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# HOW-R-U?

Suite of e-coaches aimed to analyse human behaviour

Carlos Sánchez Páez  
Oresti Baños Legrán



17th July 2020

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- *E-coaches* suite as chatbots.

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- Doctors can assign questions to patients.

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- *E-coaches* suite as chatbots.
- Doctors can assign questions to patients.
- Data analysis.

# Proposal

- *E-coaches* suite as chatbots.
- Doctors can assign questions to patients.
- Data analysis.
- Psychologist bot.



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- Mental disorders are very common in our society.

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- Mental disorders are very common in our society.
- Doctors have high workloads.

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- Mental disorders are very common in our society.
- Doctors have high workloads.
- Mental diseases are taboo.

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- Mental disorders are very common in our society.
- Doctors have high workloads.
- Mental diseases are taboo.
- No continuous traceability of patient's health status.

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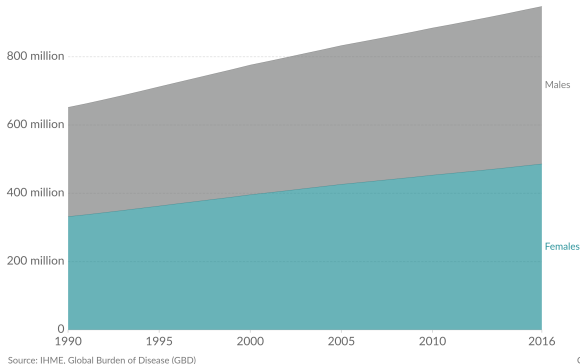
References

References

## Number of people with mental health disorders, World, 1990 to 2016

Number of people with mental or intellectual developmental disability disorders, not including alcohol and drug use disorders. This is differentiated by sex.

Our World  
in Data



**Figure:** Number of people with mental health disorders

Reprinted from (Ritchie & Roser, 2018).

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- Technology is becoming increasingly integrated into our lives.

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- Technology is becoming increasingly integrated into our lives.
- Smartphones are used in a daily basis.



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- Technology is becoming increasingly integrated into our lives.
- Smartphones are used in a daily basis.
- Chatbots are becoming growingly becoming popular.

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- Technology is becoming increasingly integrated into our lives.
- Smartphones are used in a daily basis.
- Chatbots are **becoming** growingly **becoming** popular.
- In Spain there are 2 psychologist per 100.000 citizens (Vicente, 2019).



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- **Main goal:**

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  - Questions will be defined by specialists.

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  - Questions will be defined by specialists.
- **Secondary goals.**

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- **Main goal:**
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  - Questions will be defined by specialists.
- **Secondary goals.**
  - Graphical web interface for doctors.



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  - Flexible and scalable architecture to add functionality to the system.

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  - Graphical web interface for doctors.
  - Flexible and scalable architecture to add functionality to the system.
  - Architecture based on containers to host the different system modules.

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  - Questions will be defined by specialists.
- **Secondary goals.**
  - Graphical web interface for doctors.
  - Flexible and scalable architecture to add functionality to the system.
  - Architecture based on containers to host the different system modules.
  - Implement a system that covers the previous goals.

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- **Main goal:**

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- Questions will be defined by specialists.



- **Secondary goals.**

- Graphical web interface for doctors.
- Flexible and scalable architecture to add functionality to the system.
- Architecture based on containers to host the different system modules.
- Implement a system that covers the previous goals.
- Test a beta version of the system to retrieve target audience's feelings about it.



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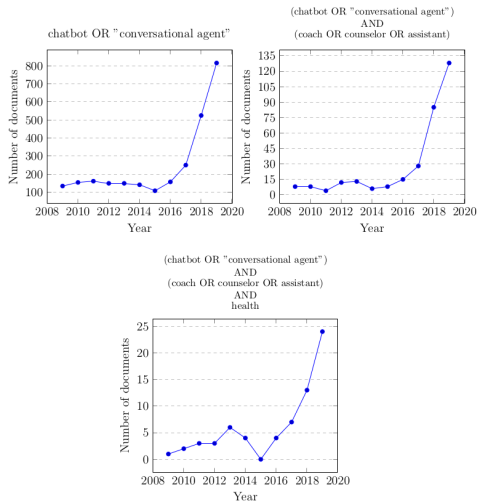


Figure: Search results of different queries performed in *scopus.com*.



