COMP39/9900 Computer Science/IT Capstone Project
School of Computer Science and Engineering, UNSW

Project Number: P6

Project Title: Development of a Computer Vision-Based Application for Quantifying Food Powder Solubility with AI Analysis

Project Clients: Yong Wang

Project Specializations: Software development; Computer Science and Algorithms; Artificial Intelligence (Machine/Deep Learning, NLP); Big data analytics and visualization; Computer vision; Human Computer Interaction (HCI); Bioinformatics/Biomedical.

Number of groups: 2

Background:

The food industry requires an efficient and accurate method to quantify the solubility of food powders, which is currently done qualitatively by observing the dissolution of powders in liquid. This project aims to develop a computer vision-based application to automate and quantify this process. By using video analysis, the software will measure the solubility rate of powders in different solvents (cold water, hot water, and coffee) and produce solubility curves over time. Additionally, AI and machine learning techniques will be employed to classify the solubility results into categories (e.g., good, medium, bad) based on human-marked training data. This will provide a more detailed and valuable understanding of powder solubility, benefiting the industry by offering precise, quantifiable data and automated quality assessment.

Requirements and Scope:

The project involves developing a software application that can:

Record videos of food powders dissolving in solvents.
Analyze the video to quantify the remaining powder on the liquid surface over time.
Produce solubility curves to show the dissolution rate.
Implement AI/machine learning models to classify solubility results based on training data.
Create a database to store results and improve AI models through continuous training.
The software will use standardized beakers and controlled stirring methods to ensure consistency. It will start with commercial food powders like milk powder and eventually expand to other types.

Software/Application Development: Create an application for recording and analyzing videos.
Computer Vision: Implement algorithms to detect and quantify powder residue on the liquid surface.
Data Analysis: Generate solubility curves from the video data.
AI/Machine Learning: Develop and train models to classify solubility results. Create a feedback loop for continuous improvement of the models based on human-marked data.
Testing: Validate the software using commercial food powders and standardized solvents.
Documentation: Prepare user guides and technical documentation for the application.

Required Knowledge and skills:

Software development (especially in video processing and computer vision)

Machine learning and data analysis

Familiarity with image processing libraries and tools (e.g., OpenCV, TensorFlow)

Experience with AI/machine learning frameworks (e.g., scikit-learn, PyTorch)

Basic understanding of food science (preferable but not essential)

Expected outcomes/deliverables:

Functional software application for video recording and analysis

Quantified solubility data and solubility curves for different food powders

AI models for classifying solubility results and a feedback loop for continuous improvement.

Comprehensive user guide and technical documentation

Source code repository with proper version control.

Supervision:

Yong Wang

Additional resources:

Access to commercial food powders and standardized beakers
Use of existing spray dryers for powder production if necessary