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Donors Choose Policy Memo: Predicting Fully Funded Projects

Donors Choose is a United States-based 501(c)(3) non-profit organization that allows people to donate funds that directly benefit classroom projects in public schools. According to their website, in **77%** of public schools, there has been at least one project request submitted through Donors Choose. The projects that individuals can contribute to are diverse in nature. They include requests for basic needs like school supplies, textbooks, and classroom furniture – to more elaborate requests like funding for school trips or greenhouse building construction. In all, our analysis shows that roughly **70%** of all project request campaigns get fully funded. That said, the remaining **30%** is a sizeable proportion that do not get fully funded. In order for requesters to maximize the probability of receiving complete funding for their projects, it is important to understand what factors increase the likelihood of a project receiving full funding. In this analysis, we built several models to predict, at the time a project was posted on the Donors Choose platform, whether that project will not get fully funded so that we can intervene to improve the project request listings.

The analysis involved data collected by Donors Choose from January 1, 2011 to December 31, 2013. The data includes information relating to the demographics of the requesting school (i.e. the school's state/city/county and whether the school is a standard, charter, or magnet school) – as well information more specific to each individual project (i.e. whether the project was fully funded, the total cost of the project, and the number of students reached by the project).

Upon analyzing the underlying data, we found that among all the projects that were fully-funded, **56%** came from schools classified as having the "highest poverty" levels – particularly in urban areas. Requests supporting pre-Kindergarten through 2nd grade projects were the group most likely to be fully funded (comprising **38%** of all funded projects) – especially if supporting literacy and language related initiatives (comprising **45%** of funded projects). The analysis also showed that less expensive requests were more likely to get fully-funded than more expensive ones.

After the exploratory analysis phase, we proceeded by building several more sophisticated machine learning classification models in order to predict what projects are more likely to be fully funded. The models were built to identify the characteristics in past data that were significant towards determining whether a project would be fully funded – with the goal of applying these trained models to predict for new, not yet fully-funded projects. The models were trained and tested across several different time periods in order to see how results change over time.

When evaluating the strength and results of the models that we built, **precision** seemed to be the more relevant evaluation metric when compared to **recall**. Because the goal of this analysis is to predict whether a project will be fully funded in order to identify projects to intervene for, it stands to reason that it is most important to quantify the ratio of **true positives** to true positives and false positives – vs. the ratio of true positives to true positives and false negatives. As such, the **F1** score evaluation metric – while still providing useful information that balances precision and recall through a harmonic average of the two – is still less relevant to our problem than precision itself.

The analysis shows that holistically, precision performed better across the models and at different evaluation levels than recall and F1 scores did. Moreover, our results show that of all the models tested, **Logistic Regression** was the best performing model. When using **auc-roc** as a metric to compare performance of predicting the classes best across models, Logistic Regression consistently performed best across the different train/test time splits used in the analysis. With the training start date of July 1, 2011, the Logistic Regression yielded an auc-roc score of **.665**. This indicates that among the classification models that were used to address this prediction problem, the Logistic Regression model should be applied when predicting for future projects that have not yet been full-funded.

However, while this auc-roc result was the highest score among all models and time ranges tested, it is still a relatively low score to be considered a strong model in isolation. As such, we recommend that the model be used primarily as a guiding tool to help users requesters and funders learn more – as opposed to blind faith in the predicted outcomes of the models. We also recommend that more research be done – potentially with more data and

more relevant features collected. The hope would be that this additional collection and analysis would result in stronger predictive model performance across our relevant evaluation metrics. If we are able to strengthen the performance of our models, we would have stronger confidence about which project requests to intervene for. We also recommend that interested parties talk to subject-matter experts (perhaps at Donors Choose), armed with the results of these models and analyses, to better understand what factors are most meaningful towards getting a project to be fully-funded on the Donors Choose platform.

Appendix:

Fully Funded Projects by Grade Level
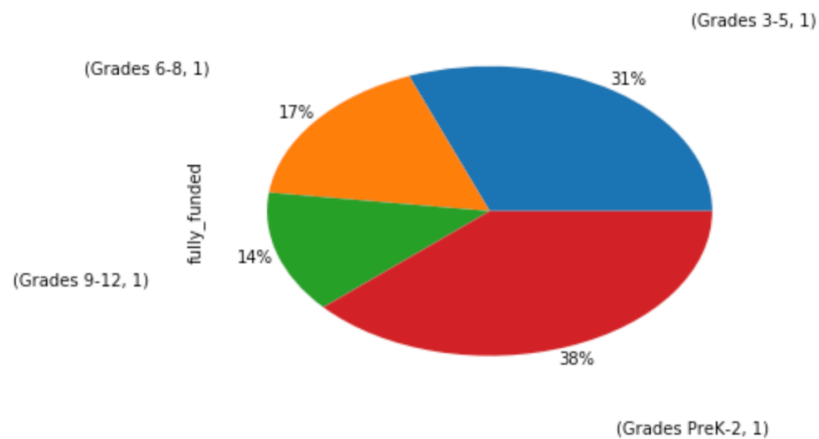
Fully Funded Projects by Poverty Level