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- Areas of application.

# Health application domains



- Areas of application.
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- Coaches: help users to get what they want.

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- Coaches: help users to get what they want.
- Counselors: help users to identify and solve problems.

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- Voice

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- Text
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Platform	Daily active users (billions)	Free API for chatbots
( <i>Facebook Messenger</i> , 2008)	1.66	✓
( <i>Whatsapp</i> , 2009)	1.5	✗
( <i>WeChat</i> , 2011)	1.083	✓
( <i>Telegram</i> , 2013)	0.2	✓
( <i>Kik</i> , 2010)	0.015	✓
( <i>Discord</i> , 2015)	0.014	✓
( <i>Slack</i> , 2013)	0.012	✓
( <i>Viber</i> , 2010)	0.008	✓
( <i>Line</i> , 2012)	0.00723	✓

Table: Comparison between different chat applications (2019).

# Technology

- Facebook likes can be helpful to predict people's sensitive properties (Kosinski, Stillwell, & Graepel, 2013).

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- Facebook likes can be helpful to predict people's sensitive properties (Kosinski et al., 2013).
- Whatsapp's end-to-end encryption methods are not secure enough (Rastogi & Hendler, 2017).



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- *Must have* requirements.

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- *Must have* requirements.
  - Ask questions to the patients.



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- *Must have* requirements.
  - Ask questions to the patients.
  - Custom keyboard.

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  - Modularity.
- *Should have* requirements.
  - CC BY-NC-SA 4.0 (*Creative Commons*, 2001) license.

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  - File with patients' answers.
  - Modularity.
- *Should have* requirements.
  - CC BY-NC-SA 4.0 (*Creative Commons*, 2001) license.
  - Questions and answers should be modifiable.

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  - User's enrollment and deletion.
  - File with patients' answers.
  - Modularity.
- *Should have* requirements.
  - CC BY-NC-SA 4.0 (*Creative Commons*, 2001) license.
  - Questions and answers should be modifiable.
  - Public questions.



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  - Custom keyboard.
  - User's enrollment and deletion.
  - File with patients' answers.
  - Modularity.
- *Should have* requirements.
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  - Questions and answers should be modifiable.
  - Public questions.
  - Configurable schedule.

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  - File with patients' answers.
  - Modularity.
- *Should have* requirements.
  - CC BY-NC-SA 4.0 (*Creative Commons*, 2001) license.
  - Questions and answers should be modifiable.
  - Public questions.
  - Configurable schedule.
  - Interactive charts.

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- *Could have requirements.*

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  - Delete data from users.

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  - View and modify profile data.
  - Assign questions to all patients.
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  - Timezones support.
- *Won't have* requirements.

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  - Timezones support.
- *Won't have* requirements.
  - Cross-platform.

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  - Password change.
  - Two factor authentication.
  - Groups.
  - Delete data from users.
  - View and modify profile data.
  - Assign questions to all patients.
  - Timezones support.
- *Won't have* requirements.
  - Cross-platform.
  - Share the retrieved data with third parties.





