

# Nemo Life Assistant

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DESIGN AND IMPLEMENTATION

# Functional Overview

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**Health check** consisting of a fall detection service and a heart rate classification service, combined with voice communication functionality and a notification service

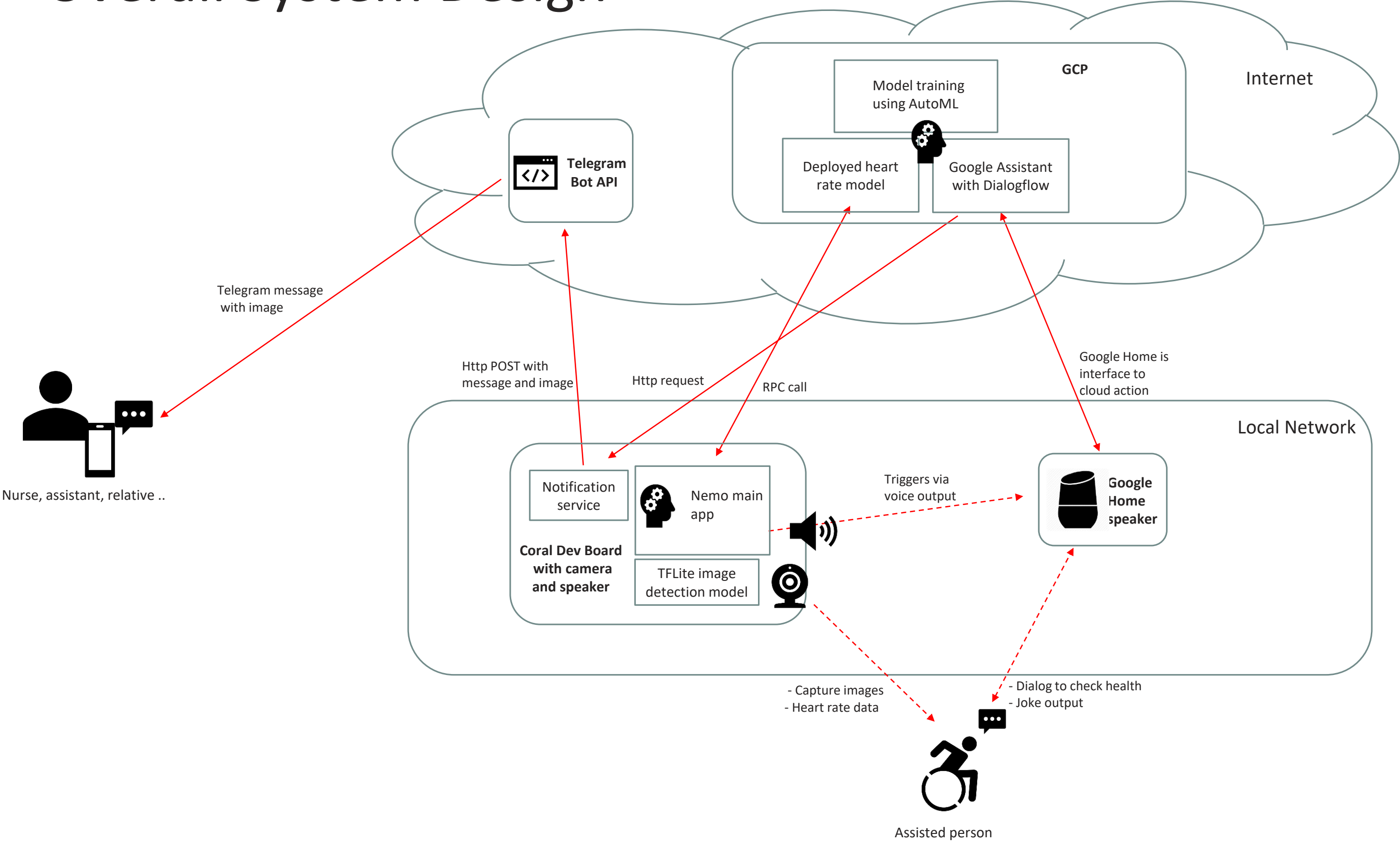
- **Fall detection:** Detect, if the assisted person has fallen out of their wheel chair using a camera and image classification
- **Heart rate classification:** Track the heart rate of the assisted person and check if it is in normal range
- Ask person if she/he is okay via **voice output** and reacting to **voice input**
- **Notify** persons of relevance for help

**Emotion Detection** service reacting to the person's mood

- As an exemplary use case, a joke is told occasionally if the persons emotion is repeatedly classified as negative

