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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]  
NETCENTRIC COMPUTING  
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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#### *Editors*

Rafiza Ruslan, Mohamad Najib Mohamad Fadzil, Noorfaizalfaird Mohd Nor, Mohammad Hafiz bin Ismail

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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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# **SURVIVAL ANALYSIS ON PREDICTION OF WAITING TIME FOR KIDNEY TRANSPLANTATION**

**Nur Syafieka binti Salleh and Balkiah binti Moktar**

College of Computing, Informatics and Media, Universiti Teknologi MARA Perlis Branch, Malaysia

## **Abstract**

Kidney transplantation (KT) describes implanting a healthy kidney from a deceased or living donor. In 2020, the statistics stated that the waiting list remains significantly longer than the supply of kidneys, posing a continuing challenge. Therefore, this research aims to estimate the likelihood of getting a KT, determine the key factors influencing KT waiting time and choose the best model within two distributions. This study includes 46,750 secondary data collected from the Kaggle website between January 1, 2000, and December 31, 2017, involving the deceased donor transplants. Potential predictors included in this study are gender, gestation, prior transplant, age, dialysis duration, underlying disease, blood group and calculated panel reactive antibody (c-PRA) level. Firstly, the Kaplan-Meier (KM) technique predicts the survival curves for each determinant group before being compared using the Log-rank test. The KM plot for the age factor shows the greatest significant divergence compared to other factors indicating the remarkable impact on the KT waiting time. The Log-rank test shows that all variables are important and impact the KT waiting time. Next, the Cox proportional hazards (PH) regression model helps examine the influence of determinants on patients on the KT waiting list. Findings revealed that all determinants above significantly affect the waiting time. Lastly, the Exponential and Weibull models determine the best model for fitting the KT dataset. Both models generated similar significant variables, but the Weibull models apt the dataset better due to a lower Akaike Information Criterion (AIC) index.

***Keywords:** Kaplan-Meier, Log-rank test, Cox proportional hazards regression, Weibull distribution, Exponential distribution, kidney transplantation*

## **1. Introduction**

This research aims to study the waiting time for kidney transplantation by applying a survival analysis approach. The objectives are to illustrate Kaplan-Meier curves in estimating the likelihood of transplantations and to identify the significant determinant affecting the waiting time for kidney transplantation using Cox regression analysis. The last objective is to compare and determine the best model within parametric survival models, which are the Weibull and Exponential distribution based on Akaike Information Criterion (AIC). The potential determinants affecting the waiting time for KT included in this research are the number of dialyzes, sex, underlying disease, and blood type.

## **2. Methodology**

The secondary data used is derived directly from the Kaggle website consisting of patients registered for kidney transplantation between January 1, 2000, and December 31, 2017, on the waiting list of the Sao Paulo State Organ Allocation System, Brazil. This research involved the deceased donor transplant and eight potential contributors, including age, dialysis duration and others. Firstly, the survival analysis started with KM curves, followed by the Log-rank test to compare the survival functions, and Cox proportional hazards (PH) regression to analyze the relationship between covariates and time. Then, the AIC will determine the best model between the Weibull and Exponential distributions.

### 3. Results and Discussion

When comparing the Kaplan-Meier survival curve of the binary variable, prior transplant curves differed substantially compared to gender and gestation. As for the numeric variable, the age curves reflected a significant divergence compared to other factors. Next, the Log-rank test and univariate Cox regression analysis show that all variables were relevant at a five percent significance level. Meanwhile, the multivariate Cox regression analysis does include all compelling variables found in the univariate analysis. After applying the Weibull and Exponential distribution, the result concluded that the Weibull distribution is more effective in the predicting the waiting time for kidney transplantation. This is due to the AIC value obtained for Weibull is slightly lower compared to the Exponential, even though they underlined the same significant factors.

### 4. Novelty of Research / Product

Based on previous research, some studies explore survival analysis, highlighting risk factors related to suicide attempts (Kim et al., 2018) and examining prognostic factors in gastric cancer patients (Habibi et al., 2018). There is also previous research on graduate employability survival function done through the analysis of explanatory variables (Shahadan et al., 2019) and research on kidney transplantation by developing a predictor model to calculate the length of a kidney transplantation waiting list (Bastos et al., 2021). There is also a past study on employing a machine learning prediction model for waiting time for kidney transplants (Sapiertein Silva et al., 2021). However, they included factors related to local features such as race and subregion and used a few survival models. Therefore, the primary goal of this research is to examine multiple survival models, including non-parametric, semi-parametric, and parametric survival models. This research also excludes local features to improve the model accuracy.

### 5. Conclusion

In short, this research successfully used all methodologies and distributions mentioned above in generating output. It also concluded all variables included are crucial features to be considered for future study.

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