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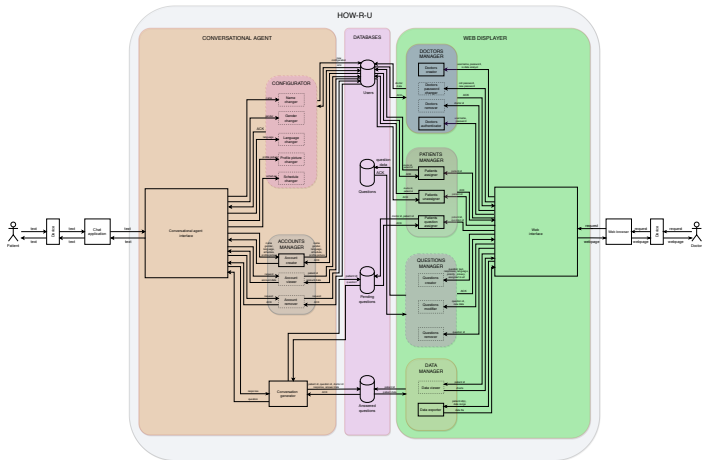


Figure: System architecture. Created using *diagrams.net* (*diagrams.net*, 2020).

# Architecture

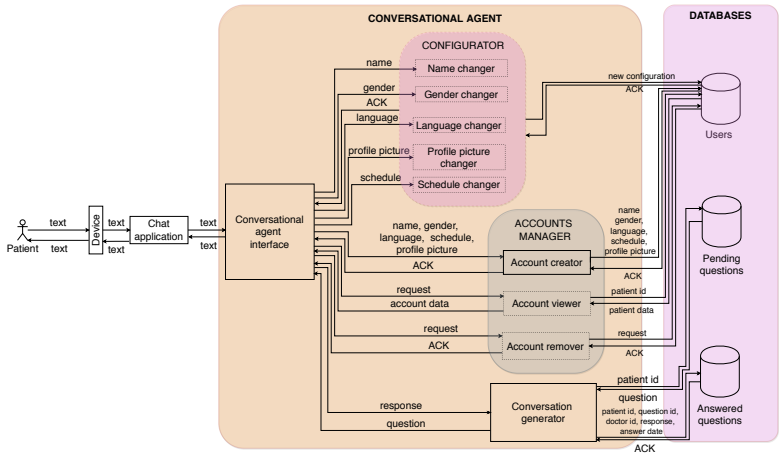


Figure: System architecture (conversational agent and databases).

# Architecture

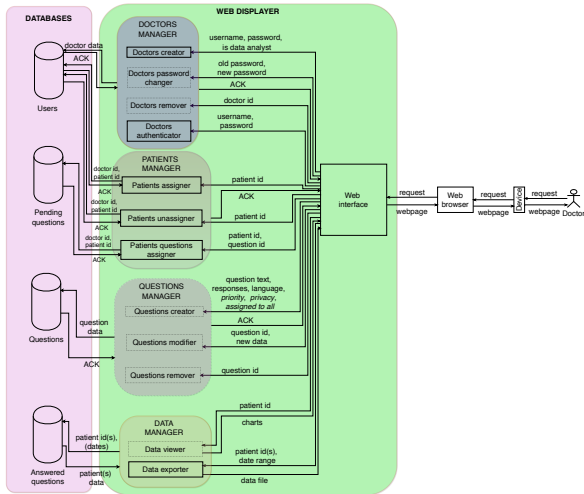


Figure: System architecture (web interface and databases).

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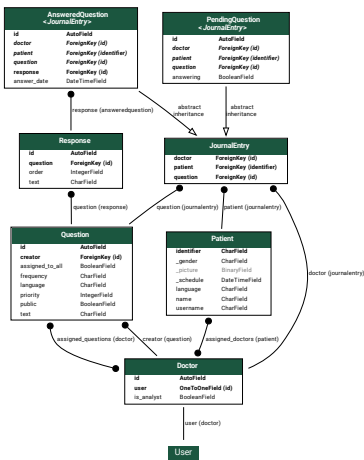


Figure: System class diagram (HOW-R-U classes)

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- Python 3.6.10 (Van Rossum & Drake, 2009)

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- Python 3.6.10 (Van Rossum & Drake, 2009)
- Handlers.



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- Python 3.6.10 (Van Rossum & Drake, 2009)
- Handlers.
  - Start handler

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- Handlers.
  - Start handler
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  - Start handler
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  - Question handler.
- Jobs.

