



Automated Screening of Competitive Residency Applicants: A Machine Learning Model



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Introduction

- Integrated plastic surgery residency application volume has **increased by approximately 35% over the past five years**
- This growing application burden has intensified the challenge of efficiently screening applicants and limits the feasibility of a fully holistic review
- Machine learning (ML) offers an opportunity to **rapidly process large volumes of applicant data** and use historical interview selection patterns to provide preliminary decisional support

Objectives

- Develop a ML algorithm to predict interview invitations and generate a weighted rubric to increase transparency in the selection process.

Materials and Methods

- Retrospectively collected all applications submitted to a single integrated plastic surgery residency program from 2022 to 2026
- A custom scraper was developed to automatically extract relevant applicant data from PDFs
- Applicant data was processed through four machine learning models: XGBoost, Random Forest, CatBoost, and LightGbm
- Models were training on applicant data from the 2022-2025 cycles (n=1255)
- Model validation was performed on applicants from the 2026 cycle (n=97)
- Applicants were ranked and stratified into percentiles**
- Performance was assessed using AUROC, AUPRC, and accuracy.

Results



Figure 1. Workflow design for applicant information extraction and interview prediction

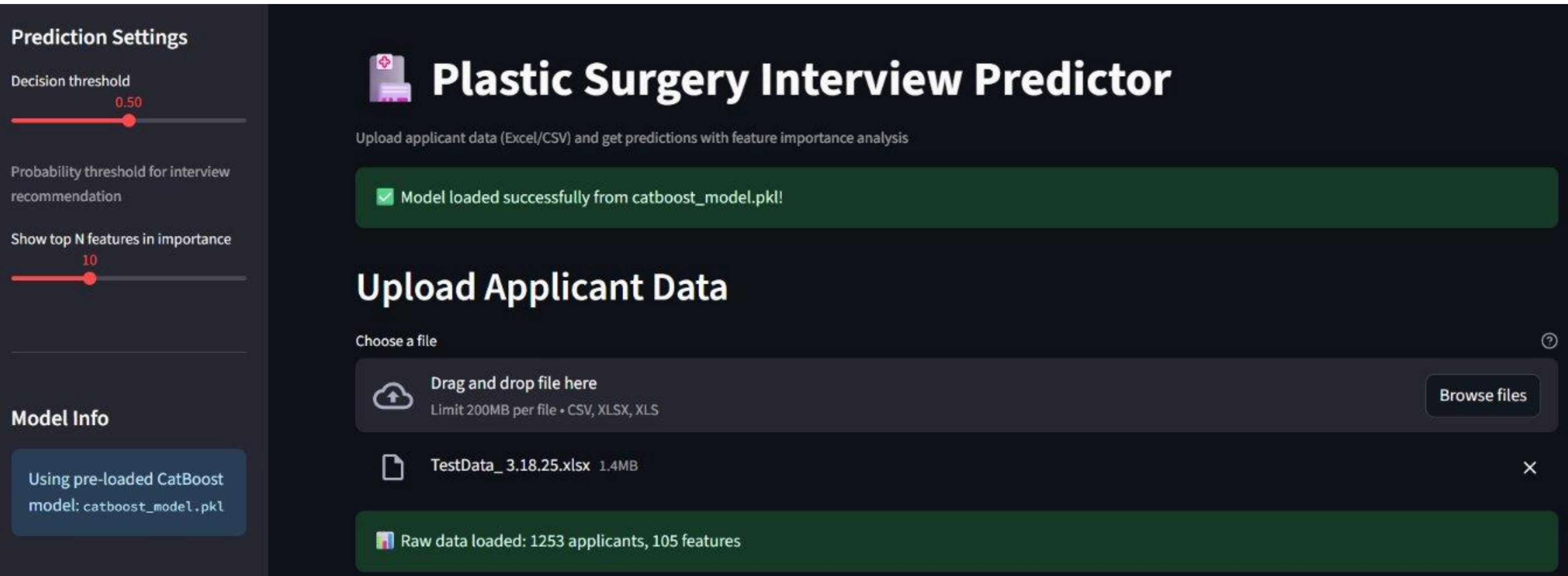


Figure 2. ML-based ranking tool user interface

Table 1. Model validation accuracy calculated per percent stratum

Overall	Top 10%	Top 20%	Top 30%	Bottom 30%	Bottom 20%	Bottom 10%
84.38%	100%	80%	50%	90%	100%	100%

