

Intelligent Parole Violation Prediction System Using Neural Networks

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ABSTRACT

An artificial intelligence-based tool called the Parole Violation Prediction System was created to help correctional officials make data-driven fair and accurate parole decisions. Conventional parole evaluations frequently lead to mistakes that jeopardize public safety or unfairly punish low-risk individuals because they mainly rely on subjective judgment scant information and inconsistent human assessments. To overcome these limitations this study uses machine learning more specifically a neural network model trained on prior parole data analyse significant variables like offender demographics criminal history offense features and supervision details. This solution takes advantage of the hierarchy of the features involved to calculate the likelihood of parole violations for a specific individual. As a result, the solution is objective. The suggested web application uses the Flask framework to implement the solution. It includes two separate modules: the User module and the Administrator module.

The web application that will be developed using the Flask framework for implementing the suggested system includes the user and administrator components. In addition, the account management system together with the FAQs page, which can be found on the site, can be viewed as another means to implement the software. The data pertaining to the parolees needed to predict their behaviour through the use of an artificial neural network shall be provided by the subscribers. It will be easy to manage the parolees since no human intervention is required in the entire process.

Keywords: *Parole Violation Prediction, Artificial Intelligence, Machine Learning, Neural Network, Predictive Analytics.*

I. INTRODUCTION

The last condition concerns real existence of parole for the offenders who have been set free for serving the rest of their prison term. Given the advantages of such an approach through the prism of benefits to society, which arise due to the rehabilitation of the offender and low costs related to detention in prison, it may be considered appropriate to say that the likelihood exists that parole terms will be violated and new crimes will be committed. Thus, in order to avoid such an undesirable outcome, it is necessary to assess the probability of the violation of parole requirements. Now, parole requirements depend only on the information collected by parole officers and, therefore, discrimination takes place, as there are no parole requirements at all.

This study proposes a project on development of an Intelligent Parole Violation Prediction System based on neural network technology used to predict parole violations. Intelligent parole prediction system relies

on many different characteristics of parolees, making predictions based on data, thus helping make decisions. To facilitate usability of the

developed intelligent system, it is incorporated into a Flask web application with Admin and User modules. This approach enhances efficiency, reduces human bias, and increases transparency in parole administration, ultimately contributing to reduced recidivism rates and improved public safety.

II. RELATED WORK

H. S. Laqueur and R. W. Copus. This paper examines the role of machine learning in improving parole decision-making by analysing the New York State Parole Board's release practices. Using ensemble machine learning models, the study predicts the likelihood of any arrest and violent felony arrest within three years for individuals released on parole between 2012 and 2015. The findings reveal that non-risk-based parole decisions result in significant social welfare losses, including higher crime rates and unnecessary incarceration of low-risk individuals. By

comparing actual decisions with counterfactual, risk-based release strategies, the paper demonstrates that crime rates could be reduced or release rates increased without compromising public safety. The study also addresses the selective labels problem by validating predictions on inmates initially denied parole but later released, highlighting the potential of data-driven approaches to create fairer and more effective parole systems.[1]

T. Soliman and A. H. Abd-elaziem. This paper explores the application of artificial intelligence in astrophysics, focusing on stellar classification using spectral data. By analysing electromagnetic radiation and spectral features from over 100,000 astronomical observations, the study classifies celestial objects as either stars or galaxies. A multi-layer perceptron (MLP) neural network is employed using 18 input features, and correlations among these features are examined to enhance classification performance. The experimental results demonstrate that the MLP model achieves an accuracy of 97%. Furthermore, a comparative evaluation of different optimization algorithms is conducted, revealing that the Adagrad optimizer delivers the highest validation accuracy, making it the most effective optimizer for this stellar classification task.[2]

III. EXISTING SYSTEM

The existing process of parole evaluation includes the manual decision-making system based on the subjective and discretionary power of members of the parole board and correctional officers. This process requires partial information about the offender including his or her history, interviews, and behavioral analysis. Although the above techniques give some qualitative understanding of the situation, they lack objectivity and consistency leading to considerable differences between the parole outcomes. The process is highly influenced by the human factor because its decisions are based on the subjective judgments, therefore, in some cases the parolee will be dangerous to society and may commit parole condition violation, while in other cases the offender will stay in jail without having any risk of violating parole conditions. The traditional methods of assessing the risk of parole violation have limited capability in terms of analysing the historical data and finding relationships among the numerous factors that can influence the offender, such as demographic, historical, and criminal

characteristics and offense and supervision conditions. Parole assessment is always conducted based on the established rules or scores; therefore, it cannot adapt to new trends in crime. In addition, there is not enough information regarding particular scenarios for analysis and justification.

IV. PROPOSED SYSTEM

In summary, therefore, the design process of this model should follow the development process of the Intelligent Parole Violation Prediction Model with the use of AI and ML. Unlike other existing parole violation models that are concerned with subjective considerations alone, this model will rely on both the use of neural network and parole information to predict parole violations. The variables that will be used to predict parole violations will consist of demographic information about the offender, history of crimes committed, specifics of the crime, information on sentencing and parole and whether offenders have fulfilled the requirements of parole. A web application was created by the team working on this project. This application has two components, which are Admin and User. The Admin is responsible for managing permissions of users, managing users, updating the FAQ page, and so forth. Users can provide essential data for predicting violations of parole using neural networks.

