Project Number: 231309

MindDoc

Unraveling the Decision Making Process:

A Machine Learning Project on Analyzing Patient Characteristics to Enhance Doctor's Judgment

Yuval Vinokur, Noam Gutman, Rotem Eidlitz

Dr. Sarel Cohen

Project Number:

MindDoc

Unraveling the Decision Making Process:

A Machine Learning Project on Analyzing Patient Characteristics to Enhance Doctor's Judgment

Yuval Vinokur, Noam Gutman, Rotem Eidlitz

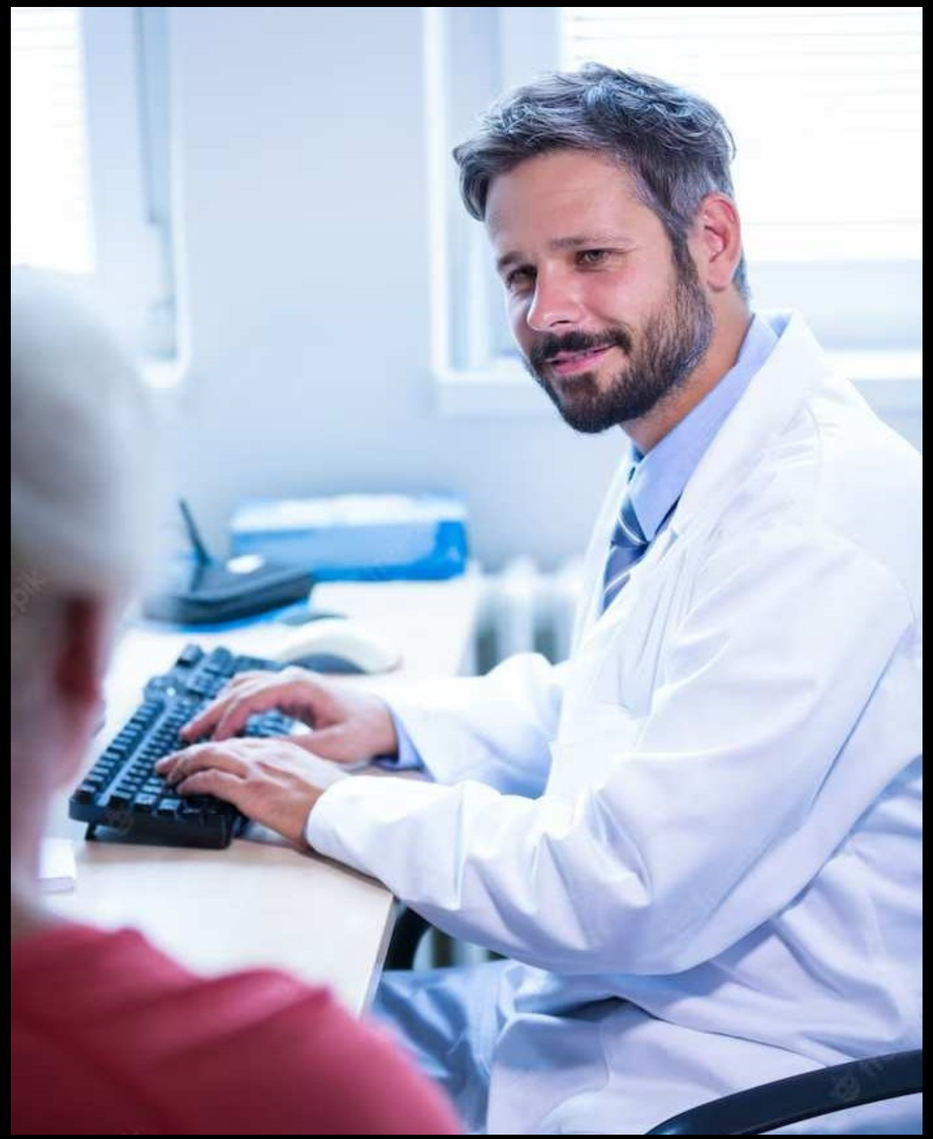
Dr. Sarel Cohen

Introduction

we explore the use of **Machine Learning** to analyze patient characteristics and enhance doctor's judgment.
We will discuss the importance of accurate decision-making in healthcare and the potential of using advanced algorithms.
Join us on this journey of discovery!

Main Goals:

- Understand how doctors make their decision
  - Predict the decision of a specific doctor.
  - Predict the actual decision (psychosis or neurosis).

