Chatbot for Diabetic patients

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Introduction

In UAE., 1 in every five adults is diagnosed as diabetic. Every 8 seconds, one person dies due to diabetes worldwide. The UAE is ranked within the highest ten countries in diabetes. Doctors always emphasize the need not to wait for the symptoms to get more series and let the diabetic person be more empowered to start self-managing their health (Ahmed, 2019).

Main Objective of this project :
We wanted to develop a chatbot for diabetic patients to help them be more self-reliant and, allow them to take the lead in their diabetes management.

Research Question

Our Main question was: **Can we design a chatbot which can help enhance the diabetic patient in his/her diabetes management?**

The need of the diabetic person is summarized on the below requirements:
- The need to have the proper advice, considering his/her current state.
- The need to have clear guidance.
- The need to for having the guidance to be easy to follow.
- They need to feel, as if they are doing it alone, not being codependent on others.

We asked **Dr. Muna**, a clinical dietitian for the most important needs for the diabetic patient, as per her 7 years of experience, and some results are in Next slide

Research Question

The Most common reasons miss-management of the condition for a diabetic patient are:
- No Emotional support (chatting)
- Lack of direct advice/wrong advice
- Bad Food selection

The Most suggested ways a chatbot can help the diabetic patient:
1- Teaching them carbohydrate counting and exchange list
2- Reminding them to exercise daily and lightly
3- Reminding them of the medications timing

Problem Statement

- **Sadly, diabetes does not have a treatment**, but the patient can adjust his/her lifestyle to make it work and prevent the problems that can arise from long duration of high blood sugar level

- **Having high blood sugar for long times can lead to many health problems** such as:
  - Heart disease
  - Stroke
  - Kidney disease
  - Eye problems

- **The Better diabetes is managed, the less there will be the need for hospitalization**

- **Benefits of Having a chatbot to help the diabetic patient self manage his/her condition:**
  - The chatbot give more instant answers
  - It cost less for diet-related advices
  - No need for someone available to answer patient questions

Theoretical Literature

Literature about Diabetes

According to the international diabetes federation (Diabetes facts & figures, 2020)

In **2019**:

- Half of the people who have diabetes are undiagnosed!

- Diabetes caused 4.2 million deaths

- More than 1.1 million children are living with diabetes of type 1

- 374 million people are in increased risk of developing diabetes

Theoretical Literature

Literature about Diabetes

- Diabetes Types:

    o Type 1 diabetes (The body does not make insulin)

    o Type 2 diabetes (The body does not make or use insulin well)

- Some Health problems which can occur due to Diabetes:

