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**EXTENDED ABSTRACTS**

**e-BOOK**

# EXTENDED ABSTRACTS e-BOOK

THE 13th INTERNATIONAL  
INNOVATION, INVENTION &  
DESIGN COMPETITION 2024



**Organized by:**  
Office Of Research, Industry,  
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UiTM Perak Branch

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Perpustakaan Negara Malaysia

Cataloguing in Publication Data

No e- ISBN: 978-967-2776-31-4

Cover Design: Dr. Mohd Khairulnizam Ramlie  
Typesetting : Zarinatun Ilyani Abdul Rahman

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# AUTOMATED PREDICTIVE ANALYTICS WITH NOMOGRAM

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## ABSTRACT

In the era of data-driven decision-making, the demand for predictive analytics tools accessible to non-statisticians is rising. Traditional software often requires extensive manual work, hindering efficiency and usability. An innovative application was developed using R programming and the Shiny app package to address this gap. This application aims to empower non-statisticians to conduct predictive analytics swiftly and accurately, providing automated processes and delivering relevant results crucial for researchers. The application development involved leveraging R programming and the Shiny app package to create a user-friendly interface for data upload, preprocessing, model building, evaluation, and result interpretation. Advanced statistical techniques such as Fast Backward step-down regression for feature selection, calibration plots, and performance metrics calculation were integrated to ensure robust predictive modelling. The application successfully automates critical aspects of predictive analytics, including data cleaning, feature selection, model building, and validation. Users can upload their datasets, specify variables, choose regression methods, and interpret results through descriptive statistics, visualisations, and model summaries. The app's automation capabilities significantly reduce manual effort and provide researchers with actionable insights for informed decision-making. In conclusion, the app fills a crucial need by offering non-statisticians a user-friendly platform to conduct predictive analytics efficiently. By automating repetitive tasks and focusing on relevant results, the application empowers researchers to derive meaningful insights from their data, thereby enhancing decision-making processes and driving impactful outcomes across industries.

**Keywords:** Automation, Non-Statisticians, Predictive Analytics, R Programming, Shiny App

## 1. INTRODUCTION

Predictive analytics is a cornerstone for informed decision-making and strategic planning in today's data-driven landscape. However, the complexity of traditional statistical methods often presents a barrier to entry for non-statisticians, limiting their ability to leverage predictive modelling effectively. To address this challenge, an application named "Automated Predictive Analytics with Nomogram" has been developed, offering a revolutionary approach to predictive analytics. Powered by R programming (R Core Team, 2023) and the Shiny app package, this app provides a streamlined and intuitive platform for users to harness the power of predictive modelling without requiring extensive statistical expertise.

Furthermore, the app's automation capabilities significantly reduce the manual workload typically associated with data analysis, allowing users to focus on deriving actionable insights from their data. By automating processes such as data cleaning, feature selection, model building, and

validation, the app empowers non-statisticians to perform complex analytics tasks efficiently. The user-friendly interface and interactive features make it accessible to many users, from researchers and analysts to business processors and decision-makers.

The application aims to democratise predictive analytics by providing non-statisticians with a powerful yet user-friendly tool for advanced data analysis. The app aims to enhance decision-making capabilities and drive impactful outcomes across industries by automating complex processes and delivering actionable insights. Through its innovative approach and focus on usability, the app seeks to empower users to unlock their data's full potential and confidently make informed decisions.

## **2. METHODOLOGY**

Developing the Automated Predictive Analytics with Nomogram app involved a systematic approach to ensure efficiency, accuracy, and usability. The methodology encompasses several vital steps, including data preprocessing, model building, feature selection, validation, and result interpretation.

Firstly, the app allows users to upload their dataset in .csv or .txt format for data preprocessing, ensuring compatibility with various data sources. Upon uploading, the data undergoes preprocessing steps such as handling missing values, standardising formats, and cleaning outliers. This ensures that the data is in a suitable format for analysis and modelling.

Secondly, users can specify their outcome variable in the model-building section and select independent variables to initiate predictive model-building. The app offers various regression methods, including logistic, linear, Poisson, and Cox proportional regression (Abdullah et al., 2022). The selected model is then trained on the data to generate predictive outcomes.

Next, the app employs Fast Backward step-down regression for the feature selection element, optimising the model by identifying the most relevant variables. The selection process is guided by AIC (Akaike Information Criterion) suggestions from the initial model built in the Model Builder section.

