Appendix 4A

UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

INDUSTRIAL TRAINING REPORT

MALAYSIA RAIL LINK SDN BHD

By

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ABSTRACT

The purpose of this study is to investigate the application of genetic algorithm (GA) in modelling linear and non-linear dynamic systems and develop an alternative model structure selection algorithm based on GA. Orthogonal least square (OLS), a gradient descent method was used as the benchmark for the proposed algorithm. A model structure selection based on modified genetic algorithm (MGA) has been proposed in this study to reduce problems of premature convergence in simple GA (SGA). The effect of different combinations of MGA operators on the performance of the developed model was studied and the effectiveness and shortcomings of MGA were highlighted. Results were compared between SGA, MGA and benchmark OLS method. It was discovered that with similar number of dynamic terms, in most cases, MGA performs better than SGA in terms of exploring potential solution and outperformed the OLS algorithm in terms of selected number of terms and predictive accuracy. In addition, the use of local search with MGA for fine-tuning the algorithm was also proposed and investigated, named as memetic algorithm (MA). Simulation results demonstrated that in most cases, MA is able to produce an adequate and parsimonious model that can satisfy the model validation tests with significant advantages over OLS, SGA and MGA methods. Furthermore, the case studies on identification of multivariable systems based on real experiment t al data from two systems namely a turbo alternator and a continuous stirred tank reactor showed that the proposed algorithm could be used as an alternative to adequately identify adequate and parsimonious models for those systems. Abstract must be bilingual. For a thesis written in Bahasa Melayu, the abstract must first be written in Bahasa Melayu and followed by the English translation. If the thesis is written in English, the abstract must be written in English and followed by the translation in Bahasa Melayu. The abstract should be brief, written in one paragraph and not exceed one (1) page. An abstract is different from synopsis or summary of a thesis. It should states the field of study, problem definition, methodology adopted, research process, results obtained and conclusion of the research. The abstract can be written using single or one and a half spacing. Example can be seen in Appendix 1 (Bahasa Melayu) and Appendix J (English).

ABSTRAK

Kajian ini dilakukan bertujuan mengkaji penggunaan algoritma genetik (GA) dalam pemodelan sistem dinamik linear dan tak linear dan membangunkan kaedah alternatif bagi pcmilihan struktur model menggunakan GA. Algorithma kuasa dua terkecil ortogon (OLS), satu kaedah penurunan kecerunan digunakan sebagai bandingan bagi kaedah yang dicadangkan. Pcmilihan struktur model mengunakan kaedah algoritma genetik yang diubahsuai (MGA) dicadangkan dalam kajian ini bagi mengurangkan masalah konvergens pramatang dalam algoritma genetik mudah (SGA). Kesan penggunaan gabungan operator MGA yang berbeza ke atas prestasi model yang terbentuk dikaji dan keberkesanan serta kekurangan MGA diu t arakan. Kajian simulasi dilakukan untuk membanding SGA, MGA dan OLS. Dengan meggunakan bilangan parametcr dinamik yang setara kajian ini mendapati, dalam kebanyakan kes, prestasi MGA adalah lebih baik daripada SGA dalam mencari penyelesaian yang berpotensi dan lebih berkebolehan daripada OLS dalam menentukan bilangan sebutan yang dipilih dan ketcpatan ramalan. Di samping itu, penggunaan carian tcmpatan dalam MGA untuk menambah baik algorithma tersebut dicadang dan dikaji, dinamai sebagai algoritma mcmetic (MA). Hasil simulasi menunjukkan, dalam kebanyakan kes, MA berkeupayaan menghasilkan model yang bersesuaian dan parsimoni dan mcmenuhi ujian pengsahihan model di samping mcmperolehi beberapa kelebihan dibandingkan dengan kaedah OLS, SGA dan MGA. Tambahan pula, kajian kes untuk sistcm berbilang pcmbolehubah menggunakan data eksperimental sebenar daripada dua sistem iaitu sistem pengulang-alik turbo dan reaktor teraduk berterusan menunjukkan algoritma ini boleh digunakan sebagai alternatif untuk mcmperolehi model termudah yang memadai bagi sistcm tersebut.

TABLE OF CONTENTS

TITLE   **PAGE**

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Company Background

Malaysia Rail Link Sdn Bhd (MRL) was established as a government-owned company to oversee and implement large-scale railway infrastructure projects across Malaysia. MRL plays a critical role in national infrastructure development, particularly focusing on rail projects such as the East Coast Rail Link (ECRL). This initiative aims to enhance connectivity between Malaysia's East and West coasts, facilitating economic growth and enabling more efficient transportation options for goods and passengers. MRL collaborates with local and international stakeholders to ensure that the projects are executed with adherence to regulatory standards and project milestones. By aligning with Malaysia's national development plans, MRL strives to contribute to the modernization and sustainability of the country's transport network.