Nemo Life Assistant

# Overall System Design



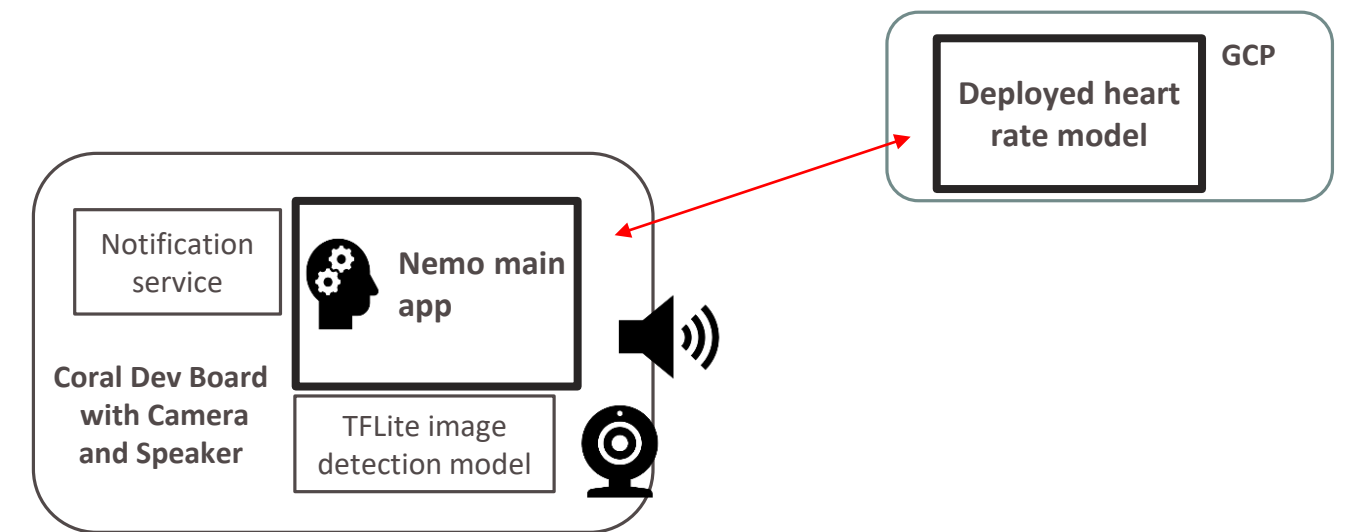
# System Components

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The central system components are:

1. Python Application on Coral Dev Board with an image classification model
2. Google Assistant using Dialogflow and Google Home speaker to communicate with the assisted person
3. Notification service on Coral Dev Board to send an alert to a person of reference via Telegram messenger

# Nemo Life Assistant System Components

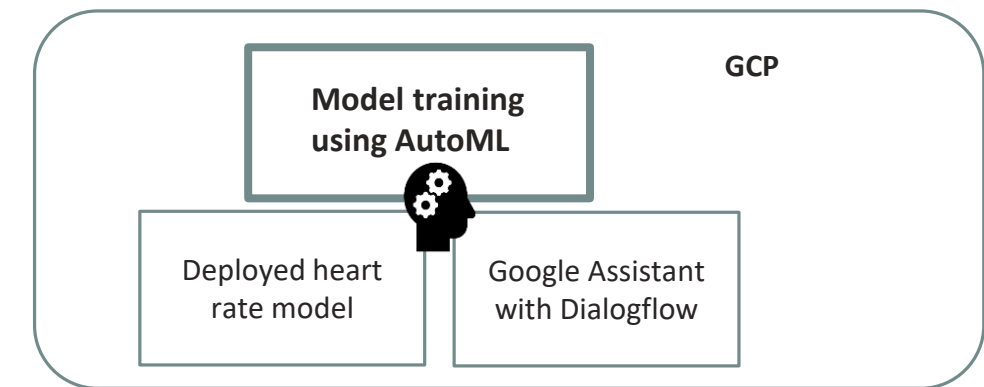


## Python Application on Coral Dev Board (Nemo main app) -> Code on GitHub (nemo\_main.py)

- For demo purposes, a camera connected to the Dev Board is attached to the wheelchair (e.g. on the arm rest) such that it points at the face of the person sitting in the wheelchair
- Camera takes an image every 5 s, locally deployed AutoML vision model is able to detect faces (and emotions) in them
- Due to the camera's position a detected face implies the person is still sitting in the wheelchair
- Additionally, checks heart rate ~ once per minute by calling an AutoML tables model deployed on GCP via RPC
  - Prototype uses sample heart rate data provided in a csv file
- If no face detected or heart rate not in normal range -> sound is played via speaker to trigger Google Home
- If a face is detected, the model predicts the emotion
  - In case of repeatedly detected negative emotions (sad, scared, disgusted, angry) one of various joke audio files is played via the speaker (includes a timer to play a joke only after specified time intervals, e.g. every 30 min.)

