

AI System Project: Food Image Classification for Nutritional Estimation

Project Team – P01:

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Project Brief:

This project aims to develop a system for food image classification and nutritional estimation using Convolutional Neural Networks (CNNs). The goal is to develop a model that can identify and categorise food images, while comparing CNNs with other techniques, such as Random Forest, to determine the most effective approach. The system will integrate the FOOD101 dataset with USDA's Food Data Central to estimate nutritional values.

Project Goals:

- **Baseline Extension** - Food image classification: Developing a model capable of categorising food images into different classes and trying to get the best accuracy.
- **Model's Evaluation** - Comparing the performance of different learning techniques.
- **Project Extension** - Nutritional estimation: Developing a model to estimate the nutrients associated with each food category.

Requirement List:

- Use of public dataset: Food-101, USDA Food Data Central
- Tools: Jupyter Notebook, Keras, TensorFlow, GitLab

Feasibility Analysis:

- **Data Availability:** Sufficient dataset availability with preprocessing strategies.
- **Technical Implementation:** Utilising TensorFlow, or Scikit-learn, and Gitlab.

Project Plan:

Sprints	Description	Estimated Duration in Weeks
Sprint 1: Planning and Data collection	<ul style="list-style-type: none">• Download the required dataset (Food -101).• Dataset splitting, Feature engineering & Data Augmentation.• Setup a Gitlab repository and upload the dataset.	1
Sprint 2: Model Development	<ul style="list-style-type: none">• Train and evaluate a CNN model for image classification.• Develop Decision Trees and Random Forest for comparison.• Explore existing approaches like Transfer learning to enhance CNN performance using pre-trained models.	2
Sprint 3: Model evaluation and Optimisation	<ul style="list-style-type: none">• Experiment with different architectures and hyperparameters to improve models' performance.• Use of metrics to evaluate models such as Accuracy, Precision, Recall, F1-score, Confusion Matrix, and Runtime performance.	1
Sprint 4: Model Extension	<ul style="list-style-type: none">• Integrate USDA's Food Data Central for nutritional estimation.	2
Sprint 5: Test the model	<ul style="list-style-type: none">• Real-Time Demo Testing: Input an image to evaluate the model's food detection and nutrient estimation accuracy.	1
Sprint 6: Report and documentation	<ul style="list-style-type: none">• Preparation of reports, statistics, performance comparison, presentation, and source code.• References	1