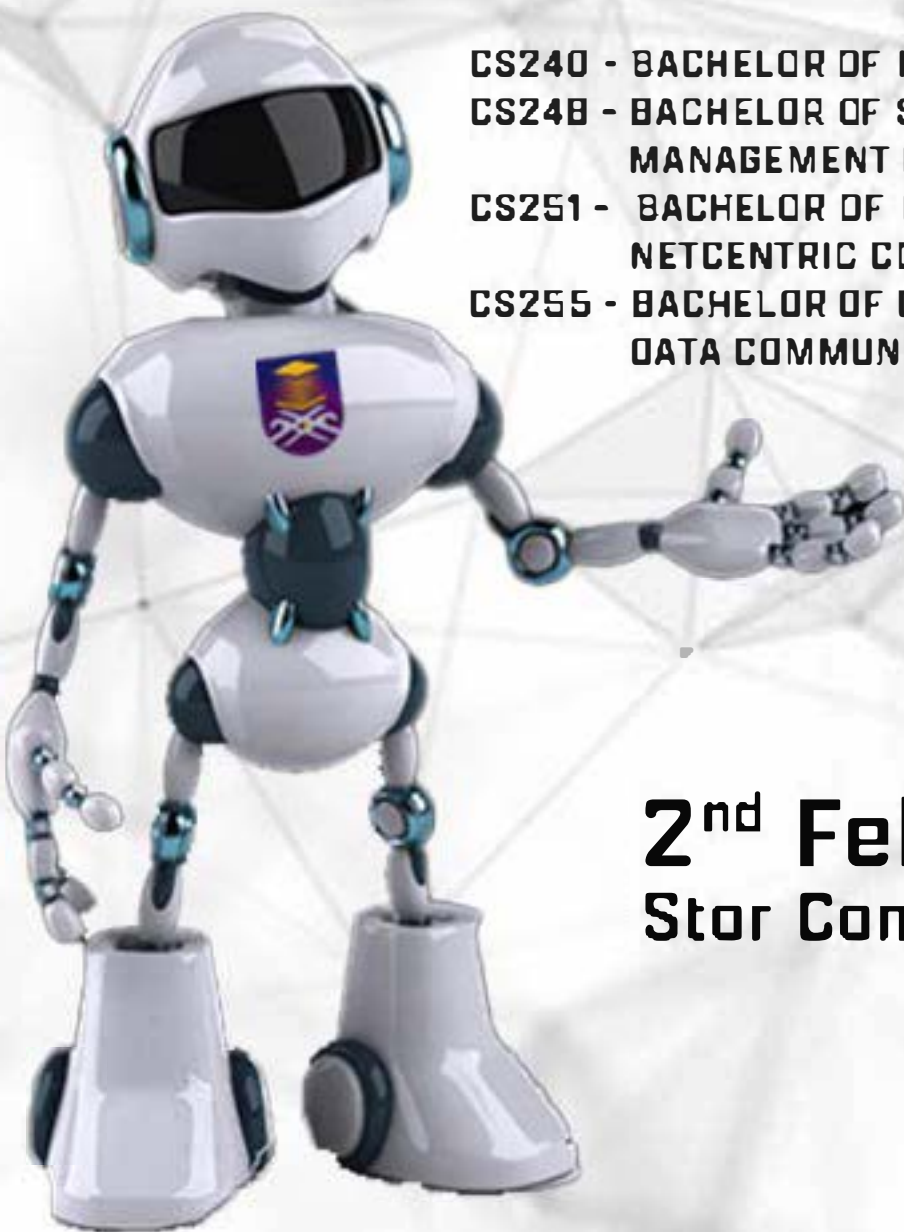


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**RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES**

# **REMACS 5.0**

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**CS240 - BACHELOR OF INFORMATION TECHNOLOGY [HONS.]**  
**CS248 - BACHELOR OF SCIENCES [HONS.]**  
**MANAGEMENT IN MATHEMATICS**  
**CS251 - BACHELOR OF COMPUTER SCIENCE [HONS]**  
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**CS255 - BACHELOR OF COMPUTER SCIENCE [HONS]**  
**DATA COMMUNICATION & NETWORKING**

**2<sup>nd</sup> February 2023**  
**Stor Complex, UiTM Perlis**

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**Organized by:**  
**College of Computing, Informatics and Media**  
**Universiti Teknologi MARA Perlis Branch**

**Research Exhibition in Mathematics and Computer Sciences  
(REMACS 5.0)**

Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)

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# Preface

It is with great pleasure that we present this extended abstract book, titled "The 5<sup>th</sup> Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)". This book is a collection of research work in the fields of Computer Science and Mathematics, contributed by the final year students from Universiti Teknologi MARA, Perlis Branch. The aim of this book is to showcase the diversity and depth of research in these two interrelated fields.

Mathematics and Computer Science are two fields that have seen tremendous growth and advancement in recent years. With the rise of new technologies and the increasing demand for data-driven solutions, researchers in these fields have been working hard to develop new theories, algorithms, and models that can help solve some of the most pressing problems of our time. This book is a testament to their hard work and dedication.

The abstracts in this book cover a wide range of topics, including algebra, analysis, logic, computer architecture, algorithms, artificial intelligence, machine learning, computer network, netcentric computing and many more. The work presented here is both theoretical and practical, and has the potential to impact many areas of society, from finance and healthcare to education and security.

