HSUHK 45th Anniversary -HSU x eClass Computing Cup

Smart Meal Plan AI Assistant Design Competition

*** Overview ***

Utilize large language models (hereinafter referred to as LLMs) to create a generative artificial intelligence system called the "Smart Meal Plan Assistant" (hereinafter referred to as "Assistant"). After users input personal information into the "Assistant," including height, weight, gender, age, average daily exercise, and food preferences, the "Assistant" can generate a personalized weekly meal plan. In addition to providing the meal plan, the "Assistant" can offer timely health guidance, such as recommending an increased exercise intensity or suggesting a reduction in the intake of unhealthy foods.

Each school may send up to two participating teams, with each team consisting of 1 to 5 students.

*** Data of Foods ***

Food data must be based on the "Table of Energy Contents of Common Foods"¹ (hereinafter referred to as the "Table"), and the required data should be preloaded into the "Assistant." Participants may provide additional food information beyond what is included in the "Table," but they must demonstrate that this information is reliable and not generated by artificial intelligence. The "Assistant" is designed to optimize the user's meal plan preferences. To simplify the process, users may only enter their preferences for certain foods. Preferences are rated on a scale from 0 to 6, where 0 indicates a strong dislike of the food and 6 indicates strong preference. The default value is set to 3 for foods that do not have specified preferences.

¹ https://www.chp.gov.hk/files/pdf/exn_nutp_058b.pdf

*** Smart Diet Planner ***

The Smart Meal Plan Assistant allows users to input their weight, height, gender, activity level, and other relevant information. The "Assistant" records this information and considers it each time it provides suggestions.

Users can have three meals a day: breakfast, lunch, and dinner. They enter their preferences for each food on a scale from 0 to 6. Once the user has completed entering their preferences, the "Assistant" will design a menu for the three meals based on their requirements and conditions. We have the following basic assumptions and requirements:

The number of calories a man needs in a day:

Calories = $[665 + 1.38 \times \text{weight (kg)} + 5 \times \text{height (cm)} - 6.8 \times \text{age}] \times \text{activity level}$ The number of calories a woman needs per day:

Calories = $[655 + 9.6 \times \text{weight (kg)} + 1.9 \times \text{height (cm)} - 4.7 \times \text{age}] \times \text{activity level}$ The activity level varies between 1.1 and 1.3. If a person sits in the office all day, the activity level is 1.1.

Breakfast calories should be less than 30% of the day's calories. Lunch calories should be less than 40% of the day's calories. Dinner calories should be less than 30% of the day's calories. Suggest only one serving of each food per day or skip it.

*** LLMs ***

Each team must design their "Assistant" using large language models (LLMs), with no restrictions on the number of models or parameters. The hardware used can include a computer, tablet, smartphone, or microcomputer, among others. Participants should note that the use of open-source LLMs and the resources they consume will be among the scoring criteria. Detailed information can be found in the "Scoring Criteria" section below.

*** Examples ***

The following is an example of how the "Assistant" operates. The process, format, and suggestions are provided for reference only, and participants are not required to adhere to these examples when creating their "Assistant".



"Assistant" concept map:

User enters personal information:

Height: 175 cm Weight: 70 kg Gender: Male Age: 30 years old Average daily exercise: 1.2

Food preferences:

Potatoes: 6

(Other food preferences: Default is 3)

[The system calculates the daily calories required]:

Calorie formula for men: Calories = [665 + 1.38 × weight (kg) + 5 × height (cm) - 6.8 × age] × activity level

Calculation: Calories = [665 + 1.38 × 70 + 5 × 175 - 6.8 × 30] × 1.2 = 2700 calories

["Assistant" output]:

(Note: This is only an example. It only displays the menu for Monday and Tuesday, and the food information is not accurate. Participants must refer to the food listed in the "Table" and let the "Assistant" generate the menu for the week.)