    - Heart disease

    - Stroke

    - Kidney disease

    - Eye problems
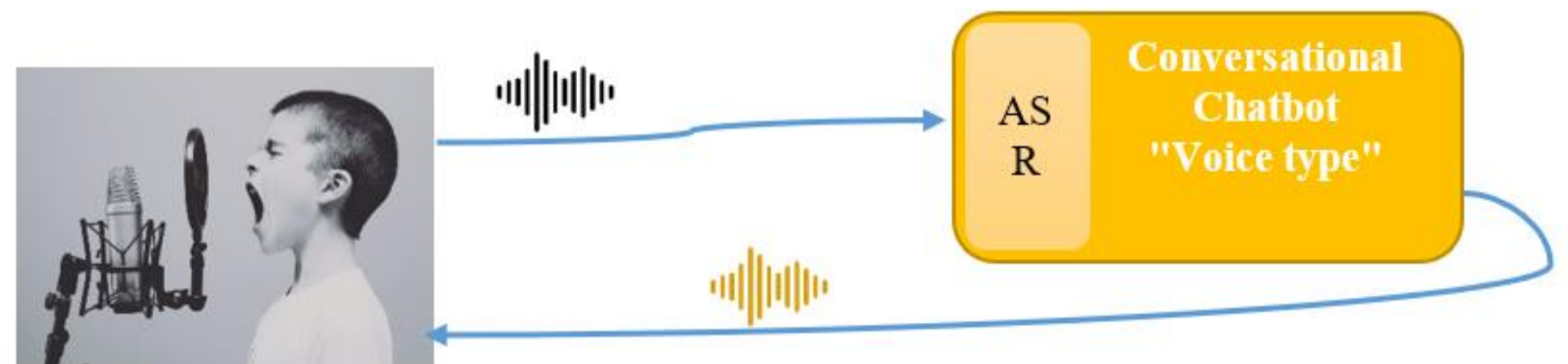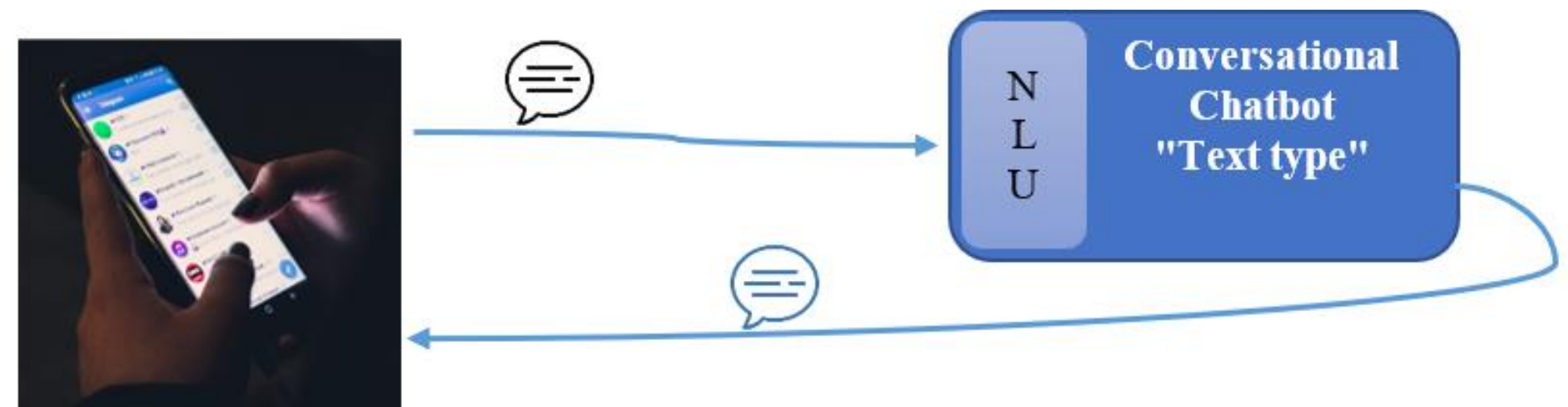
Theoretical Literature