We hope that this book will serve as a valuable resource for future students in the fields of Mathematics and Computer Science. We also hope that it will inspire more students to pursue innovative and groundbreaking research in these two fields. Finally, we would like to express our gratitude to all the contributors for their hard work and dedication, without which this book would not have been possible.



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# EVENT SCHEDULE

8:00 – 8:30 am

- Registration

8:00 am – 12:00 pm

- FYP Project Presentation

12:00 - 2:00pm

- Lunch Break

2:15 – 2:35 pm

- National & Wawasan Setia Anthems
- Doa Recitation

2:35 – 2:45 pm

- Welcoming Address by Director of REMACS 5.0

2:45 – 2:55 pm

- Officiating & Closing Remarks from Rector of UiTM Perlis

2:55 – 3:00 pm

- REMACS 5.0 Montage

3:00 – 4:00 pm

- Awarding of Winners:
  - Best Poster
  - Best Project Award

- Photo Session

- End of Ceremony

*Dress Code: Formal / Corporate*

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# EXTENDED ABSTRACTS

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RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES  
**REMACS 5.0**

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# EARLY DIABETES RISK PREDICTION USING ANT COLONY OPTIMIZATION ALGORITHM

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## Abstract

Diabetes is a deadly disease that causes serious health complications to its sufferers. It costs the sufferers' health as well as their money. It is crucial to detect diabetes risk early to prevent the disease from worsening and becoming hard to treat. Therefore, this study has developed a classification model for predicting early diabetes risk using an Ant Colony Optimization (ACO) algorithm. The ACO-based classification algorithm, Ant-Miner is used to train the diabetes dataset of 520 new diabetes or potential diabetes patients from Sylhet Diabetes Hospital in Sylhet, Bangladesh. The average predictive accuracy from Ant-Miner is compared to the average predictive accuracy from J48. It is found that the average predictive accuracy of the model produced by Ant-Miner is at par with J48. The average predictive accuracy of the model produced by Ant-Miner is 95.51%, while J48 is 95.38%.

*Keywords: Ant Colony Optimization, Ant-Miner, machine learning algorithm, diabetes, diabetes risk prediction*

## 1. Introduction

Early detection and treatment can control and even prevent complications caused by diabetes. However, it is difficult to predict early diabetes risk accurately without the help of technology. The use of computer technology can help to precisely detect diabetes (Gupta et al., 2020). Therefore, the main objective of this study is to develop a classification model for predicting early diabetes risk using an Ant Colony Optimization algorithm, Ant-Miner. This study used the data from the research paper 'Likelihood Prediction of Diabetes at Early Stage Using Data Mining Techniques' by Islam et al. (2020). The ACO-based classification algorithm, Ant-Miner is used to train the diabetes dataset of 520 new diabetes or potential diabetes patients from Sylhet Diabetes Hospital in Sylhet, Bangladesh.

## 2. Methodology

There are three stages in the research framework: data pre-processing, model development, and model validation. In the data pre-processing stage, the diabetes data is discretized to convert the attribute Age into an ordinal attribute or bins. Next, in the model development stage, there are three steps to generate a term for a rule. Firstly, the entropy is calculated. Secondly, the normalized heuristic functions is applied to the entropy values. Thirdly, the probability value is calculated. The term with the highest probability is chosen as the first rule. All three steps are repeated to get one more term from the available attribute. These steps are repeated until the entire attributes had been attempted. Every time a new term was added, the number of training instances will be reduced, therefore this process will continue until there were no more training instances remain. Lastly, in the model validation stage, this study used 10-fold to determine the average predictive accuracy of the developed classification model. Majority of researchers suggest 10-fold partition because 10-fold will produce the best estimate of error (Witten et al., 2011, p. 153). In addition, the average predictive accuracy of the prediction model by Ant-Miner is compared to the average predictive accuracy from J48. J48 is an implementation of C4.5 (Parpinelli et al., 2022) algorithm, C4.5 is an industrial standard algorithm for classification-rule discovery.

### 3. Results and Discussion

It is found that the average predictive accuracy of the prediction model by Ant-Miner is higher than J48. The average predictive accuracy of the model produced by Ant-Miner is 95.51%, while the average predictive accuracy of the model produced by J48 is 95.38%. The number of rules and the number of terms generated using ACO for average predictive accuracy 95.51% are 7.6 and 13, respectively. Thus, this study proves that the ACO algorithm, Ant-Miner can help to develop the classification model for predicting diabetes risk at early stage.

### 4. Novelty of Research / Product

The Malaysia Healthcare Travel Industry Blueprint 2021-2025 aims to produce world standard healthcare facilities with state-of-the-art technology (Malaysia Healthcare Travel Council, 2021, p. 13). The use of ACO algorithm, Ant-Miner to develop a classification model for predicting early diabetes risk is in line with the government aspiration as it uses leading-edge technology. Health systems and clinicians can use the ACO algorithm, Ant-Miner to develop a classification model for predicting early diabetes risk. The use of intelligent diagnostic systems such as ACO can help to minimize errors and improve diabetes diagnostic precision (Wu et al., 2022).

### 5. Conclusion

The results show that the developed classification model, namely the early diabetes risk forecasting model, should help health systems and clinicians to find new ways of predicting diabetes risk at early stage and improve the prediction of early diabetes risk.

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