# Nemo Life Assistant

## System Components



### Model training using GCP AutoML

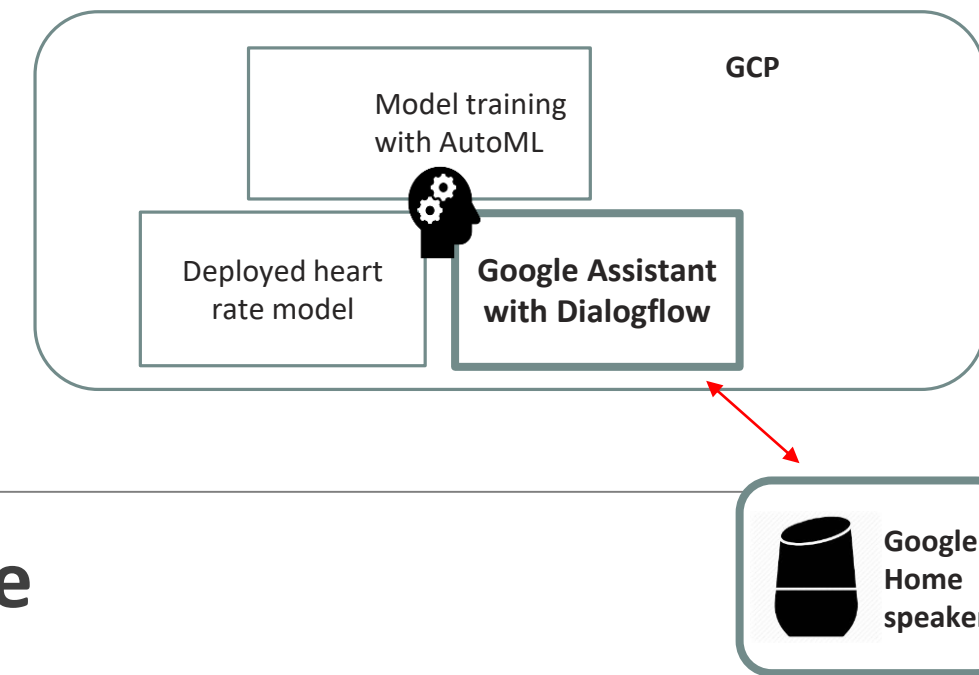
#### 1. Face Detection / Emotion Recognition Model:

- AutoML Object Detection Model trained with ~ 1150 pictures of the seven base emotions happy, sad, angry, surprised, contempt, disgusted, scared
- Detects faces in images and classifies emotions

#### 2. Heart Rate Model

- AutoML Tables Model trained with a dataset of ~ 4300 rows, the features age, gender and heart rate as well as a binary target variable
- Classifies whether heart rate is normal or not

# Nemo Life Assistant System Components

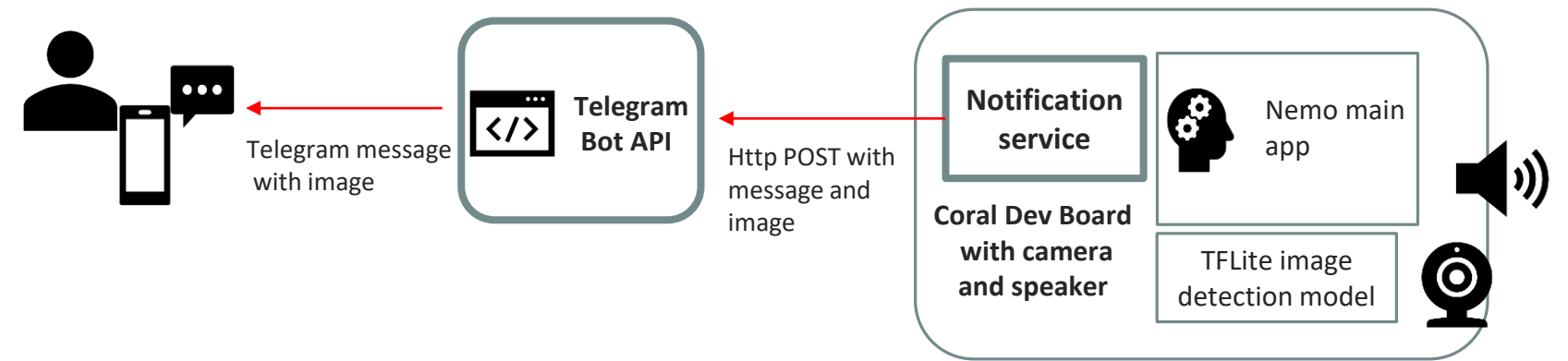


## Google Assistant using Dialogflow and Google Home

-> Dialogflow fulfillment code on GitHub (dialogflow\_fulfillment.js)

- Dialogflow is triggered via the Google Home speaker by an audio output played by the Nemo main app
- Assistant asks assisted person, if she/he is alright
  - Person answers she/he is okay: Dialogflow ends
  - Person answers she/he needs help: HTTP request is send to notification service deployed on the Coral Dev Board to notify a person of reference
  - No answer: Dialogflow repeats asking for three times. If now answer is received, finally the notification service is called

# Nemo Life Assistant System Components



## Notification service

-> code of python web service on GitHub (notification\_service.py)

- Notification web service on Coral Dev Board is called by a HTTP request from the Dialogflow fulfillment
- Service takes the last photo taken and sends a help notification message together with the photo to a specified Telegram chat via a HTTP POST request
- All persons connected to the specified chat receive the message with the photo