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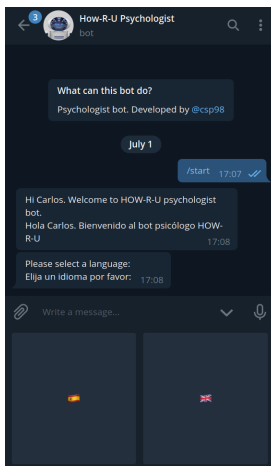


Figure: Agent showing the welcome message and asking for language selection.

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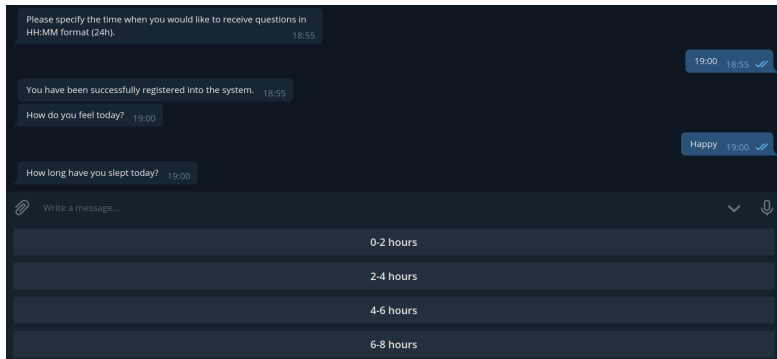


Figure: HOW-R-U conversational agent asking a question to a patient.

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- Django (*Django*, 2020) project.



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- Django (*Django*, 2020) project.
- Applications.

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- Django (*Django*, 2020) project.
- Applications.
  - Homepage.

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- Django (*Django*, 2020) project.
- Applications.
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  - Doctors manager.

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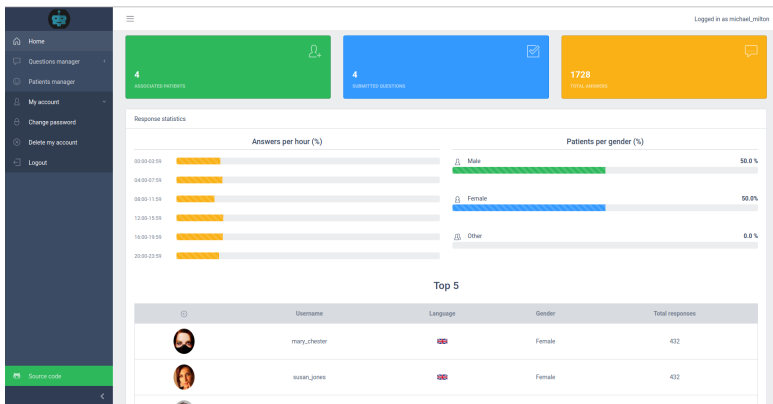


Figure: HOW-R-U homepage.

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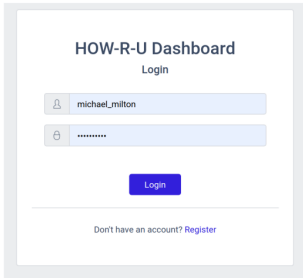
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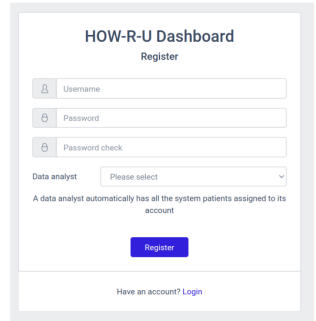
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HOW-R-U Dashboard  
Login

Login

Don't have an account? [Register](#)



HOW-R-U Dashboard  
Register

Data analyst

A data analyst automatically has all the system patients assigned to its account

Register

Have an account? [Login](#)

Figure: Doctors manager.