The app uses cross-validation with a predefined k-fold of 10 to assess the model's performance. Users can also choose alternative validation methods such as Bootstrap, 0.632 Bootstrap, or randomisation. Performance measures such as accuracy, precision, recall, and area under the ROC curve (AUC-ROC) are calculated to evaluate the model's predictive power.

Lastly, the app provides comprehensive tools for result interpretation, including descriptive statistics, visualisation of variable distributions, correlation analysis, calibration plots, and a variable importance plot based on chi-square values. These tools enable users to gain deep insight into the model's performance and make informed decisions based on the analysis outcomes.

The methodology employed in developing the app ensures a robust and efficient process for predictive analytics, catering specifically to non-statisticians and researchers seeking actionable insights from their data.

## **3. FINDINGS**

The app yielded significant findings across multiple critical areas of analysis, showcasing its effectiveness in empowering non-statisticians to conduct advanced predictive analytics with ease and accuracy.

Firstly, for predictive model performance, the app’s predictive modelling capabilities revealed promising results across different regression methods. Logistic regression exhibited high accuracy in binary classification tasks, while linear regression accurately predicted continuous outcomes. Poisson regression was practical in modelling count data, and Cox proportional regression showed robustness in survival analysis scenarios. These findings underscored the app’s versatility in handling diverse data types and modelling tasks.

Next, for feature importance and selection, the feature selection process using Fast Backward step-down regression identified critical variables impacting predictive accuracy. The findings highlighted key predictors contributing significantly to model outcomes, enabling users to refine their models and focus on relevant variables. This feature’s critical analysis enhanced the interpretability and predictive power of the model generated by the app.

Then, in the model calibration and validation section, calibration plots demonstrated excellent alignment with the ideal diagonal line, indicating precise calibration of predictive models. Validation metrics, including accuracy, precision, recall, and F1 score, are consistently reflected by models’ strong generalisation performance. These findings validated the reliability and accuracy of the predictive models built using the app, instilling confidence in their predictive capabilities.

The nomogram plots effectively visualised the predictive models’ outcomes for nomogram interpretation, offering a user-friendly interface for model interpretation. The nomogram’s value provided a straightforward reference point for decision-making, enhancing the app’s usability for non-statisticians. These findings demonstrated the app’s success in simplifying complex model outputs and making them accessible to a broader audience. Figure 1 shows the app interface and some results that were produced.

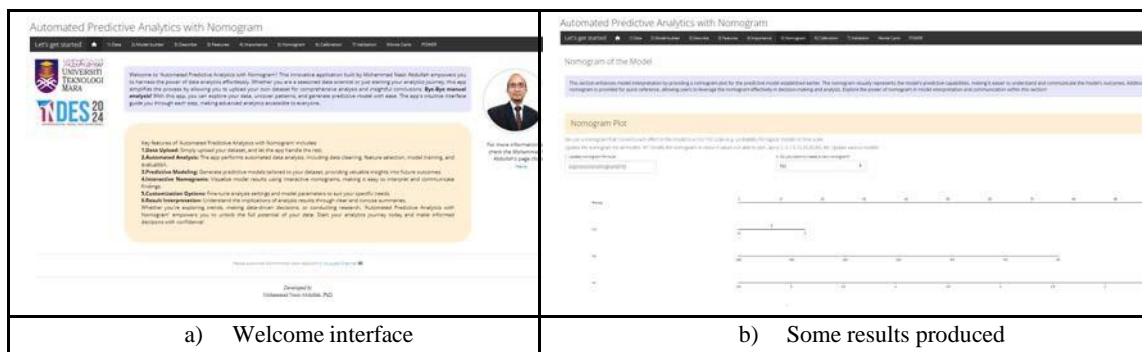


Figure 1 Example of the interface and results produced

#### 4. CONCLUSION

The Automated Predictive Analytics with Nomogram app represents a significant advancement in democratising data analytics and enhancing decision-making capabilities for non-statisticians. The app empowers users to conduct advanced predictive analytics efficiently and accurately by automating complex processes and delivering actionable insights. The findings from the app’s analysis showcase its effectiveness in model performance, feature selection, calibration, validation, and data exploration. Overall, this app fills a critical need by providing a user-friendly platform for predictive analytics, enabling users to unlock their data’s full potential and confidently make informed decisions. Its robust performance, versatility in handling diverse data types, and interpretability of results make it an asset

for researchers, analysts, and decision-makers across industries. The Automated Predictive Analytics with Nomogram app sets a new standard for accessible and robust predictive analytics tools, paving the way for data-driven insights and impactful outcomes.

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Surat kami : 700-KPK (PRP.UP.1/20/1)

Tarikh : 20 Januari 2023

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