Description of Product

## **Key Features**

The final product aims to contain these features. **Satellite Data Integration** by making use of open-source satellite data from government agencies like NASA and the European Space Agency, focusing on multispectral and thermal imagery for assessing vegetation health and water availability. We will then use **Machine Learning Models (more on this in the technical considerations section)** to develop predictive models that analyse historical and current satellite data to identify patterns indicative of impending drought conditions. Finally, an **Interactive Dashboard** will be built to offer a user-friendly web interface that displays drought monitoring data, historical trends, and predictive analytics in an easily digestible format. This dashboard is intended for use by policymakers, farmers, and researchers to facilitate informed decision-making.

## **User Goals**

The primary value proposition is to enable farmers to receive timely and accurate forecasts about drought conditions to make informed agricultural decisions. Our secondary objective is to assist policymakers in planning and allocating resources efficiently based on data-driven insights about drought conditions.

## **User Stories**

1. **As a farmer**, I want to access real-time drought conditions so that I can plan irrigation and cropping patterns effectively.
2. **As a policymaker**, I need to monitor drought trends over time to formulate better agricultural policies.
3. **As a researcher**, I wish to analyse historical drought data to predict future environmental impacts.

## **User Experience – Step by Step Flow**

1. **Login/Registration:** Users access the system via a secure login or registration module.
2. **Dashboard**: After login, users are presented with a dashboard displaying current drought conditions, forecasts, and personalised alerts.
3. **Data Analysis Tools**: Tools for detailed data analysis are available, such as heat maps, trend lines, and predictive analytics.
4. **Report Generation**: Users can generate custom reports based on selected data points and time frames.
5. **Alerts and Notifications**: Users receive notifications based on specific criteria set for drought conditions.

## **Narrative**

Imagine a farmer in South Africa, previously reliant on conventional wisdom, now using our AI-driven platform to see real-time data visualisations of impending drought conditions. This enables precise planning of water use, potentially saving crops and livelihoods during critical periods. Policymakers, equipped with predictive insights, can allocate resources more effectively, ensuring food security and economic stability in the region.

## **Feasibility**

Multispectral and thermal imagery allows us to accurately monitor vegetation health and water availability. This is at the crux of forecasting drought impacts (Tian, 2018). Integrating this type of data with machine learning models improves the strength of our predictions, however, continuously calibrating the model and incorporating real-time data inputs are importanting for maintaining accuracy (Boegh *et al.*, 2004; Forkel *et al.*, 2014). Additionally, the interactive front-end dashboard designed for this system will provide a user-friendly UI that offers real-time data visualisations and predictive analytics, making it an invaluable tool for the stakeholders involved.

This project is not without challenges however. For instance, regarding the accuracy and availability of the satellite data we will be pulling from APIs, the availability and reliability of our model may be affected since the accuracy of satellite data can be compromised by atmospheric conditions like cloud cover, which obscures the imagery. Also, the resolution and update frequency of data from generalised, unpaid APIs may not meet this project’s specific needs for detailed, local-scale analysis. This could affect the precision of drought predictions and how useful the system’s data is for our stakeholders.

Ultimately, this project would likely necessitate close collaboration with faculty advisors and possibly partnerships with external organisations for technical support and data access.

# References

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