Question text (empty to get all questions) 🔍 Search

◀ ◻ ▶ ◀ ◻ ▶ ◀ ≡ ▶ ◀ ≡ ▶ ≡ ↺ 🔍 ↻ 39/61

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Logged in as data\_populator

### Modify a question

Question: This is test question number 17

Possible responses:

- response 1
- response 2
- response 3
- response 4

Privacy: Public

Language: English

Frequency: Daily

Priority: 1

Assigned to all: Yes


[Submit](#) [Cancel](#)


HOW4U Dashboard


Forked from [AppSeed](#)


Figure: Questions creator and modifier.


# Implementation (web interface)

 Home

 Questions manager

 Patients manager

 My account











Logged in as richard\_milton

⋮

Search

Export

	Name	Username	Language	Gender	Assigned questions	Last answer	Actions
	Mary	mary_chester		Female	<div>Show (3)</div> <div>How do you feel today? How long have you slept today? Do you feel sad and cry easily?</div>	April 27, 2020, 8:10 p.m.	<div>View data</div> <div>Assign questions</div> <div>Delete patient</div>
	Oliver	oliver_morton		Male	<div>Show (4)</div> <div>How do you feel today? How long have you slept today? Do you feel sad and cry easily? Have you noticed an appetite decrease in the last week?</div>	April 27, 2020, 9:23 p.m.	<div>View data</div> <div>Assign questions</div> <div>Delete patient</div>
	Robert	robert_garfield		Male	<div>Show (4)</div> <div>How do you feel today? How long have you slept today? Do you feel sad and cry easily? Have you noticed an appetite decrease in the last week?</div>	April 27, 2020, 6:10 p.m.	<div>View data</div> <div>Assign questions</div> <div>Delete patient</div>
	Susan	susan_jones		Female	<div>Show (4)</div>	April 27, 2020, 10:04 p.m.	<div>View data</div> <div>Assign questions</div> <div>Delete patient</div>

Source code

+ Add a new patient

Figure: Patients manager.

# Implementation (web interface)

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Logged in as michael\_milton

Assign questions to patient mary\_chester

Question text	Possible responses	Frequency	Priority	Privacy	Creator	Language	Actions
Do you feel sad and cry easily?	Yes No	Daily	1	Public	michael_milton (You)	English	Unassign
Have you noticed an appetite decrease in the last week?	Yes No	Weekly	1	Private	michael_milton (You)	English	Assign
How do you feel today?	Sad Tired Happy Very happy	Daily	1	Public	michael_milton (You)	English	Unassign
How long have you slept today?	0-2 hours 2-4 hours 4-6 hours 6-8 hours More than 8 hours	Daily	1	Public	michael_milton (You)	English	Unassign

Source code

HOWRU Dashboard

Forked from AppSeed

Figure: Patients manager assign questions page.

# Implementation (web interface)

Select patients to export

susan\_jones  
robert\_garfield  
oliver\_morton  
mary\_chester

Start date

04/01/2020

Please enter a valid date

End date

mm/dd/yyyy

June 2020

S	M	T	W	T	F	S
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	1	2	3	4
5	6	7	8	9	10	11

Today

Submit Reset

Figure: Export page

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Patient username	Question	Answer	Date
robert_garfield	How do you feel today?	Tired	2020-04-01 04:12:20
robert_garfield	How do you feel today?	Sad	2020-04-02 05:24:20
robert_garfield	How long have you slept today?	0-2 hours	2020-04-01 12:56:20
robert_garfield	How long have you slept today?	4-6 hours	2020-04-02 11:28:20
robert_garfield	Do you feel sad and cry easily?	Yes	2020-04-01 14:22:21
robert_garfield	Do you feel sad and cry easily?	No	2020-04-02 06:31:21
oliver_morton	How do you feel today?	Very happy	2020-04-01 01:45:19
oliver_morton	How do you feel today?	Happy	2020-04-02 02:59:19
oliver_morton	How long have you slept today?	More than 8 hours	2020-04-01 20:51:20
oliver_morton	How long have you slept today?	2-4 hours	2020-04-01 22:24:20
oliver_morton	Do you feel sad and cry easily?	No	2020-04-01 07:47:20
oliver_morton	Do you feel sad and cry easily?	Yes	2020-04-02 17:26:20
oliver_morton	Have you noticed an appetite decrease in the last week?	Yes	2020-04-01 21:41:20
oliver_morton	Have you noticed an appetite decrease in the last week?	Yes	2020-04-08 21:09:20