1.1.1 History

Malaysia Rail Link Sdn Bhd (MRL) was founded as part of Malaysia's strategic vision to expand and modernize its rail infrastructure. Established under the purview of the Ministry of Finance, MRL was given the mandate to develop the East Coast Rail Link (ECRL) project, a significant infrastructure initiative aimed at connecting the eastern and western regions of Peninsular Malaysia. The ECRL project was officially launched as part of the Belt and Road Initiative (BRI) in collaboration with the Chinese government, reflecting Malaysia's commitment to enhancing national and regional connectivity.

One of the biggest infrastructure projects in Malaysia's history, the establishment of MRL marked a turning point in the rail transportation industry. With the goal of cutting down on travel time, increasing logistical effectiveness, and fostering socioeconomic development along the ECRL corridor, MRL's function goes beyond simple project management to become a catalyst for economic progress in the East Coast Economic Region (ECER). To guarantee that the ECRL project satisfies worldwide standards for quality, safety, and environmental sustainability, MRL has collaborated closely with a range of domestic and international parties from its founding, including financial institutions, construction companies, and regulatory agencies.

Over the years, MRL has expanded its focus, prioritizing knowledge and technology transfer in addition to construction supervision in order to strengthen Malaysia's technical proficiency in rail infrastructure. Because of this strategy, MRL has been able to help create a trained local workforce that can oversee and maintain innovative rail systems. As the government's goal to modernize public transportation and create greater regional integration, MRL is now a key actor in Malaysia's infrastructure development initiatives.

1.1.2 Company Vision

Malaysia Rail Link (MRL) envisions enhancing national connectivity through efficient rail infrastructure, focusing on safety, quality, and sustainability. MRL aims to foster economic growth, facilitate regional integration, and modernize Malaysia's transportation network.

1.2   Products and Clients

Products

Malaysia Rail Link Sdn Bhd

Figure 1.1:   Malaysia Rail Link Logo

The East Coast Rail Link (ECRL) is MRL's flagship project, aimed at improving connectivity between Malaysia's east and west coasts. This rail infrastructure solution is designed to support both passenger and freight transport, significantly reducing travel time and boosting regional economic integration.

The ECRL service offering includes:

- Passenger Transportation: Efficient, modern transportation solutions for public commuting.
- Freight Services: Enhances the logistics sector by providing fast and reliable cargo transportation.
- Project Management and Consultation: Provides technical expertise and project oversight for large-scale infrastructure development.

Client

Tuxuri are working with different type of client using TuxGeo+ platform. Most of their clients are from telecommunications, utilities, and government sector. Below are the main enterprises:

1. **Telekom Malaysia Berhad (TM)**

Figure 1.2:   TM Logo

Telekom Malaysia (TM) provides essential telecommunications services, ensuring that ECRL's operational sites and stations are connected with high-speed internet and communication networks.

2. Suruhanjaya Pengangkutan Awam Darat (SPAD)

Figure 1.3: **SPAD Logo**

Suruhanjaya Pengangkutan Awam Darat (SPAD) is the government body responsible for land public transport in Malaysia, working closely with MRL to ensure the ECRL project aligns with national transportation standards and policies.

3. Petronas

Figure 1.4: **Petronas Logo**

Petronas collaborates with MRL to supply fuel and support for transportation and machinery used in the ECRL project, ensuring consistent project execution across all phases.

4. **Tenaga Nasional Berhad**

Figure 1.5:   TNB Logo

Tenaga Nasional Berhad (TNB) collaborates with MRL to supply the necessary power infrastructure for the ECRL project, supporting operational sustainability and reliability.

5. **Malaysia Airports Holdings Berhad (MAHB)**

Figure 1.6:   MAHB Logo

Malaysia Airports Holdings Berhad (MAHB) coordinates with MRL to improve transportation links between airports and key stations, enhancing connectivity for both domestic and international travellers.

1.3   Organization Structure

1.4   Division/Unit Information: Infrastructure and Security

The Infrastructure and Security division at Malaysia Rail Link (MRL) is tasked with managing and safeguarding the organization's IT infrastructure. This unit ensures the stability and security of MRL's systems and networks by implementing cutting-edge technologies like Kubernetes for container orchestration and Docker for efficient application management. Additionally, the team uses automated security tools, such as ZAP, to proactively detect and mitigate vulnerabilities. By focusing on both infrastructure optimization and security, this division plays a crucial role in ensuring reliable and secure operations throughout the organization.

1.5   Training Program Planned by the Organization

The Malaysia Rail Link (MRL) organization has structured a comprehensive training program for my internship period, aimed at enhancing my technical skills and aligning them with the organization's goals in IT support, infrastructure setup, and security management. The training includes hands-on tasks and responsibilities to help me grow professionally in the following areas:

1. **System Troubleshooting and IT Support**

   - **Objective**: To equip me with the skills required to handle common hardware and software issues encountered in a professional environment, ensuring that systems function optimally to support organizational activities.

   - **Planned Tasks**:

      o Gain experience in diagnosing and resolving performance issues, such as system lags, crashes, and black screen errors, across various devices like desktops, laptops, and mini-computers.

      o Learn to perform system repairs, such as repairing system files and conducting preventive maintenance to improve system stability.

      o Provide remote support for staff, assisting with technical issues, and enhancing my troubleshooting and problem-solving skills.

