Module VII.2

Early care and application of smart resources: Intelligent personal assistants

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e-EarlyCare-T

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MEDRI

Early care and application of smart resources

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2. Definitions
    2.1. Most common use cases
3. Typology
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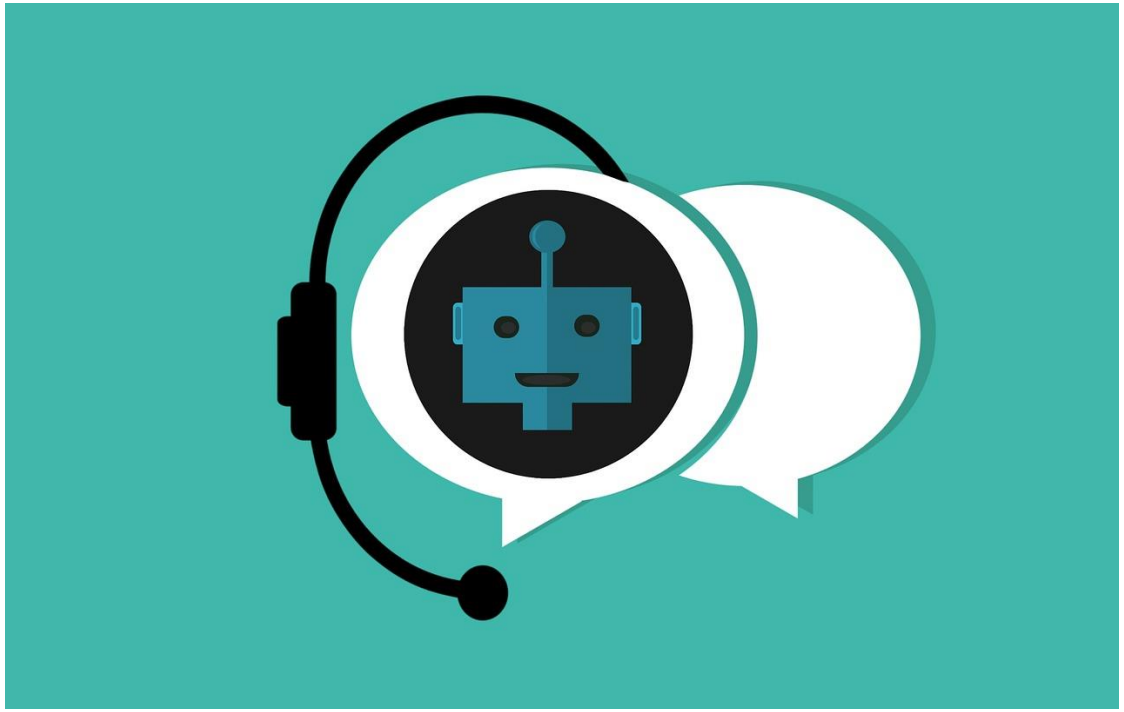
1. *Bots* o asistente personales

Nowadays, the use of **bots** or **Intelligent Personal Assistants** (IPAs) is becoming **widespread** in all areas, providing multiple types of services, such as resolving doubts, searches, recommendation services, agenda management, ticket booking and purchase, etc.