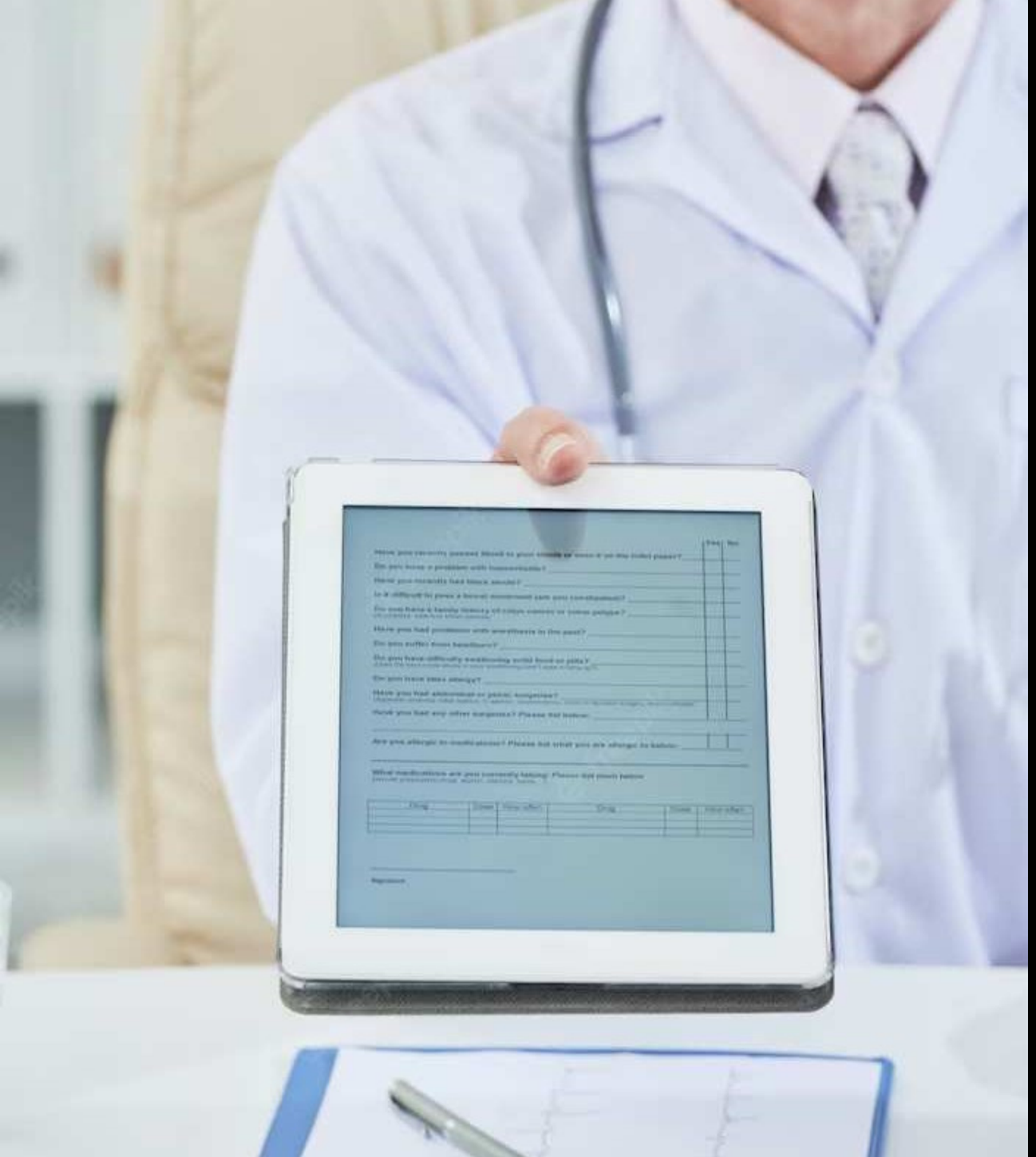


Objective

Our objective is to leverage **Machine Learning** techniques to analyze patient characteristics and provide insights that can enhance doctor's judgment.
By understanding the underlying patterns in patient data, we aim to improve diagnostic accuracy and treatment decisions.
This project has the potential to revolutionize healthcare by augmenting human expertise with computational intelligence.

