IOT-ENABLED SOFT SENSOR FOR CHLOROPHYLL-A CONCENTRATION PREDICTION USING MACHINE LEARNING

PALOK BISWAS

faculty of computer science and

information technology

UNIVERSITY OF MALAYA

Kuala lumpur

2021

**IOT-ENABLED SOFT SENSOR FOR CHLOROPHYLL-A CONCENTRATION PREDICTION USING MACHINE LEARNING**

PALOK BISWAS

**DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF COMPUTER SCIENCE**

**FACULTY OF COMPUTER SCIENCE AND**

**INFORMATION TECHNOLOGY**

**UNIVERSITY OF MALAYA**

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**2021**

**UNIVERSITY OF MALAYA**

**ORIGINAL LITERARY WORK DECLARATION**

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Name of Degree: Master of Computer Science (Applied Computing)

Title of Dissertation: IoT-enabled soft sensor for Chlorophyll-a concentration prediction using Machine Learning

Field of Study: Machine Learning

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IOT-ENABLED SOFT SENSOR FOR CHLOROPHYLL-A CONCENTRATION PREDICTION USING MACHINE LEARNING

Abstract

Keyword:

IOT ENABLED (MALAY VERSION)

Acknowledgements

MM 202X,

Palok Biswas

Table of Contents

[Abstract iii](#_Toc80639207)

[Abstrak v](#_Toc80639208)

[Acknowledgements vii](#_Toc80639209)

[Table of Contents viii](#_Toc80639210)

[List of Figures xii](#_Toc80639211)

[List of Tables xiii](#_Toc80639212)

[List of Symbols and Abbreviations xiv](#_Toc80639213)

[CHAPTER 1: introduction 1](#_Toc80639214)

[1.1 Background 1](#_Toc80639215)

[1.2 Motivation 2](#_Toc80639216)

[1.3 Problem statement 5](#_Toc80639217)

[1.4 Research questions 6](#_Toc80639218)

[1.5 Objectives of the study 6](#_Toc80639219)

[1.6 Scopes of the study 7](#_Toc80639220)

[1.7 Research Mapping 8](#_Toc80639221)

[1.8 Significance or Impact of the Study 9](#_Toc80639222)

[1.9 Dissertation organization 9](#_Toc80639223)

[CHAPTER 2: literature review 10](#_Toc80639224)

[2.1 Overview 10](#_Toc80639225)

[2.2 Something 10](#_Toc80639226)

[2.8 Concluding remark 39](#_Toc80639246)

[2.9 Chapter summary 40](#_Toc80639247)

[CHAPTER 3: methodology 41](#_Toc80639248)

[3.1 Overview 41](#_Toc80639249)

[3.8 Chapter summary 55](#_Toc80639265)

[CHAPTER 4: results and discussion 56](#_Toc80639266)

[4.1 Overview 56](#_Toc80639267)

[4.6 Chapter Summary 72](#_Toc80639282)

[CHAPTER 5: conclusion and future work 73](#_Toc80639283)

[5.1 Conclusion 73](#_Toc80639284)

[5.2 Future work 75](#_Toc80639285)

[References 76](#_Toc80639286)

[APPENDIX A 91](#_Toc80639287)

[APPENDIX B 106](#_Toc80639288)

[APPENDIX C 111](#_Toc80639289)

[APPENDIX D 113](#_Toc80639290)

[APPENDIX E 114](#_Toc80639291)

List of Figures

List of Tables

List of Symbols and Abbreviations

# introduction

## Background

Some instructions by Dr Zati [25/08/21 Meeting]  
Make sure the italics stays in references

Equation number-> continue numbering

Don’t go beyond 3 layers of sectioning: 2.2.3 (max)

Need to finalize title

<<All about chl-a concentration prediction – who, what, when, why… issues, >>

Malaysian lake condition

Eutrophication

Chl-a factors/role in eutrophocation

Methods of water sampling, expensive sonde

Include stats, citations

## Motivation

You are motivated because of ML/timeseries can help with water quality prediction 🡪 soft sensor development (DON”T TALK CHL-A)

You are also motivated of Iot to help real-monitoring, firmware, 🡪 hardware sensor

## Problem statement

## Research questions

## Objectives of the study

## Scopes of the study

## Research Mapping

|  |  |  |  |
| --- | --- | --- | --- |
| **Research Questions** | **Research Objectives** | **Research Methodology** | **Research Outcome** |
| What are the various methods and core parameters for measuring chl-a in lake water? | To study different monitoring methods for efficient lake water sampling and parameters to accurately predict Chlorophyll-a | 1. Systematic literature review | 1. Findings on the performance of existing approaches 2. Core parameters for water quality monitoring and Chlorophyll-a prediction |
| How can chl-a concentration be predicted using 5 basic parameters? | To develop an ensemble machine learning model for chl-a concentration prediction based on 5 basic parameters and timeseries data. | 1. Model Development | 1. An ensemble model for Chl-a concentration prediction based on ML (ML/DL/RNN) |
| How to reduce real-time monitoring cost for chl-a prediction? | To develop an IoT monitoring system for chl-a prediction | 1. System Development | 1. An IoT-enabled sensor system for chl-a concentration prediction |
| How do timeseries and ML perform in predicting chl-a concentration? | To test the ensemble model performance | 1. Experiment 2. Validating & fine-tuning | 1. Results of performance on Chl-a concentration prediction |

## Significance or Impact of the Study

## Dissertation organization

This dissertation is divided into five chapters. Chapter 1 introduces the research topic, including the background and motivation, problem statement, research questions, objectives and scopes. Chapter 2 provides a critical overview of the literature for topics of interest in this dissertation. Learning from other researchers on state of art in combining OCR and ML techniques is central to the chapter. The methodology adopted in this dissertation is presented in Chapter 3. Included in the description are the proposed research framework and the overall process flow of the research. Chapter 4 presents an analysis of the performance of the proposed method, while Chapter 5 forward the final remark of the work done, concluding the dissertation.

# literature review

## Overview

## Expense reimbursement

## Concluding remark

## Chapter summary

# methodology

## Overview

## Chapter summary

# results and discussion

## Overview

## OCR result and discussion

## Chapter Summary

# conclusion and future work

## Conclusion

## Future work

References

APPENDIX A

**PYTHON SOURCE CODE**