University of Reading

Department of Meteorology

Using machine learning to predict the intensification and propagation of East African storms

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A report submitted in partial fulfilment of the requirements of
the University of Reading for the degree of
Master of Science in *Climate Change and Artificial Intelligence (AI)*

August 5, 2025

Declaration

I, Sean Kelley, of the Department of Meteorology, University of Reading, confirm that this is my own work and figures, tables, equations, code snippets, artworks, and illustrations in this report are original and have not been taken from any other person's work, except where the works of others have been explicitly acknowledged, quoted, and referenced. I understand that if failing to do so will be considered a case of plagiarism. Plagiarism is a form of academic misconduct and will be penalised accordingly.

I give consent to a copy of my report being shared with future students as an exemplar.

I give consent for my work to be made available more widely to members of UoR and public with interest in teaching, learning and research.

<div align="right">

Sean Kelley
August 5, 2025

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Abstract

Keywords: a maximum of five keywords/keyphrase separated by commas

Word count: 100

Report code: https://github.com/seangtkelley/uor-msc-dissertation-xai-african-storms

Acknowledgements

Contents

List of Figures

List of Tables

Nomenclature

c Speed of light in a vacuum

h Planck constant

Glossary

Machine Learning Subset of artificial intelligence that enables systems to learn from data and improve their performance over time without being explicitly programmed. ix, 2

Acronyms

ML Machine Learning. 2

Chapter 1

Introduction

Gebrechorkos et al. (2019)

1.1 Background

Describe to a reader the context of your project. That is, what is your project and what its motivation. Briefly explain the major theories, applications, and/or products/systems/algorithms whichever is relevant to your project.

Cautions: Do not say you choose this project because of your interest, or your supervisor proposed/suggested this project, or you were assigned this project as your final year project. This all may be true, but it is not meant to be written here.

1.2 Problem statement

This section describes the investigated problem in detail. You can also have a separate chapter on "Problem articulation." For some projects, you may have a section like "Research question(s)" or "Research Hypothesis" instead of a section on "Problem statement.'

1.3 Aims and objectives

Describe the "aims and objectives" of your project.

Aims: The aims tell a reader what you want/hope to achieve at the end of the project. The aims define your intent/purpose in general terms.

Objectives: The objectives are a set of tasks you would perform in order to achieve the defined aims. The objective statements have to be specific and measurable through the results and outcome of the project.

1.4 Solution approach

1.5 Summary of contributions and achievements

Describe clearly what you have done/created/achieved and what the major results and their implications are.

1.6 Report Structure

Describe the outline of the rest of the report here. Let the reader know what to expect ahead in the report. Describe how you have organized your report. Machine Learning is a subset of artificial intelligence that enables systems to learn from data and improve their performance over time without being explicitly programmed. In this report, we explore the application of Machine Learning () techniques to predict the intensification and propagation of East African storms.

Example: how to refer a chapter, section, subsection. This report is organised into seven chapters. Chapter 2 details the literature review of this project. In Chapter 3...

Chapter 2

Literature Review

2.1 State-of-the-art

2.2 Critique of the review

2.3 Summary

Chapter 3

Methodology

Chapter 4

Results

4.1 Summary

Chapter 5

Discussion and Analysis

5.1 Significance of the findings

In this chapter, you should also try to discuss the significance of the results and key findings, in order to enhance the reader's understanding of the investigated problem

5.2 Limitations

Discuss the key limitations and potential implications or improvements of the findings.

5.3 Summary

Chapter 6

Conclusion

References

Gebrechorkos, S. H., C. Bernhofer, and S. Hülsmann, 2019: Impacts of projected change in climate on water balance in basins of east africa. *The Science of the total environment*, **682**, 160–170, https://doi.org/10.1016/J.SCITOTENV.2019.05.053.

Appendix A

An Appendix Chapter