Literature about Chatbots
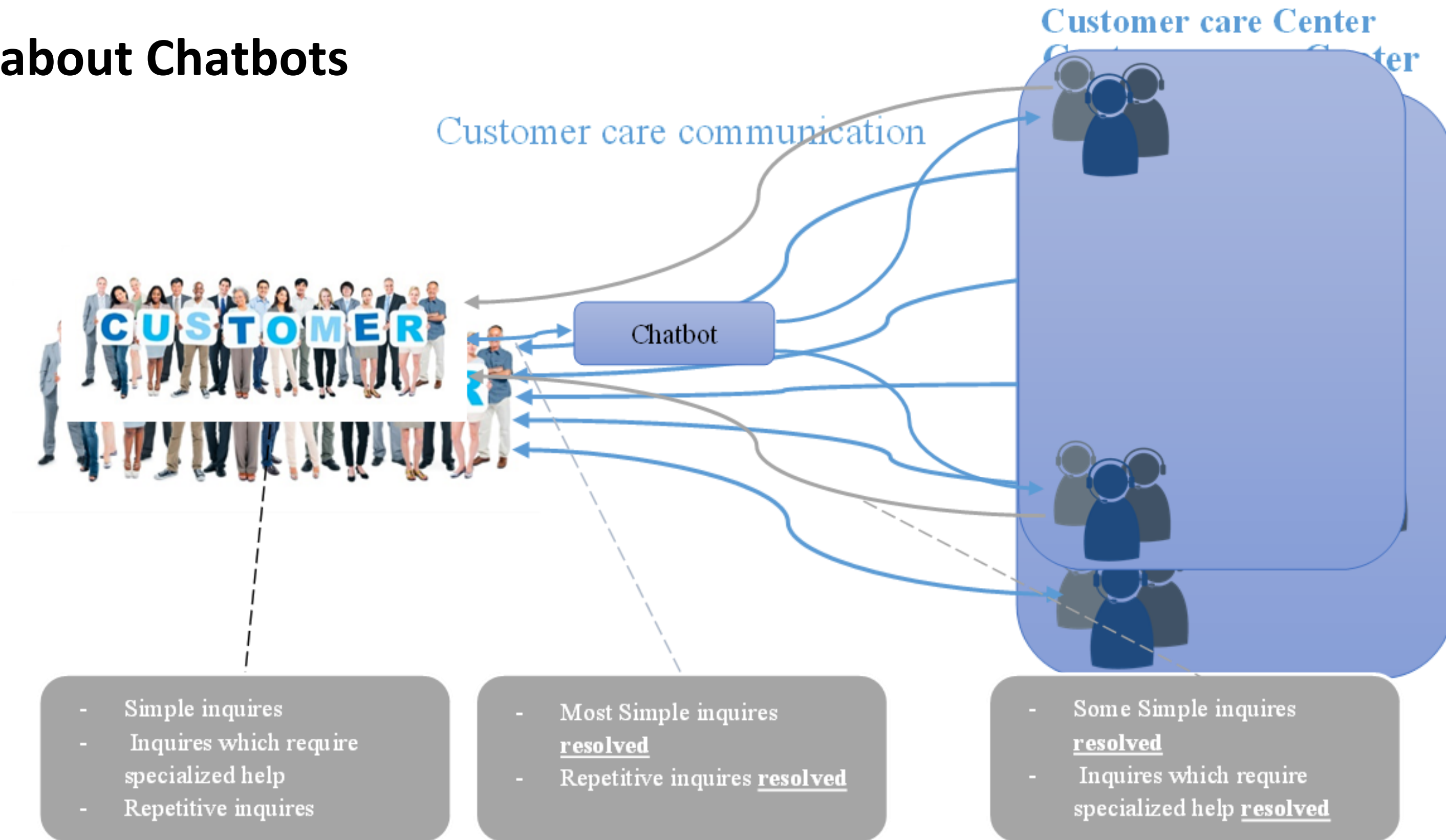
Theoretical Literature

Literature about Chatbots

- **Types of Chatbots:**
  1- Rule Based Chatbots (FAQ)
  2- Conversational Chatbots (Conversational AI)

- **Chatbot Development Frameworks:**
  - Botkit
  - **RASA**
  - IBM Watson

Theoretical Literature

Literature about Chatbots

- **Main Tools under RASA development framework:**
  1- **Rasa NLU** is basically a tool responsible to applying NLU (Natural language understanding)
  2- **Rasa Core** is a Machine learning dialogue management solution, it takes the structured input from the Rasa NLU and tries to build a probability model which decide a set of actions to preform, based on the previous user inputs.

| Rasa NLU main job	Rasa Core main job
• Training Data format • Language support • Choosing a pipeline • Entity Extraction	• Dialogue engine • Stories • Domain • Response • Action • Slots • Forms • Knowledge based actions

Problem Solution

Methodology

As per the Survey conducted with Dr. Muna, a clinical dietitian with 7 years of experience in dealing with diabetic patients, **we prioritized these two kinds of help needed for diabetic patients**:

1. Help in selection of good food choices
2. Providing emotional support to the diabetic patient

We Selected the RASA Development framework to develop the chatbot due to available training and references and because its open-source. The RASA chatbot/Assistant uses Natural Language processing in its (NLU) unit to identify the user intention to be able to respond back to the user

Methodology

RASA Development framework at a high level is below:
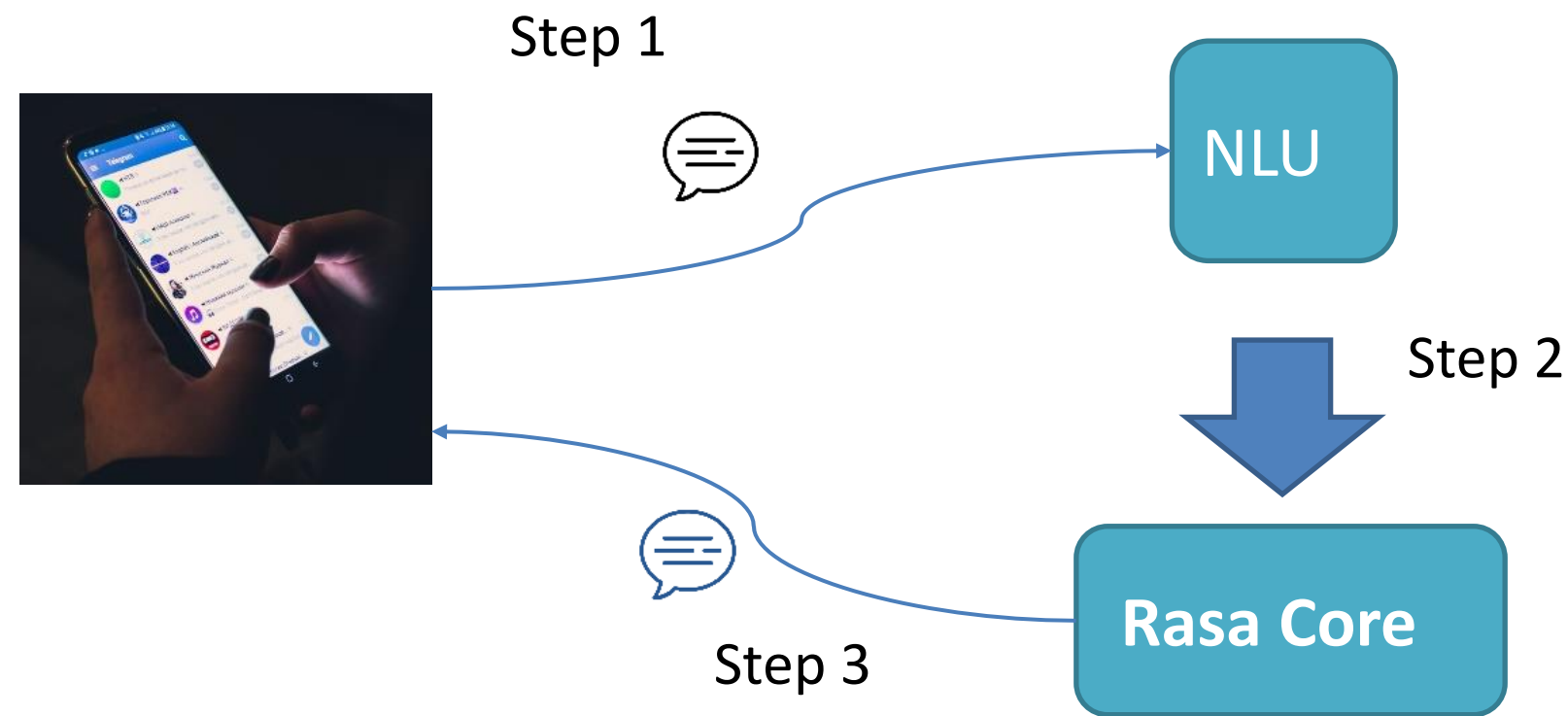
So, **we planned to develop the below user stories**:
1. "**How Many Calories**" User Story: a user story where the user will be able to get an answer about the calory count for several foods
2. "**Lets Exercise**" User Story: Rasa assistant will suggest exercises to the user and talk about how fun it will be if they did exercise.

