, we observe gathering of some characteristics around a few dominant values. This can be described with statstical distributions; the most commonly used is the famous Gaussian distribution. But not everything in Nature needs to be described with a Gaussian distribution. It turns out that other distributions—specifically, asymmetric—work better in describing the observed distributions. "Better" means that, first, two asymmetric components are required instead of three Gaussian ones, which suggests that we are dealing with only two GRB types. Second, "better" means that the discrepancy between observations and the model is smaller than when Gaussian distributions are used. It follows that there might indeed be only two GRB classes.

I described the conclusions that I reached investigating one-dimensional distributions. However, it is well known that in order to characterize GRBs fully, one needs to take into account more than one descriptive parameter, that is, one needs to consider parameter spaces with a higher dimensionality. In my project I aim at conducting such statistical analyses employing the available, quite numerous, observational data sets. I intend to apply also some machine learning techniques to infer about the number of GRB classes with no prior assumptions. To verify the results, I wish to perform numerical simulations to check if they yield results similar to those derived from observations.

Because GRBs are one of the furthest objects observed, that is the light they emit reaches us after several billions years, they can allow to probe the conditions of a very early Universe. For the same reason efforts are being put into employing GRBs as standard candles, namely as distance indicators of their—very young—host galaxies.