SCHOOL OF COMPUTING
FACULTY OF ENGINEERING
UNIVERSITI TEKNOLOGI MALAYSIA

FINAL YEAR PROJECT (PSM)
STUDENT LOGBOOK

PROJECT TITLE

Preserving Cultural Heritage Sites Through Random Forest And XGBoost Algorithm For Microclimate Monitoring And Prediction

STUDENT INFO

Name : Iman Aidi Elham Bin Hairul Nizam
Student ID : A20EC5006
Email : imanaidielham@graduate.utm.my
Mobile No : 011-54225852
Department : **IS / SE / CS**

SUPERVISOR INFO

Main Supervisor : Assoc. Prof. Dr. Mohd Shahizan Bin Othman
Email : shahizan@utm.my

STUDENT LOG BOOK NOTES

1) This logbook need to be used by a PSM 1 and PSM 2 student for a purpose of reporting all progress of their PSM projects.

2) It is the responsibility of the student that this log book is **kept up to date** and that the student complies with the Supervisor's suggestions and recommendations as noted by the student in the log book and approved by the Supervisor.

3) Student MUST makes a regular meeting with a supervisor at least ONCE in TWO WEEKS. A minimum number of meetings for PSM student-supervisor meeting are 6 times per semester.

4) A PSM Department Coordinator and supervisor have a right for not to allow the student to present their project if this regulation is not complied.

5) This log book has to be submitted together with the proposal report (for PSM 1) and the final thesis report (for PSM 2) as stated in the PSM Activities Calendar.

6) The Faculty of Computing reserves right not to accept thesis for examination if this log book is not properly documented.

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20222023 **TYPE**: PSM 1

Date **:** 03/04/2023 **Meeting:** 1

Student (Meeting Minute/ Achievements/ Activities) **:**

- Discussed the research topic and objectives.
- Conducted a literature review on microclimate monitoring and prediction in cultural heritage sites.
- Started gathering relevant research papers and articles.
- Identified potential datasets for analysis.

Supervisor (Suggestion& Comments) **:**

- Provided guidance on narrowing down the research scope and focus.
- Suggested exploring specific cultural heritage sites for case studies.
- Recommended exploring additional machine learning algorithms for comparison.

Next Meeting Plan **:**

- Further refine the research objectives.
- Share progress on literature review and dataset collection.
- Discuss the selection of cultural heritage sites for analysis.
- Explore additional machine learning algorithms for comparison.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20222023 **TYPE**: PSM 1

Date : 17/04/2023 **Meeting:** 2

Student (Meeting Minute/ Achievements/ Activities) :

- Presented refined research objectives and scope.
- Discussed the selected cultural heritage sites for analysis.
- Analyzed the collected datasets and identified relevant variables.
- Explored the implementation of Random Forest algorithm for microclimate monitoring.

Supervisor (Suggestion& Comments) :

- Provided feedback on the research objectives and scope.
- Suggested considering additional variables for analysis.
- Advised on the proper preprocessing of the datasets.
- Encouraged experimenting with different parameters for the Random Forest algorithm.

Next Meeting Plan :

- Share progress on data preprocessing and feature selection.
- Discuss the implementation of the Random Forest algorithm.
- Explore the application of XGBoost algorithm for microclimate prediction.
- Plan for data visualization and analysis techniques.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20222023 **TYPE**: PSM 1

Date : 02/05/2023 **Meeting:** 3

Student (Meeting Minute/ Achievements/ Activities) :

- Discussed the progress on data preprocessing and feature selection.
- Shared initial results of the Random Forest algorithm implementation.
- Explored the application of the XGBoost algorithm for microclimate prediction.
- Discussed challenges faced during the implementation phase.

Supervisor (Suggestion& Comments) :

- Provided feedback on the data preprocessing techniques.
- Suggested alternative feature selection methods.
- Advised on fine-tuning the model hyperparameters for better performance.
- Discussed potential solutions to overcome the implementation challenges.

Next Meeting Plan :

- Share updated results of the Random Forest algorithm implementation.
- Discuss the performance of the XGBoost algorithm for microclimate prediction.
- Address the challenges faced and potential solutions.
- Plan for data visualization and analysis techniques.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20222023 **TYPE**: PSM 1

Date :16 /05/2023 **Meeting:** 4

Student (Meeting Minute/ Achievements/ Activities) :

- Presented updated results of the Random Forest algorithm implementation.
- Discussed the performance of the XGBoost algorithm for microclimate prediction.
- Analyzed the accuracy and efficiency of both algorithms.
- Explored potential improvements for model performance.

Supervisor (Suggestion& Comments) :

- Provided feedback on the presented results and analysis.
- Suggested considering ensemble techniques to improve prediction accuracy.
- Advised on conducting further experiments with different parameter settings.
- Discussed potential limitations and areas for future research.

Next Meeting Plan :

- Provided feedback on the presented results and analysis.
- Suggested considering ensemble techniques to improve prediction accuracy.
- Advised on conducting further experiments with different parameter settings.
- Discussed potential limitations and areas for future research.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20222023 **TYPE**: PSM 1

Date : 30/05/2023 **Meeting:** 5

Student (Meeting Minute/ Achievements/ Activities) :

- Shared progress on implementing ensemble techniques.
- Discussed the impact on prediction accuracy and model performance.
- Explored different evaluation metrics for assessing model performance.
- Analyzed the results and discussed potential interpretations.

Supervisor (Suggestion& Comments) :

- Provided feedback on the implementation of ensemble techniques.
- Suggested considering cross-validation for robust model evaluation.
- Advised on properly interpreting and reporting the evaluation metrics.
- Discussed potential implications of the findings for preserving cultural heritage sites.