**Table:** Example data generated with the *Export* feature.

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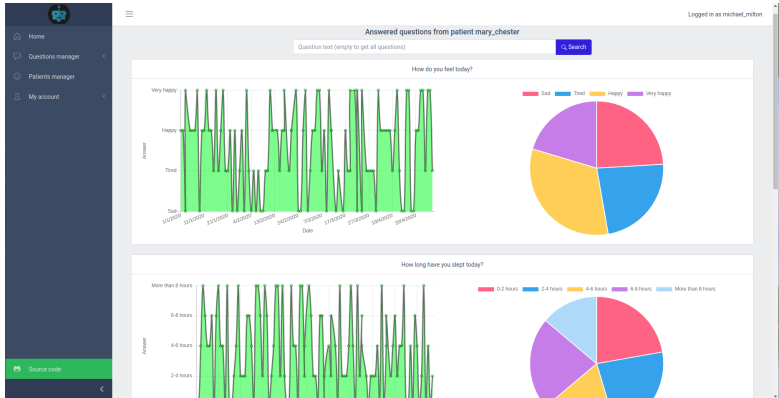


Figure: View data page.

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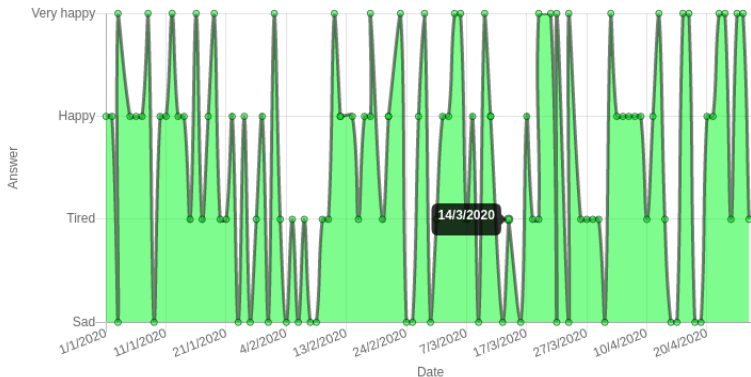


Figure: View data page (line chart).



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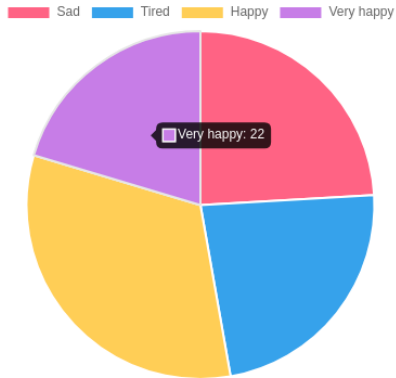


Figure: View data page (pie chart).

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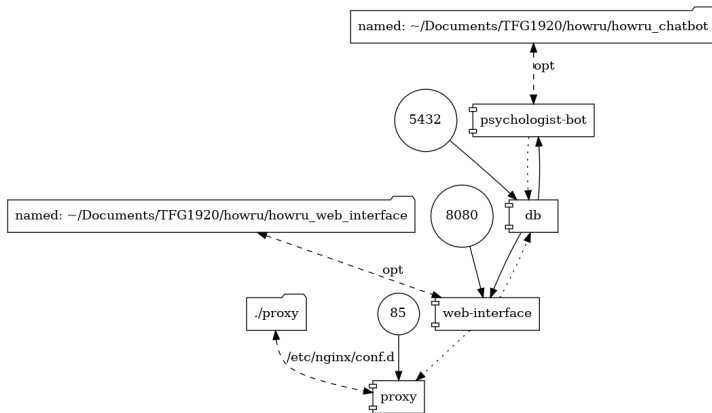


Figure: Docker-compose file schema. Generated by (PSIH, 2016).

