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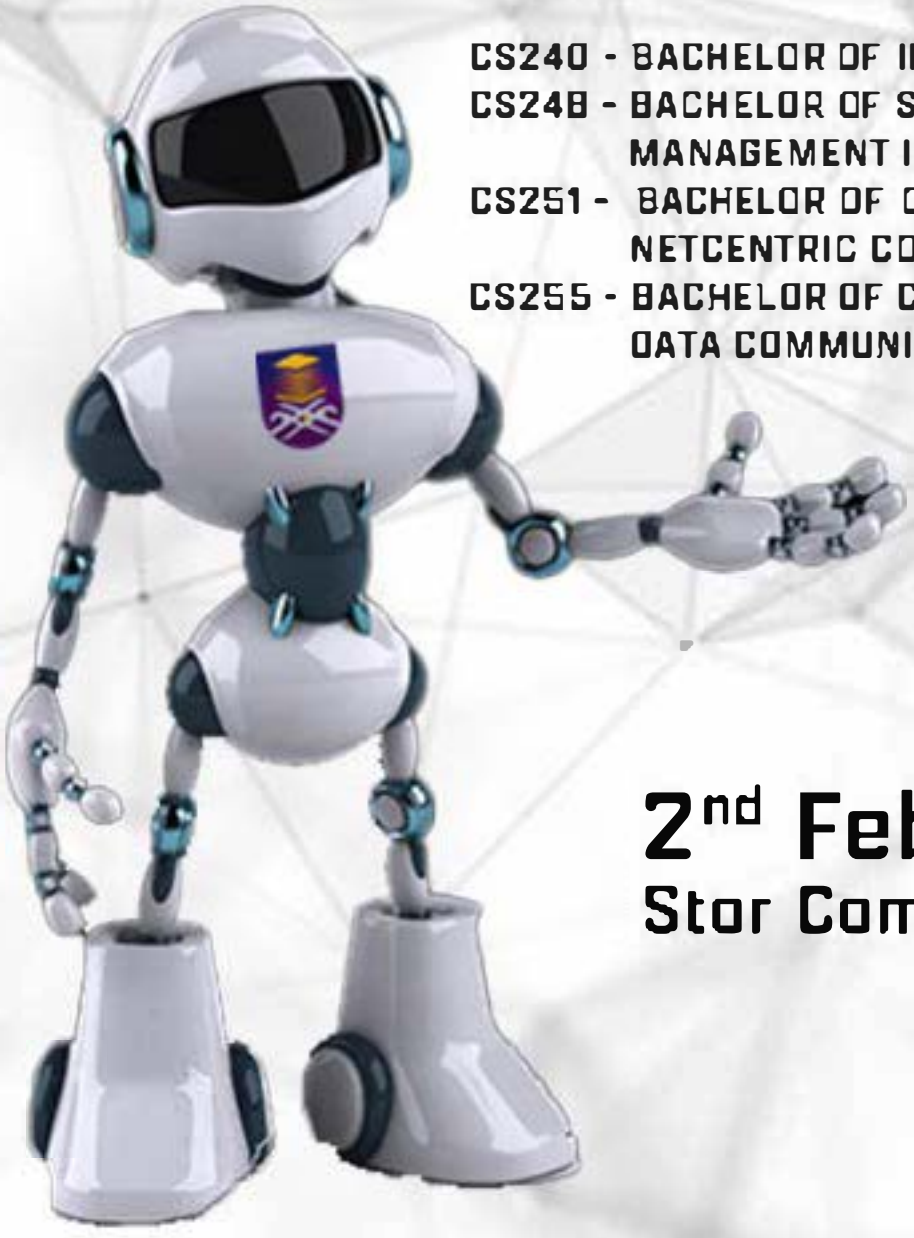
RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES

REMACS 5.0



CS240 - BACHELOR OF INFORMATION TECHNOLOGY (HONS.)
CS248 - BACHELOR OF SCIENCES (HONS.)
MANAGEMENT IN MATHEMATICS
CS251 - BACHELOR OF COMPUTER SCIENCE (HONS)
NETCENTRIC COMPUTING
CS255 - BACHELOR OF COMPUTER SCIENCE (HONS)
DATA COMMUNICATION & NETWORKING