Implementation and Results

Steps of Chatbot Development

1- **Developed** set of **Conceptual Story paths**

Implementation and Results

Steps of Chatbot Development

2- **Developed Intents** and training statements for the chatbot to be able to recognize user intents

3- **Developed** chatbot **responses**


```
! nlu.yml        ×
data > ! nlu.yml
 86
 87    - intent: want_motivation_to_exercise
 88      examples: |
 89        - I want to feel inspired
 90        - I want to feel motivated
 91        - I need motivation
 92        - Motivate me
 93        - show me a great exercise
 94        - suggest an exercise for me
 95        - I feel bored to exercise
 96        - I dont feel like Exercising
 97        - Why do we excercise?
 98        - What do you know about training?
 99        - Training? why?
```

```
! domain.yml  ×
! domain.yml
 22    responses:
 23      utter_greet:
 24      - text: "Hey! How are you?"
 25      - text: "oh, hi there, how was your day?"
 26      - text: "Hi there, how is it going with ya?"
 27      utter_cheer_up:
 28      - text: "Here is something to cheer you up:"
 29        image: https://i.imgur.com/nGF1K8f.jpg
 30      utter_did_that_help:
 31      - text: "Did that help you?"
 32      - text: "Does it feel better now?"
 33      utter_happy:
 34      - text: "Great, carry on!"
 35      - text: "Wonderful!"
 36      - text: "I am happy for that"
```

Implementation and Results

Steps of Chatbot Development

4- **Allowed** the **chatbot** to **recognize** the **fruits** by <u>adding Food as an entity</u>

5- **Allowed** the **chatbot** to **store food** by <u>adding a slot</u> with the same name as food

Implementation and Results

Steps of Chatbot Development

6- Developed a python code to **create an SQL Database called CaloriesDB** using sqlite3 library and filled it with some data for several fruits

7- Developed an independent python code that connect to the CaloriesDB database to search for a fruit and get the number of calories of that fruit

