

# Human Factor in AI

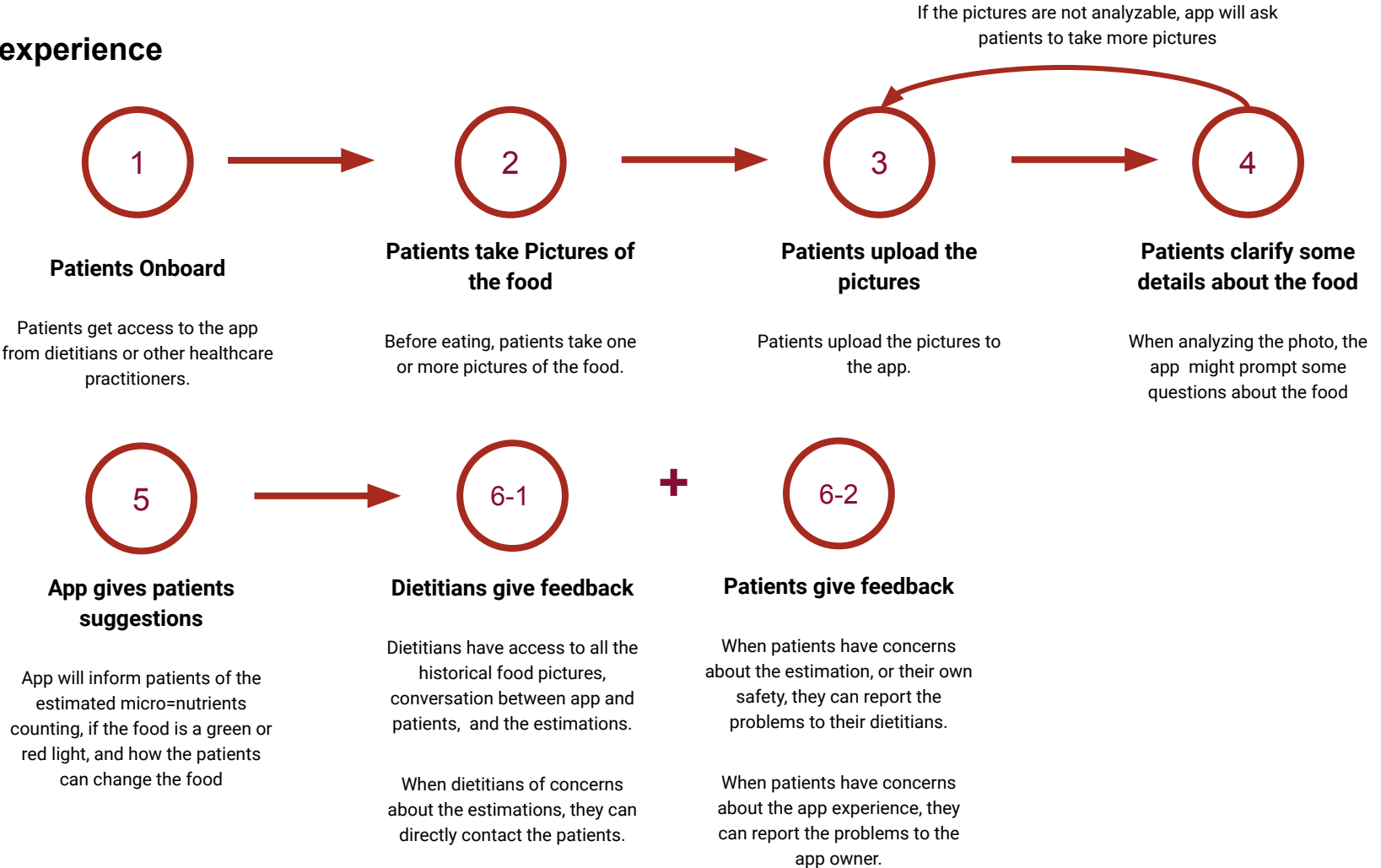
**A machine learning based food macronutrient recognition system**

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**A machine learning based food macronutrient recognition system, which can calculate the macro counting by analyzing the pictures of food users upload.** With the macronutrients data coming from the pictures, and other user data, the system can suggest if the food in the plates are appropriate or not for users obese recovery journeys.

The response to the users' picture upload will not be as simple as "Yes" or "No". Based on users' other input, the system can further suggest what food to add in or what to be removed from the plate.

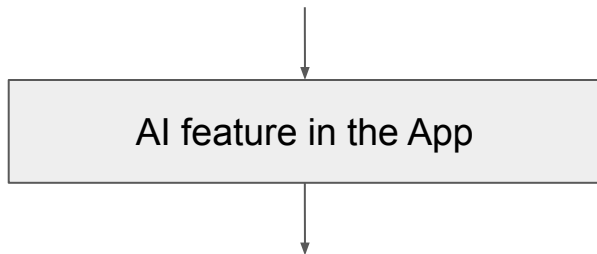
# User experience



## AI-specific inputs and outputs

### Inputs

1. Pictures of the food
  - a. Images of the food
  - b. Image of a size reference (ex: hands, coins)
2. Patients' information
  - a. Basic information: height, weight, age, gender
  - b. Medical history
  - c. Dietary restriction
  - d. Real-time biological data: exercise level, heart-rate, etc



### Outputs

1. Estimation about the food
  - a. Macro-counting: Amount of carbohydrate, protein, fat, fiber, etc.
  - b. Calorie-counting
2. Suggestion about the food
  - a. Green light, yellow light, or red light
  - b. Actions that can make the food into greenlight

## How to reach higher transparency and communicate possible uncertainty?

1. Inform what information the AI used as "Inputs".
2. List out possible reasons that can lead to a wrong estimation. (Bad lighting for example)
3. Definition of Green, Yellow, and Red light in "Outputs".
4. Remind users that this app is an augmentation, not a replacement of their dietitians.

# Privacy and Ethical Implications

1.
  - a. Fair Information Practices (FIPs) should be followed
    - i. We should inform users what personal identification information will be collected
    - ii. We should describe what choices regarding user privacy the users have, and collect users' consent
    - iii. Provide access to their individual PII for review
  - b. HIPPA should be followed
    - i. We should give users privacy notices about how the app is going to use their protected health information (PHI, including medical history, payment, and physical or mental conditions)
    - ii. We should give users access to their PHI
    - iii. We should implement safeguard to protect users' PHI

# Possible sources of bias and mitigations

- a. Bias in data collections: Since our system is based in the USA, it will be trained heavily with American food types. When users uploaded pictures of food that rarely showed up in the training data, Japanese for example, our system can come up with wrong estimation.
- b. Bias in defining features and labels: Even for experts in nutritions, it is difficult to calculate the macro-nutrients with pictures solely. Their features are hard to capture by our system via pictures: Amount of oil or sauce used during cooking, source of the food, and brand of the food. These features can significantly affect the final estimation.
- c. Deployment bias: Our system will act as an augmentation of the dietitians. However, if the patients decide to hide some food intake from our system, The system's suggestion to improve patients' obesity recovery journey will be incorrect.
- d. Bias in feedback loop: The patients who provide feedback to our system or their dietitians are the ones who are serious about obesity recovery, and they tend to recover better. The patients who recover poorly will report feedback less frequently.