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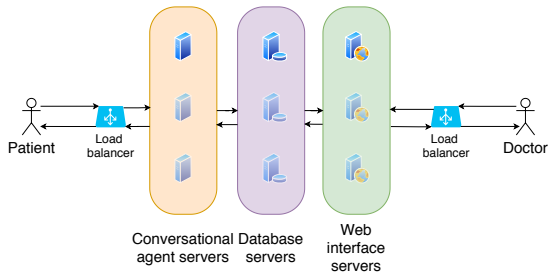
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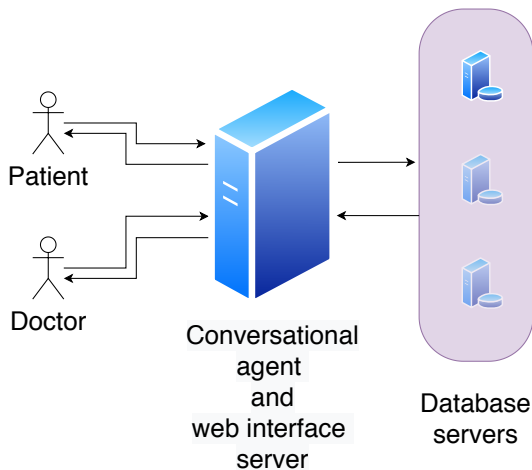
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# Production scalable environment



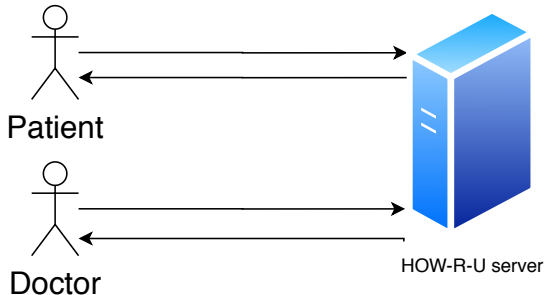
**Figure:** Scalable environment architecture diagram. Created using *diagrams.net* (*diagrams.net*, 2020).

# Production non-scalable environment



**Figure:** Non-scalable environment architecture diagram. Created using *diagrams.net* (*diagrams.net*, 2020).

# Production one-instance environment



**Figure:** One-instance environment architecture diagram. Created using *diagrams.net* (*diagrams.net*, 2020).



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## STRENGTHS

1. Different scenarios.
2. Multiple e-coaches.
3. Intuitive interface.
4. No extra software for patients.

## OPPORTUNITIES

1. COVID-19 data analysis.
2. Telegram ensures privacy.

## WEAKNESSES

1. Telegram is not used by the majority of people.
2. System deployment requires knowledge on computer science.

## THREATS

1. Elderly people may not know how to use Telegram.
2. If patients do not have Telegram installed, they could install a specific app instead of Telegram.
3. Not all patients have smartphones.

**Figure:** HOW-R-U SWOT analysis. Based on <http://www.mostlycolor.ch/2015/07/swot-matrices-in-latex.html>.



- **Main goal:** *Conversational-agent-as-a-sensor* that asks questions defined by specialists to patients.

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## Conclusions

- **Main goal:** *Conversational-agent-as-a-sensor* that asks questions defined by specialists to patients. ✓
- **Secondary goals.**

# Conclusions

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- **Main goal:** *Conversational-agent-as-a-sensor* that asks questions defined by specialists to patients. ✓
- **Secondary goals.**
  - Graphical web interface for doctors.



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# Conclusions

- **Main goal:** *Conversational-agent-as-a-sensor* that asks questions defined by specialists to patients. ✓
- **Secondary goals.**
  - Graphical web interface for doctors. ✓
  - Flexible and scalable architecture to add functionality to the system. ✓
  - Architecture based on containers to host the different system modules. ✓
  - Implement a system that covers the previous goals. ✓
  - Test a beta version of the system to retrieve target audience's feelings about it.



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# The end

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# Time for questions