New results in the application of the machine-z method
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Overview
Several thousands of GRBs have been observed so far but we could measure the distance of only a few hundreds. We studied the parameters of GRBs with available spectroscopic redshift in order to be able to estimate the redshift of those GRBs without a measured redshift. To calculate their distances we applied the XGBoost algorithm [Chen & Guestrin (2016)]. For the process we used selected gamma, x-ray and ultraviolet parameters from the Swift GRB catalog, in which 328 GRBs had measured spectroscopic redshift. We found a significantly higher correlation ($r=0.67$) between the measured and estimated redshift than the state of art value of 0.57 (published by [Ukwatta et al. (2016)]).

Method: XGBoost
XGBoost is an advanced machine learning algorithm based on the decision tree method and uses “boosting” to improve a single weak model by combining it with a number of other weak models in order to generate a collectively strong model. We could improve the correlation:

Results

• Fig. 1. We used the data of all three Swift instruments and sufficiently cleaned them. Using the log($1+z$) data we could establish a 0.67 linear correlation between the estimated and measured redshifts.

• Fig. 2. Transforming the results back to the true redshifts the correlation remained similarly good. Further improvement can be obtained by using new data points.

Summary
We examined the Swift BAT-XRT-UVOT data. Using the XGBoost estimator we could successfully improve the redshift estimations. The log($1+z$) correlations improved between the measured and calculated data to 0.67.

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Bibliography
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