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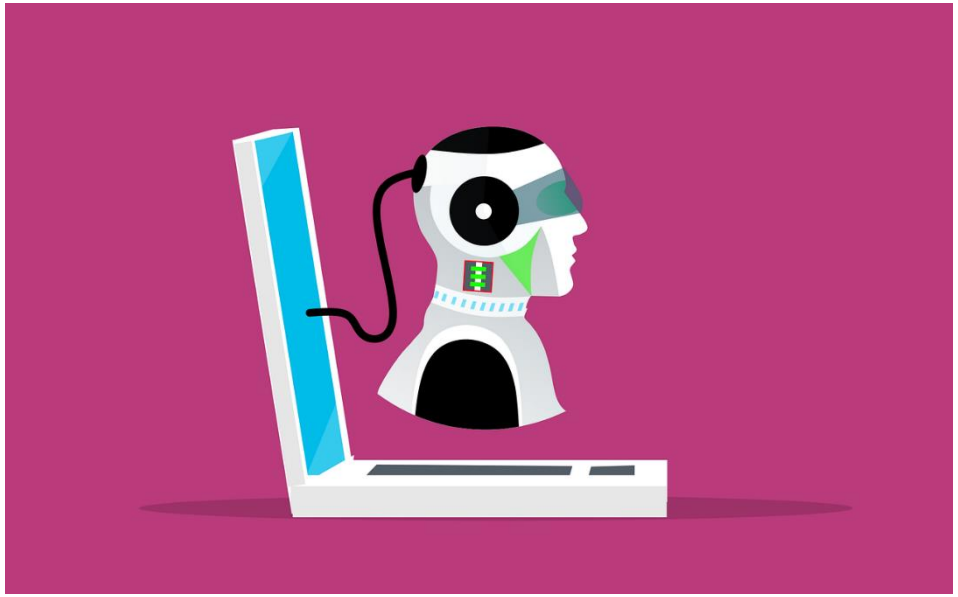
1.1. Foundations and historical precedents

Turing Test: the computer must exhibit "intelligent" behavior, such that it could deceive another human interlocutor in a conversation, impersonating another human being.



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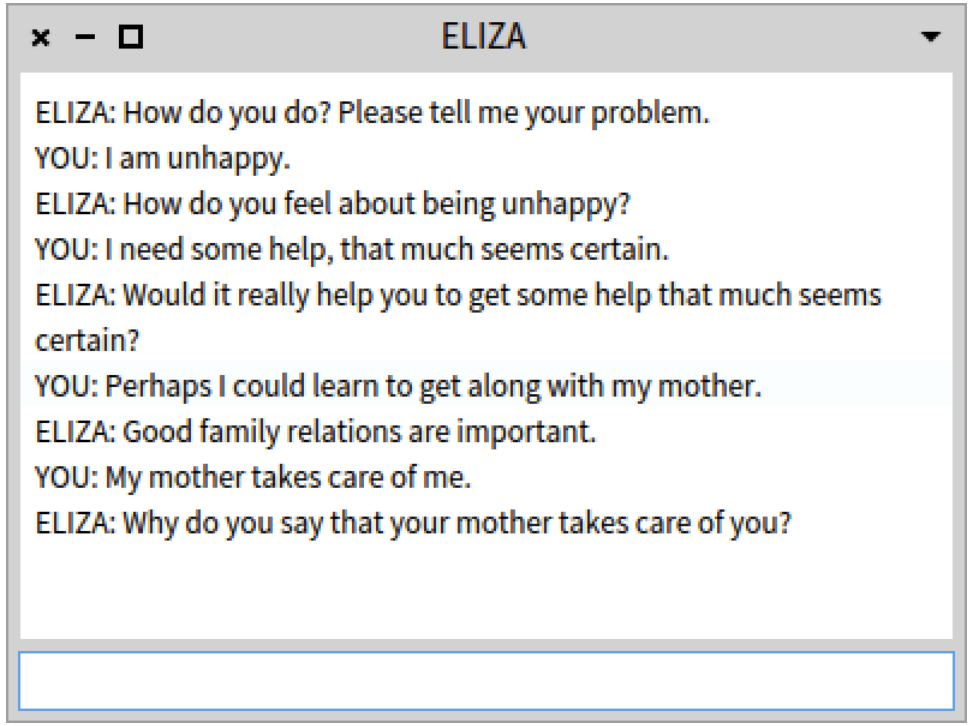
1.1. Foundations and historical precedents

The first conversational program to pass the Turing Test is ELIZA in 1966.

