

Prediction and Factors of Dropout in Higher Education

CHALLENGES: Europe in a changing world - inclusive, innovative and reflective societies

PROBLEM DESCRIPTION

Every third student drops out from undergraduate programs, that is associated with social and economic costs. The shortage of skilled human resources endangers the outlook of economic growth. The goal is to predict final academic performance and identify its contributing factors.

CHALLENGES AND GOALS

To predict the final academic performance based on pre-enrollment achievement measures.

To show how and to what extent features affect individual predictions of final performance.

To help higher education decision-makers find at-risk students.

To help students find the skills they need to master.

PRODUCTIVE SECTOR: Public administration

MATHEMATICAL AND COMPUTATIONAL METHODS

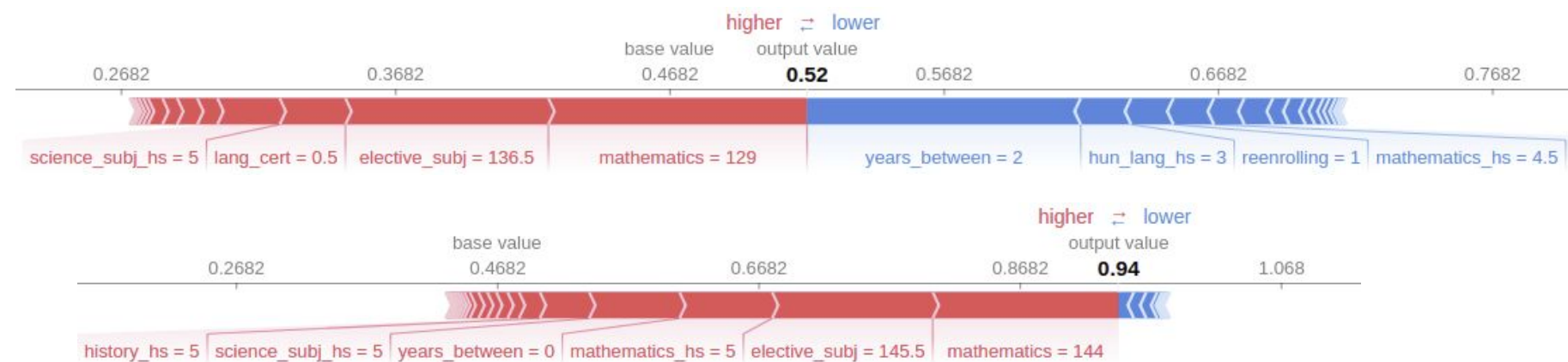
Data imputation using multiple imputation by chained equations with Bayesian ridge regression.

Prediction of final academic performance using gradient boosted trees (XGBoost).

Evaluation methods with receiver operating characteristic curve (ROC) analysis.

Local model explanation with SHAP values, based on a game-theoretical concept: Shapley value.

Global model interpretation with permutation importance and aggregated SHAP values.



Two examples for the prediction of final performance together with the contributing factors

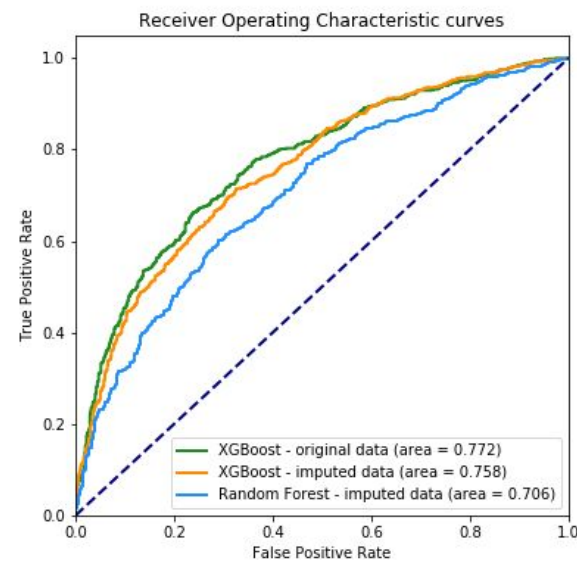
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Results and Benefits

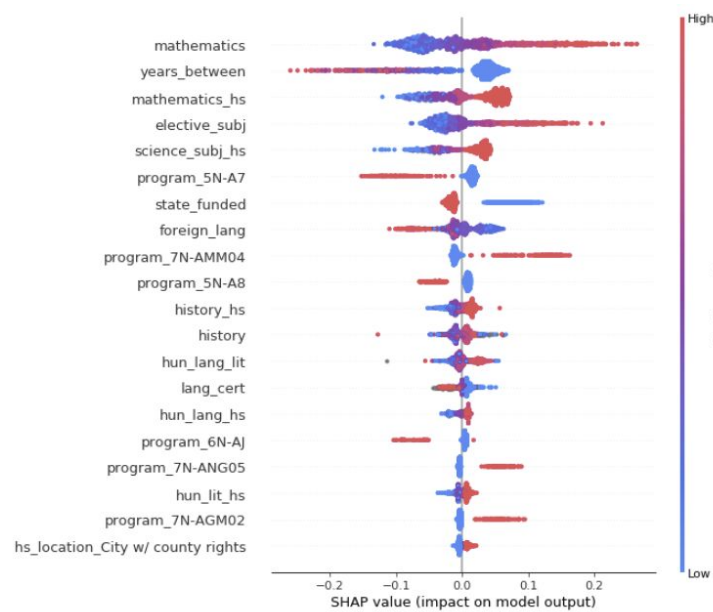
3 years of successful collaboration on educational research and decision support system development.

Staff and researchers formation: more than 10 publications in prestigious conferences and high impact journals.

The company is currently deploying our web application into the system.



ROC curves of Xboost and Random Forest models



Summary of the effects on the final performance of the most important features.

A developed web application that returns predictions of final academic performance based on some pre-enrollment achievement features. The application also highlights which skills should be improved for a given student.