8- **Added** the Python code in step7 to a **query custom action in RASA** to be used
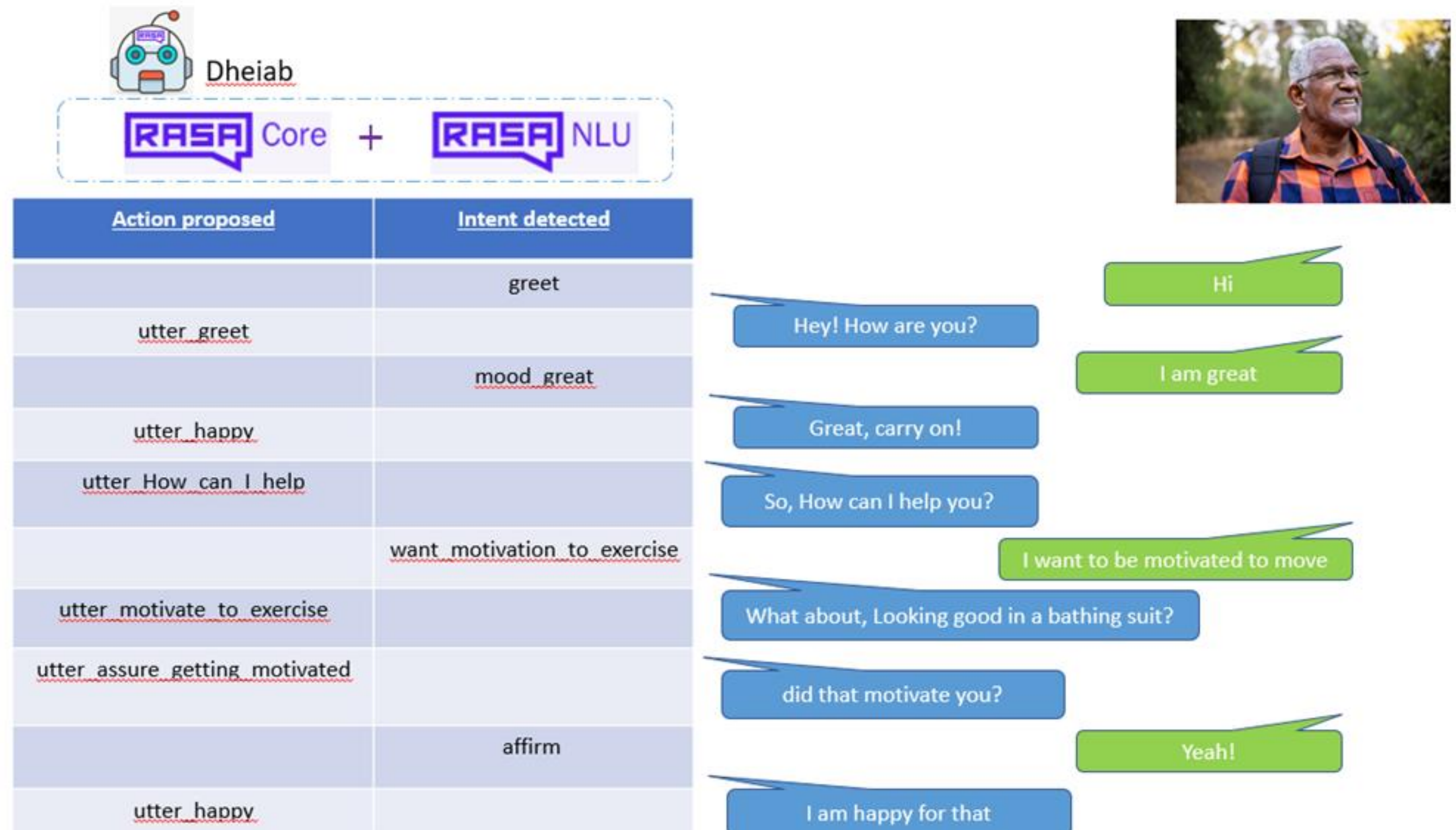
Implementation and Results

Chatbot Story paths:

1. **Story path#1.a** – the User is feeling great and want help to get motivated to exercise

2. **Story path#1.b** – the User is feeling great and want to know the number of calories in a specific whole fruit, then, the chatbot answers his/her query.

3. **Story path#2.a-** the user is not feeling great, the chatbot is able to cheer him/her up, then, the user asks to get motivated to exercise

4. **Story path#2.b-** the user is not feeling great, the chatbot is able to cheer him/her up, then, the user want to know the number of calories in a specific whole fruit, then, the chatbot answers his/her query