- Bot for **psychotherapy** that deals with patients about their problems, generating **strong emotional reactions**, even though they are aware that they are dealing with a **chatbot.**



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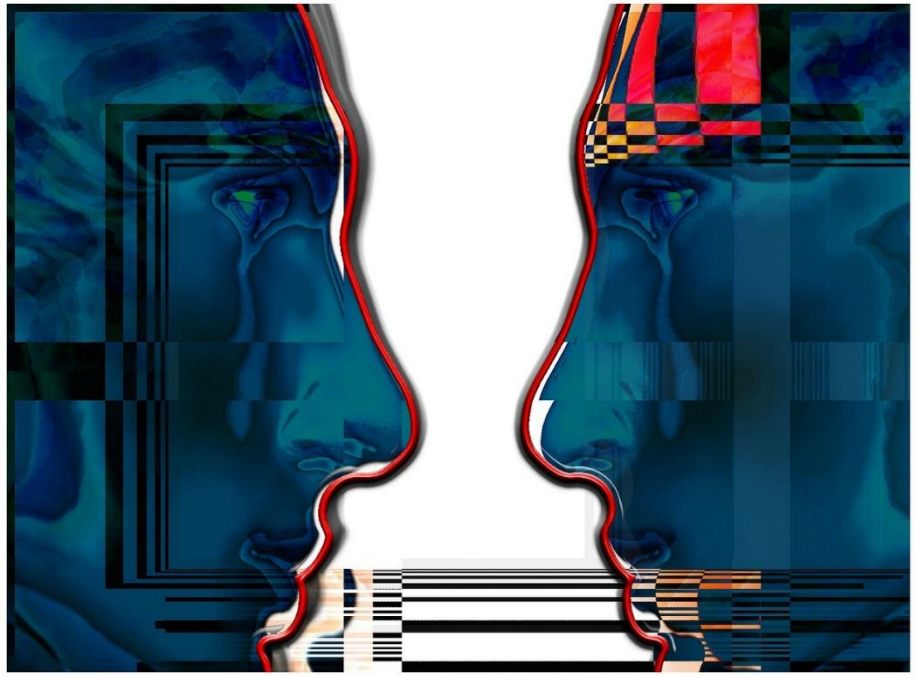
1.1. Foundations and historical precedents

- Other subsequent chatbots:
  - PARRY (1975, simulated paranoid patients with schizophrenia).
  - ALICE (1995)
  - Siri (2010)
  - Google Now (2012)
  - Alexa (2014)
  - Cortana (2014)
  - Mitsuku (2019)
  - Etc.



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2. Definitions

- **Bot** as a **software service** exposed through **a conversational interface.**
- **"Conversation"** as a fundamental element.
- **Example** of conversation in a text-based chatbot
  - User wants to set alarm clock alarm
  - He/she interacts with the chatbot just as he/she would with a person.
  - The chatbot behaves like a person.
  - Ideally it would be indistinguishable from a human agent.

