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Description automatically generatedSchool of Computer Science and Statistics

Exploring the use of a microworld to teach about economically viable climate aware forest management.

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A Thesis submitted in partial fulfilment

of the requirements for the degree of

*Master of Science in Computer Science*

**Declaration**

I, the undersigned, declare that this work has not previously been submitted as an exercise for a degree at this, or any other University, and that unless otherwise stated, is my own work.

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1.    I did not make use of AI tools in the work described in this document, including the preparation of the document itself.   
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2.    The use made of AI tools in work described here, including the preparation of the document itself, is outlined in an appendix,  as per the School guidelines. If relevant, use made of AI is also described in the body of the document.

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Name

August ??, 2024

**Acknowledgements**

**Abstract**

So far, 2024 has been a year of unprecedented heat for a large part of the world (Asia & The Americas) [1] with highest reported temperatures being 43°C (USA) [2], 51.9°C (Mexico) [3], 52.3 °C (India) [4], etc. For Europe, 2023 was the hottest year on record [5]. Heatwaves are but one of several increasingly frequent disastrous weather events like floods and wildfires. Extreme climate also negatively impacts health of most life on earth and disrupts key industries like agriculture, energy, and infrastructure [6]. CO2 is a greenhouse gas that is among primary drivers of climate change though promotion of global warming [7]. It’s concentration in the atmosphere has remained in the 200 to 300 parts per million (ppm) range throughout human evolution with the pre-industrial (1850 – 1900 [7]) level being 280 ppm. It is predicted that a level of 430 ppm would spell dangerous climatic conditions. [8] Today (22 June 2024), atmospheric CO2 concentration is 427 ppm. There is an urgent need to spread awareness and inspire action to mitigate perilous consequences of rapid climate change.

Forests absorb 30% of global emissions per year [9]. They are integral to combating climate change but are fragile. If enough of a forest is cleared, they turn from absorbing more carbon than they emit, to doing the opposite which would be catastrophic. This is already beginning to happen and will worsen if ignored. [10, 11] Widespread education/awareness is thus paramount to ensuring a sustainable future.

Effective education demands increased user engagement. Education technology approaches involving microworlds has proved successful at achieving this in other areas [4] but remain underutilized in the field of forest management with few examples of similar projects [5] existing today and none, to the best of knowledge so far, aimed at educating non-expert audiences about forestry and climate change.

Hence, this research focuses on the design, implementation, and evaluation of a microworld to teach adolescents about forest management and climate change.

The aim here is not to build a scientifically accurate, detailed simulation. For teaching purposes, it’s more important to build a conceptual model that captures real-world mechanisms in sufficient detail and accuracy while still being simple enough so as not to overwhelm/distract from learning objectives. Thus, this research shall adopt an Agent Based Modelling (ABM) approach to simulate the microworld. [5-7]

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# Introduction

## Referencing

## Ethics

The tool was used by (N=20) TY students for a period of 1.5 hours as part of a two-day workshop, within the Bridge2College programme, exploring different aspects of climate change. Ethical approval for researching different aspects of the Bridge2College programme had been granted by the School of Computer Science & Statistics.

# Background (start each chapter on a new page)

## The Content Area

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### Climate Change Education (optional)

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## Survey Instruments Used

## Use of GenAI in this Work