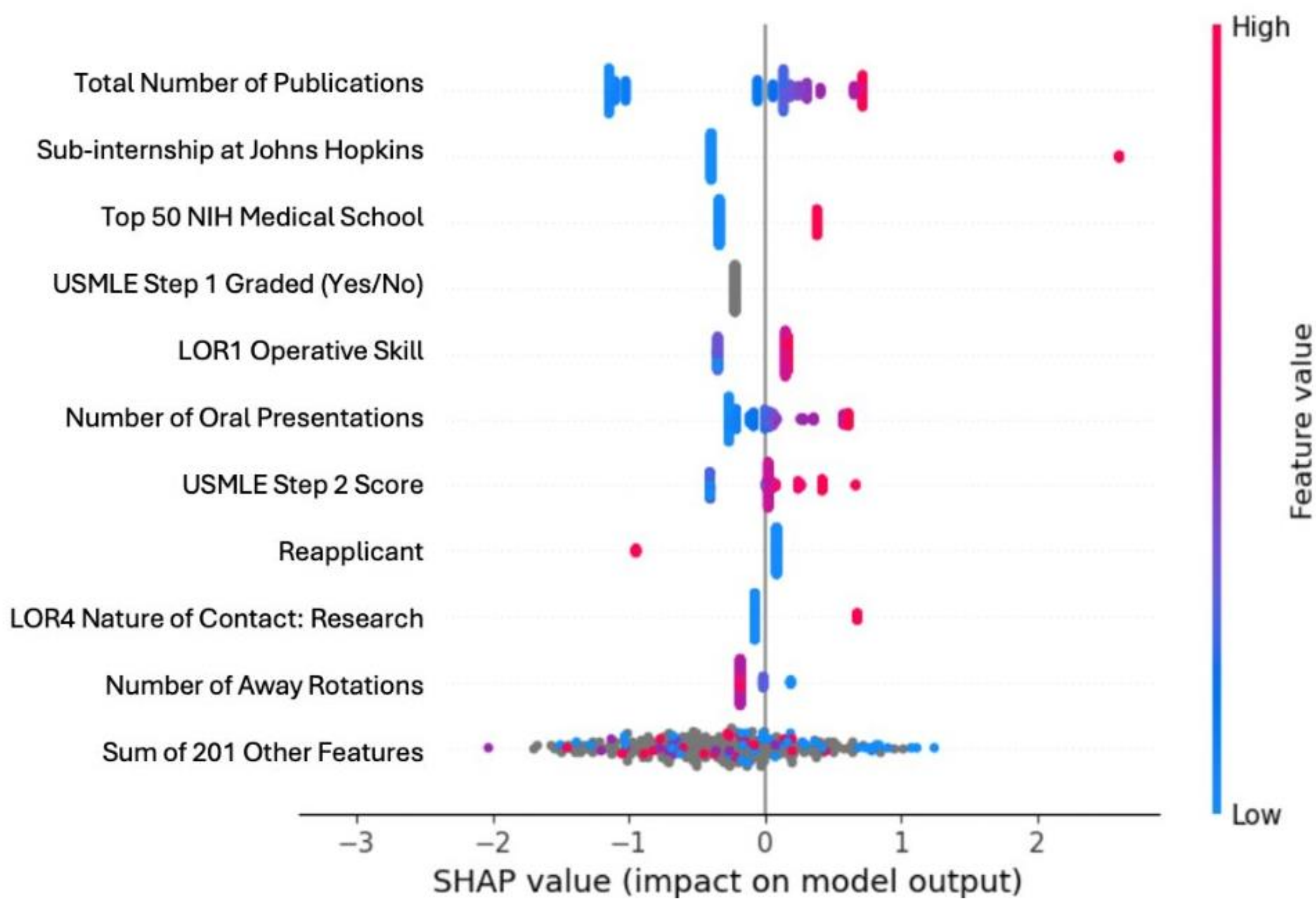


Figure 3. SHAP values for CatBoost Model

- CatBoost demonstrated the best performance, achieving a test **AUROC of 0.95, AUPRC of 0.81, and accuracy of 90.8%**
- Model validation achieved an **AUROC of 0.93, AUPRC of .89, and accuracy of 84.4%**
- Most influential features in predicting interview invitations were **total number of publications**, completion of a sub-internship at our program, and medical school ranking.

Conclusion

- We developed and **validated a ML-based ranking tool that uses historical interview selection patterns** to support residency applicant review
- This tool is intended to serve as a **screening adjunct**, and streamline applicant review by **identifying applicants at the extremes** of historical selection patterns