Next Meeting Plan :

- Share updated evaluation results after applying cross-validation.
- Discuss the final interpretation and implications of the findings.
- Address any remaining challenges or areas for improvement.
- Plan for the final report and presentation preparation.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20222023 **TYPE**: PSM 1

Date : 13/06/2023 **Meeting:** 6

Student (Meeting Minute/ Achievements/ Activities) :

- Presented the finalized evaluation results after applying cross-validation.
- Discussed the final interpretation and implications of the findings.
- Explored potential recommendations for preserving cultural heritage sites.
- Discussed the structure and content of the final report and presentation.

Supervisor (Suggestion& Comments) :

- Provided feedback on the finalized evaluation results and interpretations.
- Suggested including visualizations and case studies in the final report.
- Advised on organizing the report and presentation in a coherent manner.
- Discussed potential avenues for future research based on the findings.

Next Meeting Plan :

- Share the progress on the final report and presentation preparation.
- Discuss any revisions or additions required for the report.
- Plan for the final presentation rehearsal and feedback session.
- Confirm the timeline for the submission of the final deliverables.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20222023 **TYPE**: PSM 1

Date : 21/06/2023 **Meeting:** 7

Student (Meeting Minute/ Achievements/ Activities) :

- Shared the progress on the final report and presentation preparation.
- Discussed the revised structure and content of the report.
- Conducted a rehearsal of the final presentation.
- Addressed any feedback or suggestions for improvement.

Supervisor (Suggestion& Comments) :

- Provided feedback on the report structure and content.
- Suggested minor revisions for clarity and coherence.
- Appreciated the progress made in the presentation rehearsal.
- Discussed final details and expectations for the submission.

Next Meeting Plan :

- Confirm the final changes and revisions for the report.
- Discuss any last-minute adjustments for the presentation.
- Address any remaining questions or concerns.
- Confirm the submission timeline and requirements.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20232024 **TYPE**: PSM 2

Date : 15/03/2024 **Meeting:** 8

Student (Meeting Minute/ Achievements/ Activities) :

- Presented the initial data collection from Copernicus Climate Data Store.
- Discussed the process of extracting and transforming NetCDF files to CSV format.
- Shared preliminary data analysis for Johor Bahru and Melaka sites.
- Outlined the plan for implementing Random Forest and XGBoost algorithms.or suggestions for improvement.

Supervisor (Suggestion& Comments) :

- Advised on focusing on key microclimate variables: temperature, humidity, rainfall, and wind speed.
- Suggested cross-validation techniques for model training.
- Recommended exploring data visualization options for the dashboard.
- Emphasized the importance of documenting data processing steps.

Next Meeting Plan :

- Complete data preprocessing for both sites.
- Begin implementation of Random Forest algorithm.
- Explore initial dashboard design options.
- Prepare progress report on data collection and preprocessing.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20232024 **TYPE**: PSM 2

Date : 12/04/2024 **Meeting:** 9

Student (Meeting Minute/ Achievements/ Activities) :

- Presented completed data preprocessing for both Johor Bahru and Melaka.
- Shared initial results from Random Forest implementation.
- Demonstrated early prototype of dashboard design.
- Discussed challenges in handling missing data and outliers.

Supervisor (Suggestion& Comments) :

- Provided feedback on Random Forest implementation, suggesting hyperparameter tuning.
- Advised on methods for handling missing data in time series.
- Recommended incorporating more interactive elements in the dashboard.
- Suggested beginning work on XGBoost implementation.

Next Meeting Plan :

- Refine Random Forest model with hyperparameter tuning.
- Start implementation of XGBoost algorithm.
- Enhance dashboard with more interactive features.
- Prepare comparative analysis of both algorithms' preliminary results.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20232024 **TYPE**: PSM 2

Date : 17/05/2024 **Meeting:** 10

Student (Meeting Minute/ Achievements/ Activities) :

- Presented refined results from Random Forest and initial XGBoost results.
- Shared comparative analysis of both algorithms' performance.
- Demonstrated updated dashboard with enhanced interactivity.
- Discussed approach for evaluating model accuracy using MAE, RMSE, and R-squared.

Supervisor (Suggestion& Comments) :

- Provided insights on interpreting the comparative analysis results.
- Suggested focusing on model interpretability, especially for Random Forest.
- Recommended incorporating historical trend analysis in the dashboard.
- Advised on preparing for final result compilation and thesis writing.

Next Meeting Plan :

- Finalize model implementations and conduct thorough accuracy evaluations.
- Complete dashboard development with all planned features.
- Begin compiling final results and preparing the thesis draft.
- Outline the structure for the final presentation.

Supervisor's Signature

……. Date: ……

FACULTY OF COMPUTING
UNIVERSITI TEKNOLOGI MALAYSIA

PSM LOG BOOK

SEMESTER: 2/20232024 **TYPE**: PSM 2

Date : 14/06/2024 **Meeting:** 11

Student (Meeting Minute/ Achievements/ Activities) :

- Presented final results of both Random Forest and XGBoost models.
- Demonstrated completed dashboard with all features implemented.
- Shared draft of thesis structure and key findings.
- Discussed plans for final presentation preparation.

Supervisor (Suggestion& Comments) :

- Provided feedback on the final results and their interpretation.
- Suggested minor improvements for the dashboard user interface.
- Advised on structuring the thesis to highlight key contributions.
- Recommended practicing the presentation with a focus on methodology and results.

Next Meeting Plan :

- Incorporate final feedback into the thesis document.
- Refine and finalize the presentation slides.
- Conduct a practice run of the final presentation.
- Discuss any last-minute concerns or questions before submission.

Supervisor's Signature

……. Date: ……