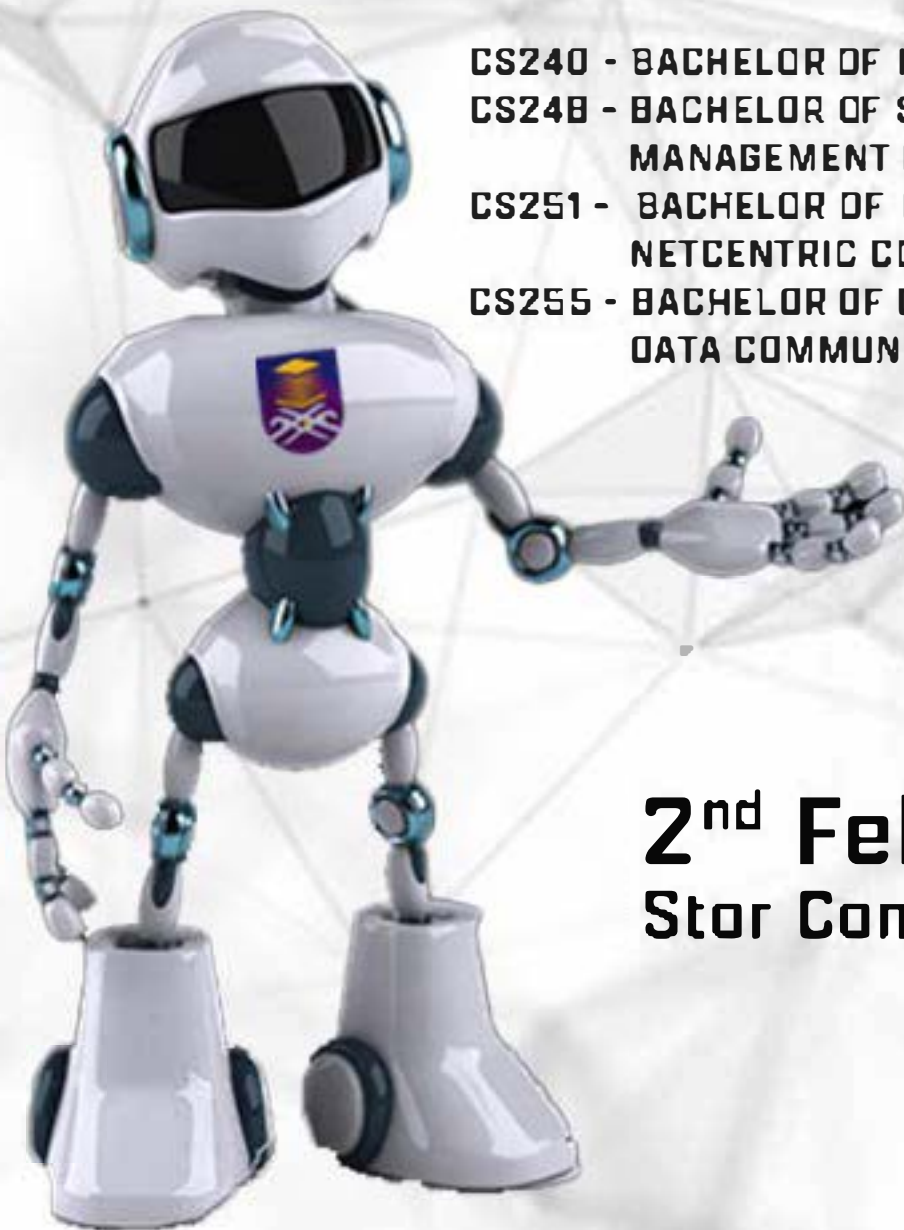


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RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES

# 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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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  
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# HOMENETSEC: ENHANCING HOME NETWORK SECURITY BY SURICATA INTRUSION DETECTION SYSTEM USING RASPBERRY PI

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## Abstract

Most of home network user are not aware that they can be exposed to attacks from threat actors through the Internet. It is important to educate the general public about home network security. So, this project aims to develop a low-cost network monitoring system. A preliminary survey was done to find the needs from the general publics. From the survey, there is a need for system that can enhance home network security and the finding of the survey was to create the HomeNetSec system. Result of functionality testing is the system can detect suspicious network traffic and bad network traffic. Each of the component of the system such as Suricata, Elasticsearch, Kibana and Fluent Bit functioned correctly. During usability testing, the users have evaluated that the system satisfied their needs of a system that can enhance their home network security.

*Keywords: Suricata, home network security, Raspberry Pi, IDS, network threats, IoT*

## 1. Introduction

Most home network users are unaware that they are vulnerable to attacks from the Internet. Some of the threat actors who attack home networks are financially motivated cybercriminals, ideologically motivated hacktivists, terrorist groups motivated and script kiddies. It is critical to educate the general public about the importance of home network security. Besides, a simple and easily managed device to secure the home network is desirable. This project aimed to create a low-cost network monitoring system using Raspberry Pi that can alert the home residence if there is an attack. To evaluate its functionality, the system was tested with specified scenarios.

## 2. Methodology

Firstly, a preliminary survey was conducted to determine the needs of the general public. Its findings confirmed that there is a need for a system that can improve home network security. Then, the home network security (HomeNetSec) system was designed and built on an Internet of Thing (IoT) device, Raspberry Pi 4. Suricata IDS, the detection engine, is one of the software components that was embedded in the system with the purpose to detect malicious network traffic that has passed through the network. Once it was fully completed, the HomeNetSec system was then tested for functionality and usability where some potential users have evaluated the capability of the system.

## 3. Results and Discussion

The system can detect suspicious network traffic and bad network traffic as a result of functionality testing. Each system component, such as Suricata, Elasticsearch, Kibana, and Fluent Bit, worked properly. Suricata IDS was able to detect and log suspicious and malicious network traffic. Elasticsearch processes the logs so that Kibana can use them. Kibana displays the processed data as meaningful data. Fluent Bit was able to successfully pipe data from Suricata IDS logs to Elasticsearch. During usability testing, users determined that the system met their requirements for a system that can improve the security of their home network.

## 4. Novelty of Product

The HomeNetSec system was developed using Open-Source software (Cueva Hurtado et al., 2019), that run on Raspberry Pi that is portable and can be move to another network whenever necessary. There been a number of research of using Raspberry Pi as a platform to secure network (Taib et al, 2020), (Taib et al, 2020). It can be configured to detect any possible network attacks through Suricata rules and signatures (Flauzac et al.,2020). The system is potentially to be commercialized as many home users may need it to secure their network activity. Moreover, it is affordable and easy to use without comprehensive training. To improve home network security even further, users must keep router firmware up to date. Older router firmware may contain flaws that threat actors can exploit. Furthermore, to protect the home network from intruders, the user can disable remote access to the router. The risk of threat actors remotely accessing and tempering the home router is reduced (Kaspersky, 2022). As a result, the home network is more secure.

## 5. Conclusion

All of the study's objectives were met with success. The first objective is to develop the HomeNetSec system as a low-cost external network monitoring system that integrates with Suricata IDS to improve home network security. The second objective is to evaluate the HomeNetSec system's capability by testing it with predefined scenarios.

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