FINAL PROJECT PRELIMINARY DRAFT AND WORK PLAN

Master in Decision Making and Innovation

Student's details:

DEC_22_SARA DÍAZ DEL SER

Proposal:

Title (keep in mind it is a provisional title that may change in the future):

(up to 20 words)

Improving Food Security and Sustainable Agriculture with Machine Learning: A Crop Yield Prediction Model

SDG (the Sustainable Development Goal you are considering as your context):

(up to 20 words)

SDG 2: "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture"

SDG 12: "Ensure sustainable consumption and production patterns".

Topic and Problem of your proposal (determine the topic and elaborate the problem and justify the relevance of it.):

(from 200 - 300 words)

The research project aims to build a machine learning model to predict crop yields in order to improve food security and sustainable agriculture practices.

The problem that the research project aims to address is the variability in crop yields, which can be affected by a range of factors such as weather, soil quality, and pest infestations. This variability can make it difficult for farmers to accurately predict their yields, which can impact their ability to plan for the harvest and make informed decisions about which crops to plant.

The relevance of this research project is that it has the potential to make a real impact on food security and sustainable agriculture. By predicting crop yields, farmers can better plan for the harvest and make more informed decisions about which crops to plant and how to use their resources more efficiently. This can help to increase crop yields, which can contribute to food security, particularly in developing countries where food insecurity is a major problem. Additionally, by promoting sustainable agriculture practices, the research project can contribute to the achievement of the

SDGs, specifically SDG 2 (end hunger, achieve food security and improved nutrition, and promote sustainable agriculture) and SDG 12 (ensure sustainable consumption and production patterns).

Bibliography (list the sources and the papers you are considering in the research of your Proposal. List them using APA 7 style):

(from 5 – 10 bibliographic entries)

1. Géron, A. (2017). Hands-On Machine Learning with Scikit-Learn and TensorFlow. O'Reilly Media, Inc.
2. Ng, A. (n.d.). Machine Learning. Coursera.
3. Journal of Agricultural and Food Information
4. Aguilar, C. (2018). React Native Cookbook. Packt Publishing.
5. Eisenman, B. (2018). React Native for Mobile Development. O'Reilly Media, Inc.
6. Liu, X., et al. (n.d.). Predicting Crop Yields Using Machine Learning: A Review.
7. Hossain, M.M., et al. (n.d.). A Review of Machine Learning Techniques for Crop Yield Prediction.
8. Dhillon, B.S., et al. (n.d.). Crop Yield Prediction Using Machine Learning: A Review of Recent Progress.
9. Ahmed, N.M., et al. (n.d.). Crop Yield Prediction Using Machine Learning: A Review of Approaches and Challenges.

Research questions (list the research questions of the problem you have developed above):

(from 100 - 150 words)

- What factors have the most impact on crop yields, and how can they be incorporated into a machine learning model for yield prediction?
- How accurate are different machine learning algorithms at predicting crop yields, and which one performs the best?
- Can a machine learning model be used to forecast crop yields over time, and if so, how accurate are the predictions?
- How can a machine learning model for crop yield prediction be incorporated into a web or mobile app for farmers to use in their decision-making processes?
- How can the results of this research project be used to contribute to the achievement of the Sustainable Development Goals (SDGs), specifically SDG 2 (end hunger, achieve food security and improved nutrition, and promote sustainable agriculture) and SDG 12 (ensure sustainable consumption and production patterns)?

Research objectives (if appropriate, list the research objectives taking into account that they may change in the future):

(from 100 - 150 words)

- To identify the factors that have the most impact on crop yields and incorporate them into a machine learning model for yield prediction.
- To compare the accuracy of different machine learning algorithms at predicting crop yields, and determine which one performs the best.
- To develop a web or mobile app that allows farmers to input data about their crops and get a prediction of the expected yield.
- To investigate how the results of this research project can be used to contribute to the achievement of the Sustainable Development Goals (SDGs), specifically SDG 2 (end hunger, achieve food security and improved nutrition, and promote sustainable agriculture) and SDG 12 (ensure sustainable consumption and production patterns).

Methodology (explain and describe as many possible elements of your methodology):

- Quantitative, qualitative or mixed methods.
- The study design: data and methods.
- Sampling procedures: type selection.

(from 200 - 300 words)

The proposed research project aims to build a machine learning model to predict crop yields in order to improve food security and sustainable agriculture practices. This will be achieved through a combination of quantitative and qualitative approaches.

To build the machine learning model, data will be analyzed using statistical techniques to identify the factors that have the most impact on crop yields. Machine learning algorithms will then be used to build a model that can predict yields based on those factors. In addition to numerical data, qualitative data may also be collected, such as through interviews with farmers or other stakeholders, to understand the context in which the model will be used and identify potential barriers or challenges to its adoption.

The study design for this research project will involve analysing weather data, soil data, and data on pest infestations, as well as data on crop yields. The methods used to analyze the data will include statistical techniques like regression analysis, as well as machine learning algorithms like decision trees, random forests, and gradient boost.

In terms of sampling procedures, the Crop Yield Prediction Dataset (Kaggle) will be used. This dataset was derived from publicly available data from the Food and Agriculture Organization (FAO) and World Data Bank. It encompasses a multitude of variables, from weather conditions to pesticides, and the recorded production yield.

Work Plan

List the deadlines you are setting in the development of your Proposal (consider the already established deadlines):

- Week 1-2: Review literature and identify relevant data sources.
- Week 3-4: Collect and prepare data for analysis.
- Week 5-7: Identify key factors that impact crop yields and build a machine learning model to predict yields based on those factors.
- Week 8-9: Test and evaluate the performance of the model.
- Week 10-12: Refine and improve the model as needed.
- Week 13-16: Build a web or mobile app to allow farmers to input data and get a prediction of expected yield.
- Week 17-18: Test and evaluate the app.
- Week 19-20: Write up and report on the results of the research project.

Signature: