Optimizing Risk Assessment for Duke University Student Athlete Injury Prevention

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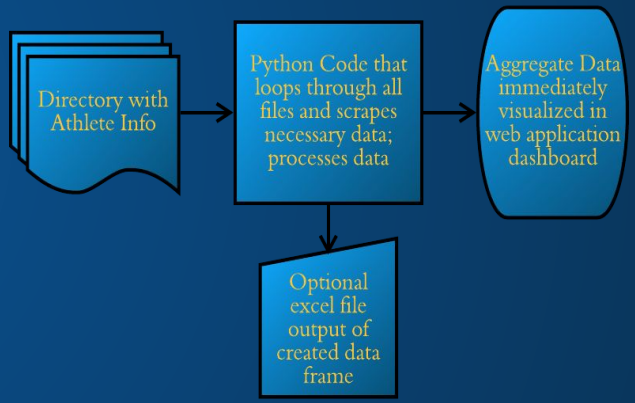
Overview

We are using athlete strength, flexibility, and balance data collected by the Michael W. Krzyzewski Human Performance lab to develop a machine learning model that can predict the likelihood of prospective injury in student athletes. We know an student athlete's injury status before and after their test results. We also want to develop a dashboard for clinicians to aid analysis, and a dashboard for the student athlete report.

Goals

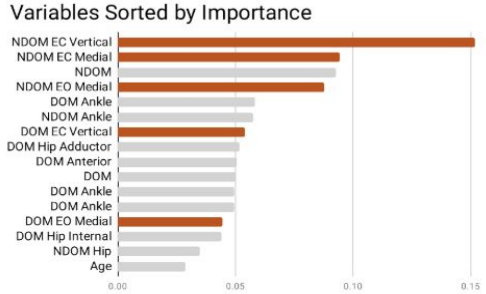
1. Improve KLab data pipelining with intuitive algorithms, strategies, and visualizations
2. Create an injury risk model using machine learning techniques
3. Develop individualized injury risk reports through an interactive web-application

Data Pipeline



Predicting Injury Risk through Machine Learning

Logistic Regression

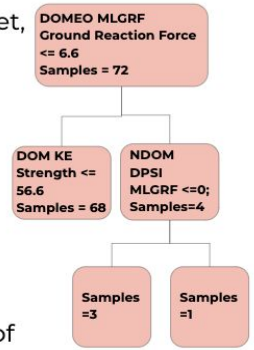


: Balance Variables

- Logistic regression performed to identify **most important variables** for LEMSI

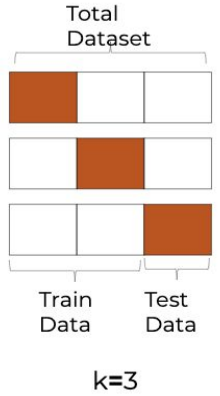
Random Forest

- Small dataset, imbalanced variable outcomes
- Target variable: prospective injury (PI)
- Returns probability of student athlete having PI a.k.a. **Injury Risk**



Model Validation

- Use K-Folds & Leave One Out cross validation methods
- Validated by running data through Gradient Tree Boosting model

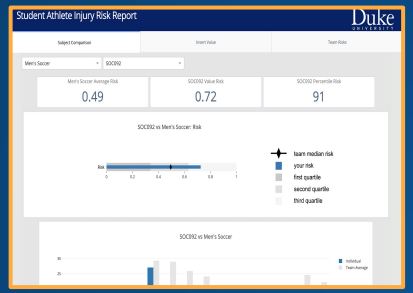


- "Balance" variables contributed significantly to injury risk
- Random Forest and Gradient Tree Boosting models produced ~ 65% accuracy
- Accuracy can be maximized as our dataset increases

Web Applications

Application made for clinical use:

- Assess athlete risk and contributing variables
- Compare athlete stats to team
- Explore team distribution of risk



SCAN ME

Application made for student athlete use:

- Explore where athlete stats stand compared to team
- Color-coded based off test value

SCAN ME

Future Steps

- Cleaning up and updating our web apps as needed
- Getting our apps hosted on a Duke server with Duke authentication - security
- Receive outside opinions on applications from potential users (i.e. clinicians, coaches, athletes, etc.)
- Implement the apps into the KLab's current framework for reporting
- Continue to optimize and improve prediction model with additional data