University of Stirling
Computing Science and Mathematics

MSc Project/Dissertation Proposal

Programme: MSc Big Data

This is Big Data Research Masters project proposal: Yes

Your name: SeyedPouria Modaresi **Student no:** 2644995

Project supervisor: Dr. Gabriela Ochoa

Provisional project title: Neural network development for social-ecological modelling of conservation conflict

Motivation:

Industrialization has led to many of the world's current environmental problems, for instance, human needs such as food security and clean water, unsafe level of air pollution and loss of biodiversity et al. As it gathers pace, innovations are becoming faster, more efficient and more widely accessible than before. Technology is also becoming increasingly connected as we see digital, physical and biological realms are being merged. Considering this, a unique opportunity exists to use Artificial Intelligence to address such conservation conflicts where this Industrial Revolution can be harnessed along with the societal shifts it triggers, to help address environmental issues and redesign how we manage our shared global environment.

Description of the project:

This project aims to improve the realism of modelling human decision-making under situations of conservation conflict, as simulated in GMSE. The primary focus of the project will be to develop and train a neural network to predict land-use decisions of stakeholders under a wide range of situations. The different situations can be addressed using data collected from 600+ participants in behavioural games from farmers in Europe and Africa. The goal of the neural network will be to serve as an artificial intelligence that plays the behavioural games in a way that successfully empowers stakeholder decisions. This decision-making could then, potentially be integrated more broadly into the social-ecological simulations.

This project will involve two main tasks: First, to attain the *ecological objectives*, that involves, understanding condition of resource to improve stability, sustainability, productivity and avoiding or halting environmental degradation. Second, to attain the *social objectives*, equity, i.e., participation in management, appropriation process, benefit distribution, etc., investment in future productivity, improvement of local living conditions and decrease in Poverty, conflict management and balance between conflicting management goals. Both of these objectives will be fulfilled using Artificial Neural Network (NN) being well-known nonparametric tool for pattern recognition, data mining, and the prediction of complex systems. Furthermore, to ensure the project meets sufficient data mining standards, CRISP-DM (Cross Industry Standard Process for Data Mining) will be used. To address this challenge, a Generalised Management Strategy Evaluation (GMSE) modelling framework and software in the form of an open-source R package and various libraries of python programming language will be used.

Project Timeline:

List of Activities	Time Period	Description
Preliminary Literature Review	Mid May	Supervisor Approval
Preliminary Literature Review	Mid May- End May	Dissertation writing will be started at this phase.
Data Collection	Early June- Mid June	Research pertaining to use of Secondary data or to collect primary data in hand for the purpose of problem in question.
Data Preparation	Mid June- End June	Involves various data mining tasks related to Exploratory Data Analysis, Data Cleaning in order to transform raw data to analytical data.
Modelling & Evaluation	Early July- End July	Building and optimizing the right model.
Feedback, Improvement & Optimization	Early August- Mid August	Review of work by the supervisor and making necessary adjustments (if any, if required).
Final Write-up Dissertation Submission	Mid-August- End August	Submission of Final Dissertation after Supervisor's approval.

List your hardware and software requirements:

This project will require use of following hardware and software (most probably):

1. Anaconda (with Python 3, Jupyter, Spyder).
2. I aim to use python packages and libraries such as Pandas, Numpy, Scikit-Learn, Keras, SciPy, Pytorch for applying data mining techniques.
3. Tableau for Data Visualization.
4. open-source R package (GMSE).
5. Personal Laptop for writing dissertation.
6. University PC for coding.

If any other hardware/software will be used, information will be given in relation to it beforehand.

Further information: (click the boxes to select them)
I confirm that the necessary Ethics Checklist or Approval application form has been submitted: YES

This project is industrially linked: Yes / No

If Yes:

- Name of industrial collaborator:
- The necessary Collaborative Project Agreement has been completed ☐

Please select which of these applies:

- Working at Stirling with idea from industry but little contact ☐
- Working at Stirling with idea from industry and regular liaison ☐
- Working on placement with industrial collaborator ☐
- Tier 4 student working on placement with industrial collaborator ☐

Your signature: **Date:**

Supervisor's signature: **Date:**