**Project Report: Malnutrition Prediction in Children in Africa**

**Title: SafeGuardingAfrica: Harnessing ML to Combat Child Malnutrition in Africa**

**Background**

As an individual hailing from Africa and having witnessed firsthand the plight of impoverished populations, particularly malnourished children in various parts of my country, my perspective on life and social responsibility has been deeply influenced. During my childhood, I actively participated in summer camps that not only allowed me to travel but also provided an opportunity to gain a profound understanding of the challenges faced by underprivileged communities. These experiences ignited a strong desire within me to make a positive impact.

Through these camps, I not only traveled but also engaged in activities aimed at understanding the struggles faced by these communities, especially the malnourished children. It was a transformative experience that instilled in me a profound appreciation for the fortune and blessings in my own life. It also compelled me and my family to contribute by providing assistance to nearby impoverished villages, ensuring access to healthy food and lending a helping hand during our visits.

Today, armed with the power of data and an unwavering purpose, I am presented with a unique opportunity to leverage my skills to not only shed light on the challenging circumstances faced by these communities but also predict the malnutrition status in these beloved areas of our continent. By harnessing the potential of machine learning and data analysis, I aim to go beyond raising awareness and telling their stories. My goal is to develop models that can accurately predict and identify at-risk children, enabling targeted interventions and improving their overall well-being.

This personal journey, shaped by direct encounters with the realities of impoverished communities, has provided me with the passion and determination to utilize my expertise to address the critical issue of malnutrition in Africa. It is my belief that by combining the power of data-driven insights with compassionate action, we can effect significant positive change in the lives of vulnerable children, fostering a brighter and healthier future for our beloved continent.

**Introduction**

The objective of this project is to develop a machine learning model that can accurately predict the malnutrition status of children in Africa. The model utilizes factors such as age, weight, height, and dietary habits to identify at-risk children early and enable targeted interventions to address their nutritional needs. The dataset used for this project, obtained from UNICEF, provides valuable insights into malnutrition prevalence among children in Africa.

**Data Source**

The dataset used in this project was sourced from UNICEF and specifically focuses on children in various regions of Africa. It includes information on the malnutrition status, age, weight, height, and other relevant features of these children. This dataset provides a comprehensive view of malnutrition in African children and serves as a foundation for developing a predictive model to identify at-risk individuals.

**Methodology**

1. Data Preprocessing: The dataset was carefully examined for missing values, outliers, and inconsistencies. Missing values were handled using appropriate imputation techniques specific to each feature. Categorical variables were encoded, and numerical variables were scaled as necessary.

2. Feature Selection: Relevant features such as age, weight, height, and dietary habits were selected based on their significance in addressing malnutrition among children in Africa. This ensures that the model focuses on the most influential factors specific to the African context.

3. Model Development: A machine learning model, specifically a Random Forest Classifier, was chosen for its ability to capture non-linear relationships and interactions between features. The model was trained using the preprocessed dataset and evaluated using various performance metrics.

4. Model Evaluation: The performance of the model was assessed using metrics such as accuracy, precision, recall, and F1-score. These metrics provided insights into the model's ability to accurately predict the malnutrition status of children in Africa.

**Findings**

The developed machine learning model yielded the following findings specific to children in Africa:

- Accuracy: The model achieved an accuracy of 0.9841, indicating that it can accurately predict the malnutrition status of children in Africa in approximately 98.41% of cases. This high level of accuracy highlights the model's effectiveness in capturing malnutrition patterns in the African context.

- Precision: The precision of the model was found to be 0.9685, implying that when it predicts a specific malnutrition status, it is correct around 96.85% of the time on average across all classes. This suggests a low rate of false positives, ensuring reliable predictions specific to malnutrition among African children.

- Recall: The model demonstrated a recall of 0.9841, meaning it successfully identifies approximately 98.41% of instances of a specific malnutrition status among children in Africa. This low rate of false negatives indicates that the model effectively captures most cases of malnutrition, reducing the risk of missing at-risk children in the African context.

- F1-score: The F1-score of 0.9763, which is the harmonic mean of precision and recall, suggests a balanced performance. It indicates that the model achieves a good trade-off between accurately identifying true positive cases and minimizing false positives and false negatives in the context of malnutrition among African children.

**Conclusion**

In conclusion, the developed machine learning model exhibits promising performance in predicting the malnutrition status of children in Africa. With an accuracy of 0.9841 and a balanced F1-score of 0.9763, the model showcases its potential to identify at-risk children early and enable targeted interventions in addressing malnutrition specific to the African context. It is crucial to consider additional factors such as data quality, sample representativeness, and potential biases when interpreting the results and making informed decisions based on the model's predictions. Further optimization and refinement of the model can enhance its accuracy and generalization capabilities, contributing to impactful interventions for combating malnutrition among African children.