Generated menu

Monday:

breakfast:

Hash browns (200 g): 154 calories Sandwich wheat bread (1 piece): 122 calories Full cream milk (1 cup): 146 calories Total: 422 calories

Lunch:

Beef stew with potatoes (200 g): 400 calories Green salad (1 serving): 100 calories Fresh orange juice (1 cup): 108 calories

Total: 608 calories

Dinner:

Mashed potatoes (200 g): 154 calories Roasted chicken breast (without skin) (skinless) (100 g): 165 calories Boiled broccoli (180 g): 63 calories Total: 382 calories

Tuesday:

Breakfast:

Potato quiche (200 g): 200 calories Oatmeal (cooked) (1 bowl): 208 calories Yogurt (1 cup): 100 calories Total: 508 calories

Lunch:

Roast Chicken with Potatoes (200g): 350 calories Rice (cooked) (1 bowl): 257 calories Scrambled Eggs with Tomatoes (1 serving): 150 calories Total: 757 calories

Dinner:

Potato salad (200 g): 154 calories Salmon (Atlantic, dry heat) (178 g): 367 calories Steamed spinach (100 g): 50 calories Total: 571 calories

*** Scoring Criteria ***

Works submitted by each team will be scored according to the following criteria:

1. Functional Assessment (25%)

Programs will be evaluated based on their performance across multiple test cases. Evaluation criteria include:

- i. Whether the suggested menu is feasible and whether its calorie count is accurate.
- ii. Optimize the preference of the recommended menu.
- iii. The response speed of the "Assistant".
- iv. Whether the "Assistant"'s response is human-like.

2. <u>Human-Centred Design (30%)</u>

"Assistants" should follow human-centred design principles and aim to provide users with a pleasant experience. This means that the "assistant" should be able to meet the users' actual needs, featuring a clear, simple, and user-friendly interface. The information provided should be practical, and expressions should facilitate real operational needs. Additionally, the Assistant should run smoothly and without errors.

Users should be able to communicate with the Assistant at any time. The "Assistant" is like a personal nutritionist, able to respond immediately when the user needs it and adjust the plan design according to the user's latest situation.

The "Assistant"'s response should be clear and unambiguous, so that the user feels like interacting with a real person and can interact with the user in a timely manner.

3. <u>LLMs Application Techniques (25%)</u>

Utilize minimal resources — Use LLMs with fewer parameter values, a smaller number of LLMs, and hardware with lower computing power to achieve the best results. Participants must understand the characteristics of the LLMs they use, and leverage

appropriate support files and pre-configurations, so that users can obtain satisfactory results even with simple commands (prompts).

4. Resource Budget (20%)

Considering the budget and resources used by the "Assistant," including but not limited to the hardware and resources used by LLMs, smaller is better.

*** Deliverable ***

** 1st Round **

Please submit the following items via the competition page:

- 1. A documentation of no more than 15 pages, with font size 12 and line spacing 1.5. The document must describe the design concept of the work, including but not limited to:
 - a. Overall design concept
 - b. Methods used in planning the meal plan
 - c. LLMs and related platforms used
 - d. Hardware used and detailed specifications
 - e. Relevant instructions and files for fine-tuning the model
 - f. Operation procedure of the "Assistant"
 - g. Screenshots of the "Assistant" (if available)

The judging panel will select the top ten participating teams to advance to the second round of judging.

** 2nd Round **

Participants should bring their "Assistant" prototypes to the designated venue, where the judging panel will test each team's prototype. Contestants are required to ensure that the "Assistant" is functioning properly prior to the judging process. The judging panel will uniformly test each prototype by asking the same set of questions and will rank the prototypes based on the quality of their responses. If the "Assistant" fails to run successfully for any reason, it will be deemed "unsuccessful." Participants must prepare the necessary hardware and materials to demonstrate the Assistant and allow the judging panel to pose questions. While they are not required to give a formal presentation, they should be ready to answer any questions from the judging panel.

The judging panel will select the top five participating teams to advance to the finals.

*** Finals 決賽 ***

The five teams with the highest scores in the second round of selection can advance to the finals. They need to complete the "Assistant" and bring all necessary hardware and devices to the finals venue for on-site testing, demonstration, and reporting.

The judging panel will select three: the champion, the first runner-up, and the second runnerup, as well as two outstanding teams.