2nd Februory 2023

Stor Complex, UiTM Perlis

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)

Editors
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e ISBN: 978-629-97934-0-3

Perpustakaan Negara Malaysia

Published by

MOHAMMAD HAFIZ BIN ISMAIL
Universiti Teknologi MARA
02600 Arau, Perlis
Tel: +604 988 2028

https://fskmperlis.uitm.edu.my/remacs50/

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Preface

It is with great pleasure that we present this extended abstract book, titled "The 5th 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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RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES
REMACS 5.0

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

List of Papers

RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES

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EXTENDED ABSTRACTS

IMAGE AUTHENTICATION SYSTEM USING DEEP LEARNING

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Abstract

Using a variety of techniques, image manipulation can be performed not only by commercial editors, but also by criminals and counterfeiters for the goal of counterfeiting. Digital forensic tools are required to detect the manipulation and tampering of images for such unlawful activities. For these reasons, this research offered an algorithm for detecting image manipulation using Convolutional Neural Network (CNN) technique that has produced excellent results in recent studies. In addition, the other purpose was to assess the performance of the developed CNN image authentication system in detecting tampering in images.

Keywords*: tampered image, neural network, image classification, deep learning, Convolutional Neural Network (CNN)*

1. Introduction

With the emergence of new cameras, mobile phones, and tablets, the number of digital photos has exploded. To maintain the integrity of digital image evidence, forensic examiners must meticulously document or record every process or step they take to assure reproducibility. This research's primary purpose was to develop an image authentication system that can identify image tampering. To achieve this purpose, the research presented a deep learning-based photo alteration detection system based on Convolutional Neural Network (CNN) technique.

2. Methodology

The research started off with building the training module for the testing function of the system. The process is done by preparing the images from the dataset CASIA V2.0 (Dong et al., 2013) into a size that the model could accept, then sequential ELA model is built with the automated validation phase for testing chapter of the research. The research would randomly pick 1000 authentic and 1000 tampered images then take 20% off the 2000 for validation purposes. The system would then output a h5 model to be used for the testing function of the research together with graph and confusion matrix as validation results. For the training function, the user could use their own dataset with their own learning rate and complete passes to create their own trained model with ELA, VGG16, and VGG19. This is done by importing the pretrained keras model but training them on the spot with user's own dataset. The same graph and confusion matrix will be shown as validation results then user can test their model using material they want. The whole GUI is built using PyQt5 library in python for ease of use.

3. Results and Discussion

Overall, all the functions proposed in the system functions as intended where the training function would be able to train the model ELA, VGG16 and VGG19 using user's own dataset. The model would then be saved and can be tested on the system. While the testing part of the system functions as intended where the result would be shown in a percentage manner and uses the innate model where it was separately trained. The outcomes of the testing are positive the trained model achieving a respectable 86.5% accuracy, 91.52% sensitivity, 82.98% specificity, and 13.5% error rate.

4. Novelty of Research / Product

There have been several rese
arches that have image tampering image classification such as the Detection and Localization of Image Forgeries Using Improved Mask Regional Convolutional Neural Network. (Wang et al., 2019) by using a mask-trained end-to-end classification algorithm to distinguish altered from legitimate parts. The system is capable of detecting the targeted types of manipulation but with slow processing. Another popular one is Image Tampering Detection for Splicing Based on Rich Feature and Convolution Neural Network (Yang et al., 2020) by utilizing rich feature kernel to suppress image content and increase the forging trace. Each research provides a fairly high accuracy manipulation detection but with slow processing.

5. Conclusion

In conclusion, we provided a novel system for detecting image tampering based on neural networks, deep learning, and the CNN architecture. The suggested method can detect image splicing and copy-and-move forms of image tampering with high sensitivity. The outcomes of the testing are positive the trained model achieving a respectable 86.5% accuracy, 91.52% sensitivity, 82.98% specificity, and 13.5% error rate.

REFERENCE LIST

Dong, J., Wang, W., & Tan, T. (2013). CASIA image tampering detection evaluation database. *2013 IEEE China Summit and International Conference on Signal and Information Processing*. https://doi.org/10.1109/chinasip.2013.6625374

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Research Exhibition in Mathematics and Computer Sciences: REMACS 5.0

e ISBN 978-629-97934-0-3