5. **Story path#3** – the user is not feeling great, the chatbot try to cheer her/him up. It didn't work, so, the chatbot says "good bye".
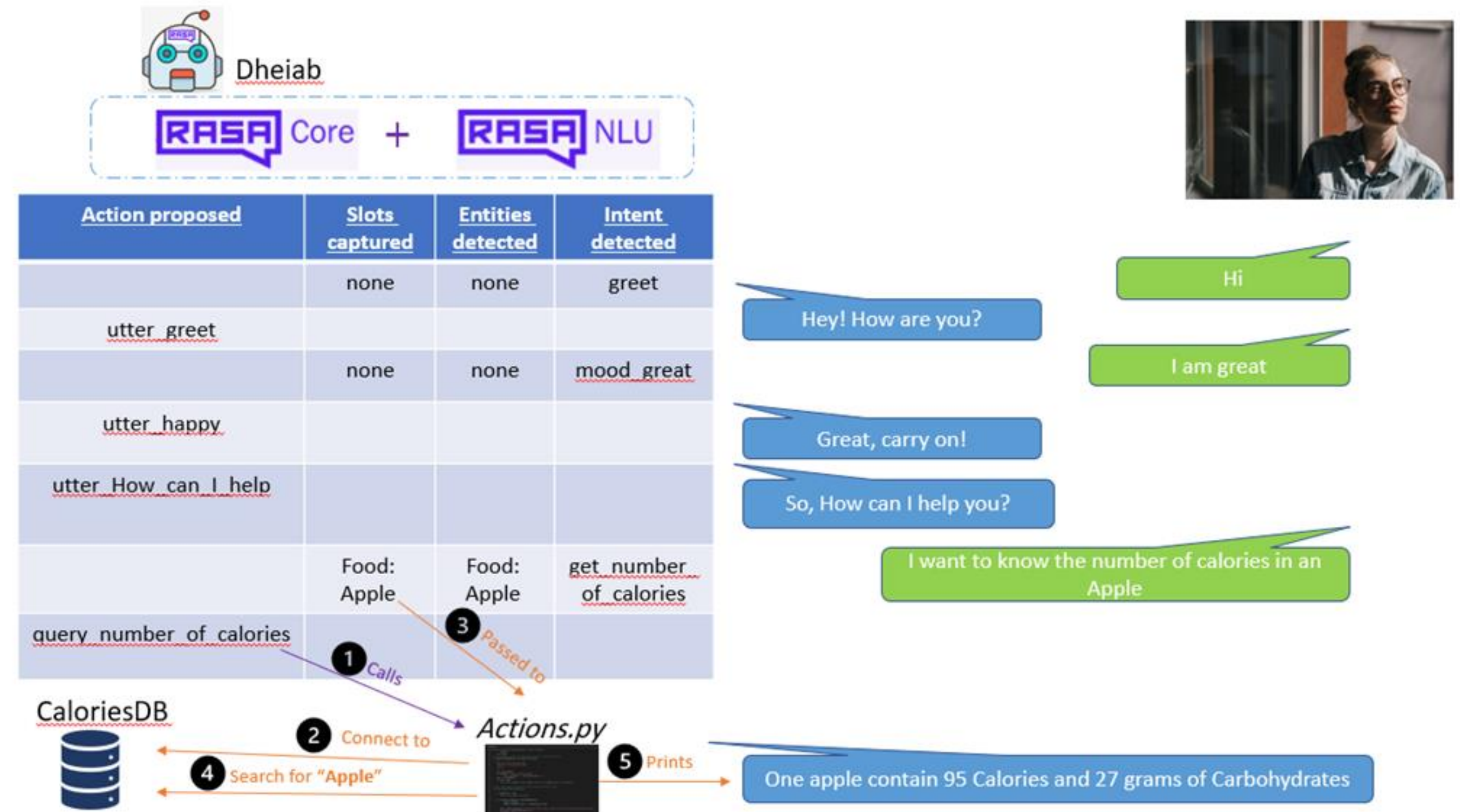
Implementation and Results

Chatbot Story paths:

Story path#1.a

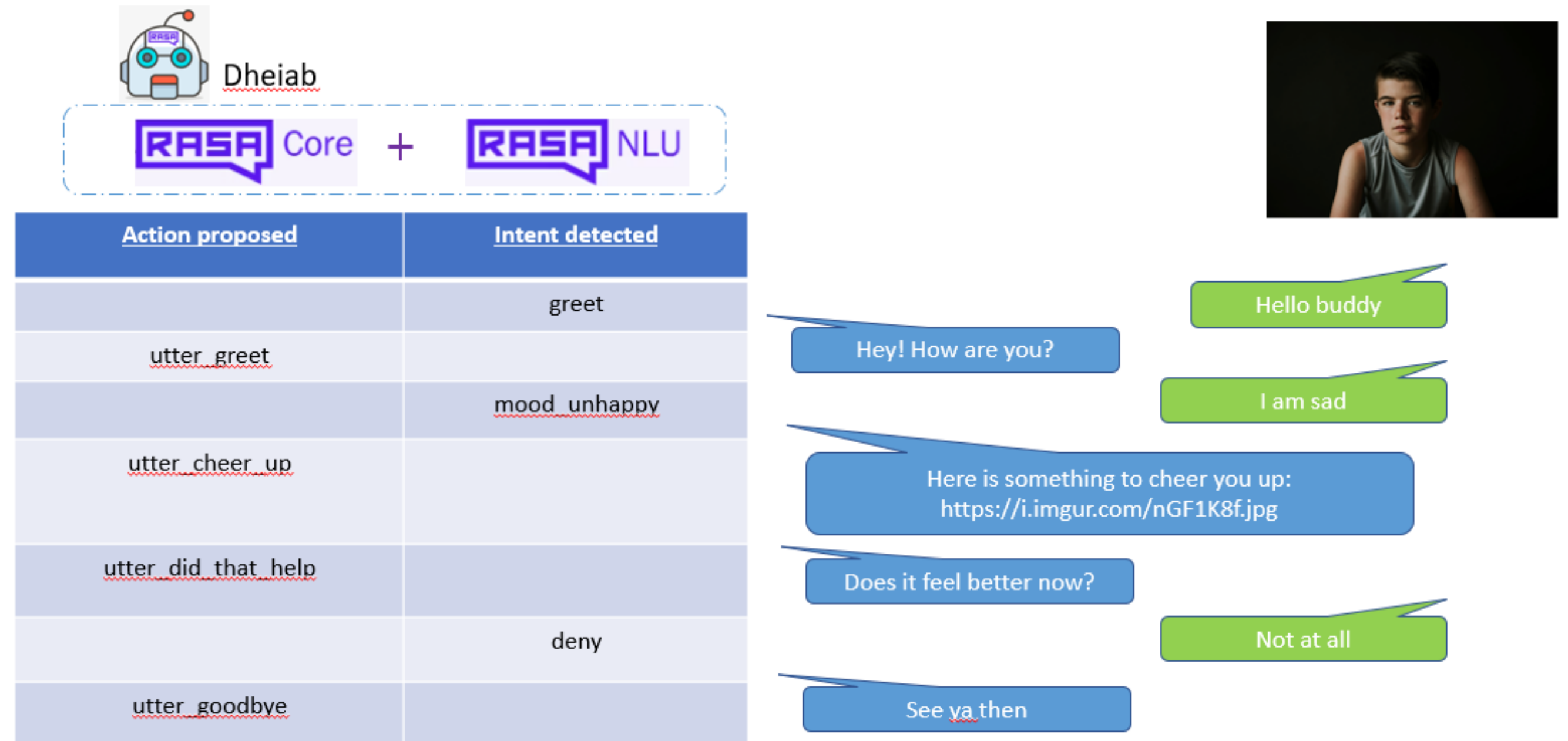# Implementation and Results

Chatbot Story paths:

Story path#1.b

Implementation and Results

Chatbot Story paths:

Story path#3

Implementation and Results

**Results
Trial#1**

Implementation and Results

Results Trial#2

Summary

- **Chatbots can reduce the demand on doctor**s, thus, help diabetic patient self manage their diabetes with no need for extra cash

- Chatbot development frameworks helps us focus on the main essence of the chatbot, which is, its training and how it shall behave. It does reduce complexity of implementation too.

- **Dheiab** (our chatbot) can try cheer up the user if the user was not happy, it does provide motivation if the user seem into it, and it does provide answer for number of calories for small number of fruits.

- **Dheiab is scalable**, in these two aspects:

  1- Can provide answer for even whole foods and dishes, by only updating the CaloriesDB independently

  2- Stories can evolve to consider the user emotions more, but, with proper help of a psychologist help to understand what words to avoid

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Thank you