2. **Event IT Infrastructure Setup and Management**

   - **Objective**: To develop my ability to manage IT infrastructure for events, including network setup, live streaming, and coordination with technical teams for smooth event operations.

   - **Planned Tasks**:

- Set up and test equipment needed for live streaming, such as cameras, computers, and connectivity tools, to support events and rehearsals like the ECRL Gombak Tunnel event.

- Configure and deploy Starlink satellite connectivity to ensure reliable network access in remote areas, particularly in event sites such as Mimaland, Gombak.

- Set up necessary IT infrastructure, including printers, workstations, and networking equipment, to facilitate on-site communication and operations for the IT team.

3. **Web Application Redesign and System Flow Documentation**

- **Objective**: To enhance my understanding of system design and user experience by actively participating in the redesign of the organization's web applications and creating system flow documentation.

- **Planned Tasks**:

  - Collaborate with senior developers to analyze and improve the design of internal applications, focusing on usability, functionality, and layout.

  - Create system flow diagrams for applications, such as the event management system, to improve my skills in documenting and visualizing processes and workflows.

  - Regularly test and review web applications to ensure updates meet organizational standards and enhance the overall user experience.

4. **Security Management and Vendor Coordination**

- **Objective**: To gain experience in cybersecurity practices by analyzing and responding to security data and coordinating with vendors to resolve security-related issues.

- **Planned Tasks**:

  - Participate in meetings with security providers, such as Cloudflare, to understand the data collected and discuss potential security improvements for the organization.

  - Analyze vulnerability reports and security data to identify potential risks and suggest mitigations, thereby increasing my awareness of cybersecurity protocols.

  - Communicate with external vendors to address network security concerns, and troubleshoot issues as they arise, building my skills in vendor management and security analysis.

GANTT CHART

Gantt Chart	Week 1					Week 2					Week 3					Week 4					Week 5				
	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
Orientation & Basic Training		▓	▓																						
Troubleshooting & Hardware Maintenance	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
Events & Meetings				▓	▓		▓	▓						▓	▓										
Project Proposal				▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓

11

CHAPTER 2

PROJECT/TRAINING DETAILS

2.1   Introduction

During my industrial training at Malaysia Rail Link (MRL), my primary focus was on providing IT support, managing event IT infrastructure, and developing systems for file management and event attendance. These tasks were designed to enhance my technical proficiency and align my work with the organization's objectives in system optimization, event management, and security practices.

2.2   Objectives

1. **Provide IT support for troubleshooting and maintenance.**
   - To diagnose and resolve hardware and software issues across desktops, laptops, and mini-computers, ensuring optimal performance and minimizing disruptions. My tasks included addressing system lags, crashes, and black screen errors, performing system file repairs, and conducting preventive maintenance. Additionally, I provided remote support to staff, enabling them to resolve technical challenges efficiently.

2. **Develop a file management and backup system.**
   - To design and implement a system for secure file storage and automated backup during preventive maintenance (PM) activities. This system ensured the integrity and availability of critical organizational files by enabling efficient storage and recovery processes.

3. **Create an event attendance system.**
   - To develop a system that scans QR codes from attendees to mark their attendance at events. This system streamlined the attendance process,

12

reduced manual errors, and provided real-time tracking of participant data.

4. **Coordinating Maintenance and Communicating with Vendors.**

- Communicate with vendors and worked together with them to schedule and provide maintenance services to ensure that the organization's assets are properly operated and maintained.

2.2.1 Type of Work Done

i. **System Troubleshooting and IT Support**: Diagnosed performance issues, repaired system files, and provided preventive maintenance for various devices.

ii. **System Development**: Designed and implemented a file management system with automated backup features and developed a QR-based event attendance system.

iii. **Email to Vendors**: Write a report to the vendor informing them of the issue we encountered in the IT department and requesting their assistance in resolving it.

2.2.2 Hardware and Software Used

Hardware	Software
Laptop	OS: Windows 10 Application: Chrome, Visual Studio Code, Notepad, GitHub Desktop, Teams, Outlook

Table 2.1 Hardware and Software Used

2.2.3 Given Period to Complete All Tasks

I intended to finish all system development projects before my university supervisor's visit to the company. This self-imposed deadline helped me prioritize tasks and manage my workload effectively.

2.2.4   Theoretical and Practical Knowledge Applied

Throughout my internship, I applied various theoretical concepts gained during my studies, such as cybersecurity principles and application design. Practical skills, including troubleshooting hardware, setting up IT infrastructure, and developing systems for file management and event attendance, were significantly enhanced through hands-on tasks.

2.2.5   Problems Faced During Task Execution

i.   There were phases where I couldn't focus on my projects due to the need to prioritize maintenance activities and IT support tasks.

ii.   I faced a lack of ideas and a clear structure for the systems I was developing, which slowed down progress and required additional research and brainstorming.

iii. Balancing multiple responsibilities, necessitating effective time management to meet deadlines.

2.3   Conclusion

The projects and training during my internship at MRL provided invaluable experience in IT support, infrastructure setup, system development, and cybersecurity. These tasks allowed me to develop both technical and soft skills, preparing me for future challenges in the IT industry.