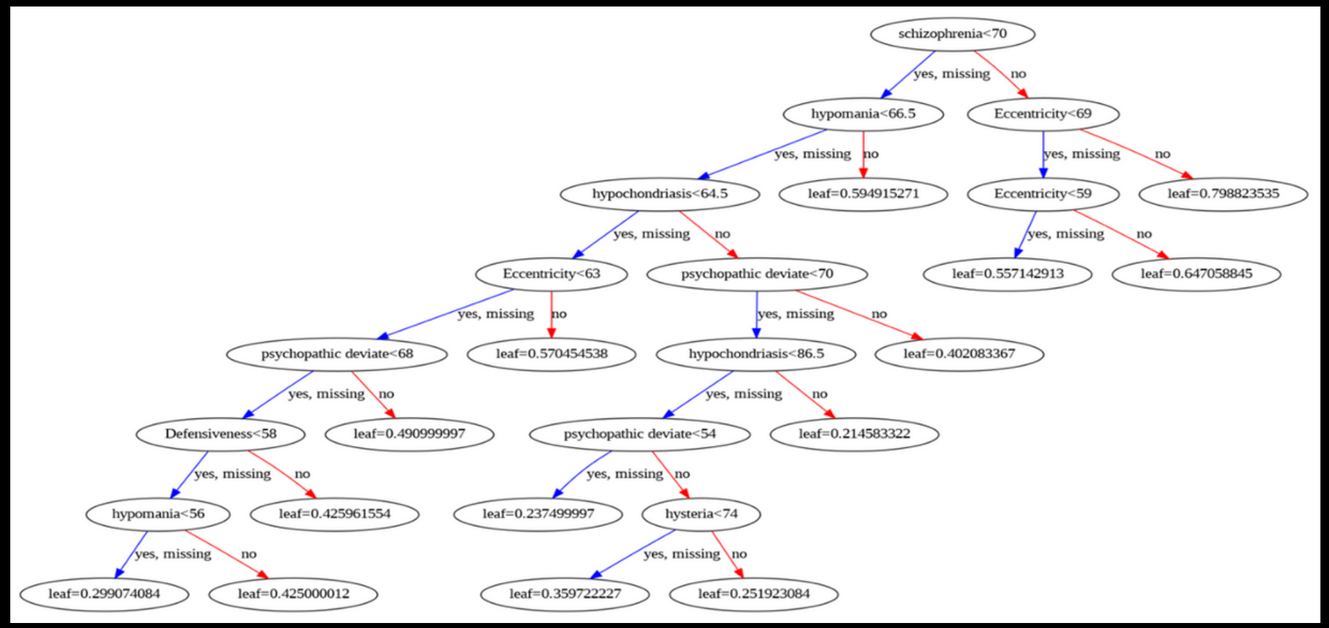
Methodology

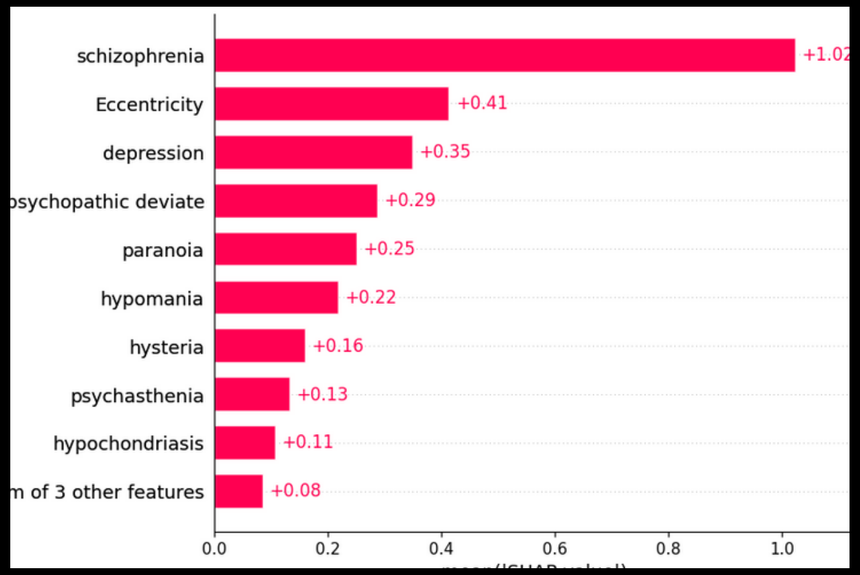
We will employ a **Machine Learning** approach to analyze a comprehensive dataset of patient characteristics. This dataset includes demographic information, medical history, symptoms, and diagnostic outcomes. By training our models on this data, we can identify patterns, correlations, and predictive factors that can aid doctors in making informed decisions. Our methodology ensures a systematic and data-driven approach to enhance the decision-making process



Dataset

Our dataset consists of anonymized patient records from various healthcare institutions.
It encompasses a diverse range of medical conditions and covers a wide demographic.
The dataset has been carefully curated to ensure privacy and compliance with ethical standards.
By leveraging this rich dataset, we can extract meaningful insights that can contribute to the improvement of healthcare outcomes





Feature Selection

Feature selection is a pivotal step in our analysis. Our **XGBoost** model, which yielded the most impactful results, highlighted key variables, including Schizophrenia, Eccentricity, and Depression, based on their substantial **SHAP** values.
These identified features are instrumental in improving decision-making accuracy, as they capture essential patient characteristics.
By relying on the insights from our model, we ensure that doctors' judgment is enhanced effectively

Model Training

We evaluated several machine learning alghoritms, including XGBoost, Linear Regression, Random forest, and Logistic regression.

After training the different models, we have determined that XGBoost outperforms the others in predicting these decisions accurately.

Results

Insight about the data

- We succeeded in separating the Doctors into 3 main clusters
- We noticed the 3 top features of most of the Doctors are schizophrenia hypomania and eccentricity.
- due to the scalar range of doctors' decisions, we refer to the problem as a regression problem and not as a classification therefore we measured the prediction by the r-squared grade.

Models top scores

XGBoost- R2 resault-
Random judge - ~0.78
 complex judge -0.88
 the median judge -0.84

Linear regression -
Random judge- ~ 0.71
complex judge -0.8
median judge - 0.74

Random forest-
Random judge - ~0.74
complex judge - 087
median judge - 0.84

all tests where 20% split of the data

Conclusion

- Nonlinear models predict better than linear models even though doctors decide by linear decisions.
- The complex judge is better than the median judge.
- Doctors differ one from the other- We can see that models trained on one doctor have bad scores on predicting other Doctors' decisions.

Thanks!

Yuval Vinokur, Noam Gutman, Rotem Eidlitz