ADVANTAGES OF THE PROPOSED SYSTEM

1. **Reduced Human Biases:** Since the algorithm utilizes predictions made from data sets, human biases are greatly reduced. The process becomes more fair, balanced, and predictable.
2. **Predictive Accuracy:** Because of the neural networks used in the algorithm, complex interactions in the historical data can be identified, making for better predictions of future behavior.
3. **Increased Transparency:** The outcome of the predictive model is solely based on clearly defined inputs, making it more transparent for parole officers.
4. **Efficient Parole Administration:** The adoption of the automated prediction system reduces the workload of the correctional officers by eliminating manual processes, thus making the process more efficient.
5. **Proactive Supervision and**

Rehabilitation: The early detection of high-risk individuals allows for proactive supervision and customized rehabilitation programs, leading to a reduction in criminal activities.

6. Efficient Deployment: The deployment of the Flask web application ensures scalability and easy-to-use

System Architecture

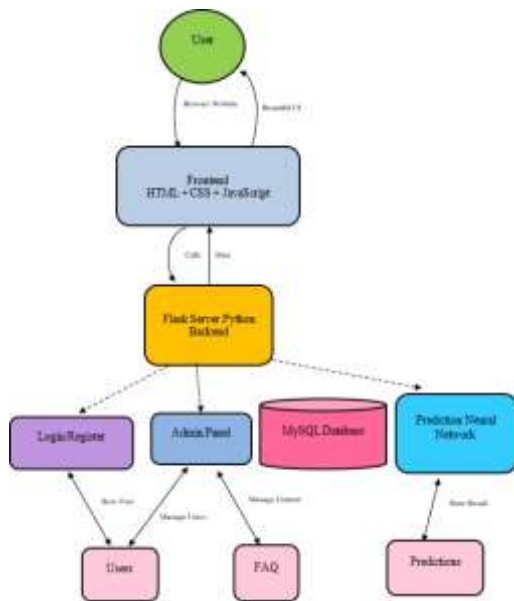


Figure 4.1. System Architecture

V. METHODOLOGY

MODULES DESCRIPTION: The

Admin module serves as the control center of the system. Depending on the situation, it is the duty of the administrator to manage the user rights and content within the system so that it works effectively.

This is what the Admin module does: authentication, where the administrator will access the system based on his/her credentials; after authentication, the administrator will see the total number of users in the system, and he/she will delete some users if need be; moreover, it is

possible for the administrator to manage Frequently Asked Questions (FAQs). For instance, he/she will delete some of the FAQs or add them in order to make the system work effectively. Through this process, the user will understand parole violation prediction and artificial intelligence decision-making.

The User module performs the task of predicting parole violation for the parole officers. Firstly, before

utilizing the system, the user should register himself/herself in the system, alongside personal and professional information.

Parolees' information will be provided by the users, and then the system will run these details through the neural network model, producing prediction results based on the processing of these details. Besides, users can view information regarding the prediction method, how to use the system, and other information about parole through the FAQ module.

VI. RESULT



Figure 6.1. Result of Parole Prediction

The prediction result generated by the proposed Intelligent Parole Violation Prediction System. The user interface allows authorized users to input parolee-related attributes such as gender, race, age, state, time served, maximum sentence, multiple offenses indicator, and crime type. These inputs are processed by the trained neural network model to assess the likelihood of parole violation.

Based on the entered parameters, the system predicts that the parolee will not violate parole, with a confidence score of 76.34%. This confidence score indicates the likelihood calculated by the artificial neural network, implying that there is a relatively low chance that the parolee will violate parole terms.

This result appears immediately upon submission, showing the potential of the system to provide immediate decision support. The result showcases the efficiency of applying machine learning models alongside the Flask framework for web application development for generating useful and interpretable predictions. Such results may aid parole officers in distinguishing between low-risk subjects, who need normal supervision, and high-risk subjects, who require closer monitoring.

Overall, the result affirms the efficiency of the designed system for making unbiased parole decisions

based on data analysis.

VII.CONCLUSION

This project presented an Intelligent Parole Violation Prediction System that leverages Artificial Intelligence and Machine Learning techniques to support data-driven and unbiased parole decision-making. By utilizing a neural network model trained on historical parole data, the system effectively analyses multiple offender-related factors, including demographics, criminal history, offense characteristics, and supervision details, to predict the likelihood of parole violations. This approach addresses the limitations of traditional parole assessment methods that rely heavily on subjective judgment and incomplete information.

The project has achieved accuracy of 76.34%.

The incorporation of the predictive model within the Flask application through the implementation of various modules such as Admin and User is relatively easy. The real-time predictions offered by the system shall prove useful in making decisions about how best the parole officers can improve their resource management and supervision strategies. The performance of the predictive model shall be determined in terms of accuracy, precision, and recall among other factors.

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