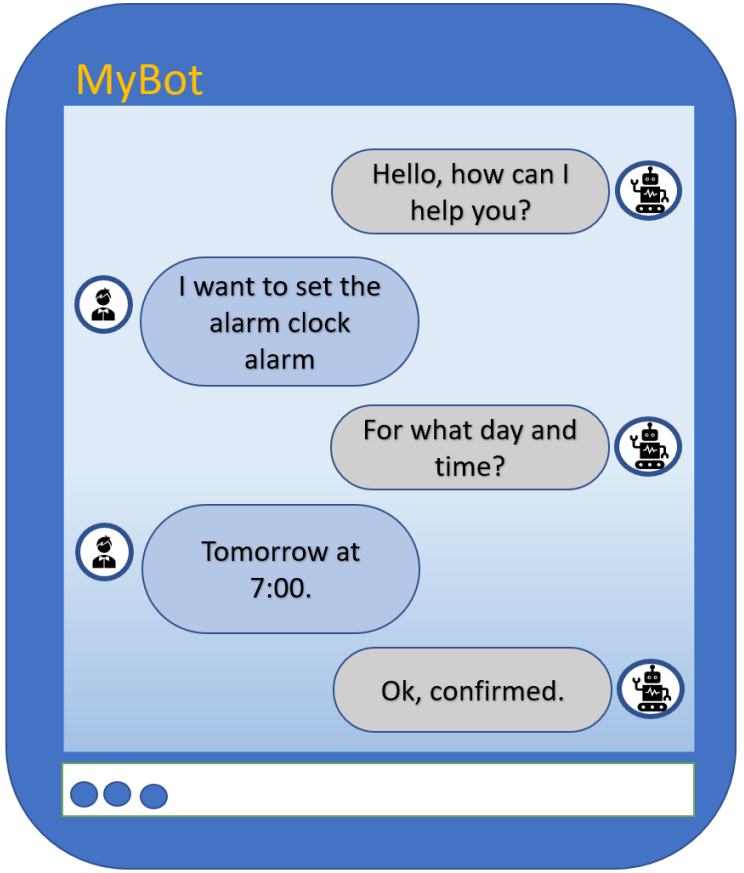

Image: own elaboration

2. Definitions

- Advantages
  - Increased user engagement (loyalty) by facilitating their tasks.
  - Ease of use compared to web interfaces and mobile apps.
- Disadvantages
  - They are not the solution to every type of problem (currently).
  - Fear of some risk of loss of privacy.
  - With voice-based interfaces, there is a certain social embarrassment.

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2.1. Most common use cases

Image: Fuente Pixabay

- **Productivity and coaching:**
  - Reminder of tasks to be performed
  - Management of personal or group tasks to be completed.
  - Help to follow diets
  - Manage expenses
  - Perform sports activities
- **Alerts and notifications:** replacing the use of email and notification apps.
- **Router to humans:** finally redirects to a human interlocutor, but assigning the best person for the resolution, through a guided conversation.
- **Customer services and answers to frequently asked questions:** to support the most common and recurring questions.
- **Third-party integration:** to integrate third-party services into the current product.
- **Games and entertainment:** with the basic objective of entertaining and amusing.

3. Typology

- **By target:**
  - **Personal *bot / private bot***: serves as a personal assistant, in a one-to-one conversation (e.g. setting an appointment in my personal calendar).
  - **Team bot**: assists a group of people to achieve an objective (e.g. setting a meeting date and time for a group).

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3. Typology

- **By scope:**
  - **Domain-specific:** exposes a single service (product, brand or target).
  - ***Super bot*:** exposes multiple services at the same time.

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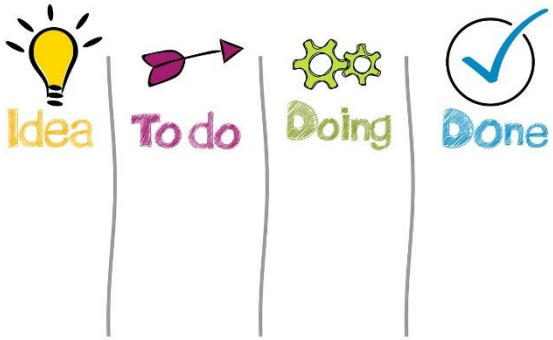
3. Typology

- **By aim:**
  - **Business:** facilitate a business task or process. The objective is to solve something concrete. Task and workflow oriented.
  - **Consumer:** entertain while facilitating a commercial interaction. Aimed at a better and entertaining user experience with a fluid conversation.



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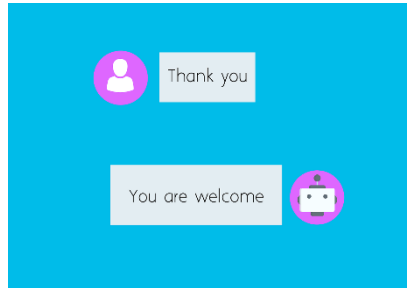
3. Typology

- **By access:**
  - **Text:** the conversation is based on text entered by keyboard and display of the response on the screen. They are often referred to as chatbots.
  - **Voice:** the conversation is based on the use of audio to ask a question and return the answer without the need to physically interact with the devices.
  - **Multimodal:** combine both elements discretely - text or voice - and may additionally require touch interaction on screens or the combined use of other devices or artifacts.



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3. Typology

- **By integration:**
  - **Legacy systems**: service existing software systems by offering new ways of interacting with **pre-existing** services.
  - **New *bots*:** interfaces to new services or products created from scratch.

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3.1. Criteria in the evaluation and selection of platforms

- Target audience.
- Business vs. consumer.
- Form of interaction (text vs. voice vs. multimodal).
- Devices required to interact.
- Associated costs of software hosting and hardware purchase.

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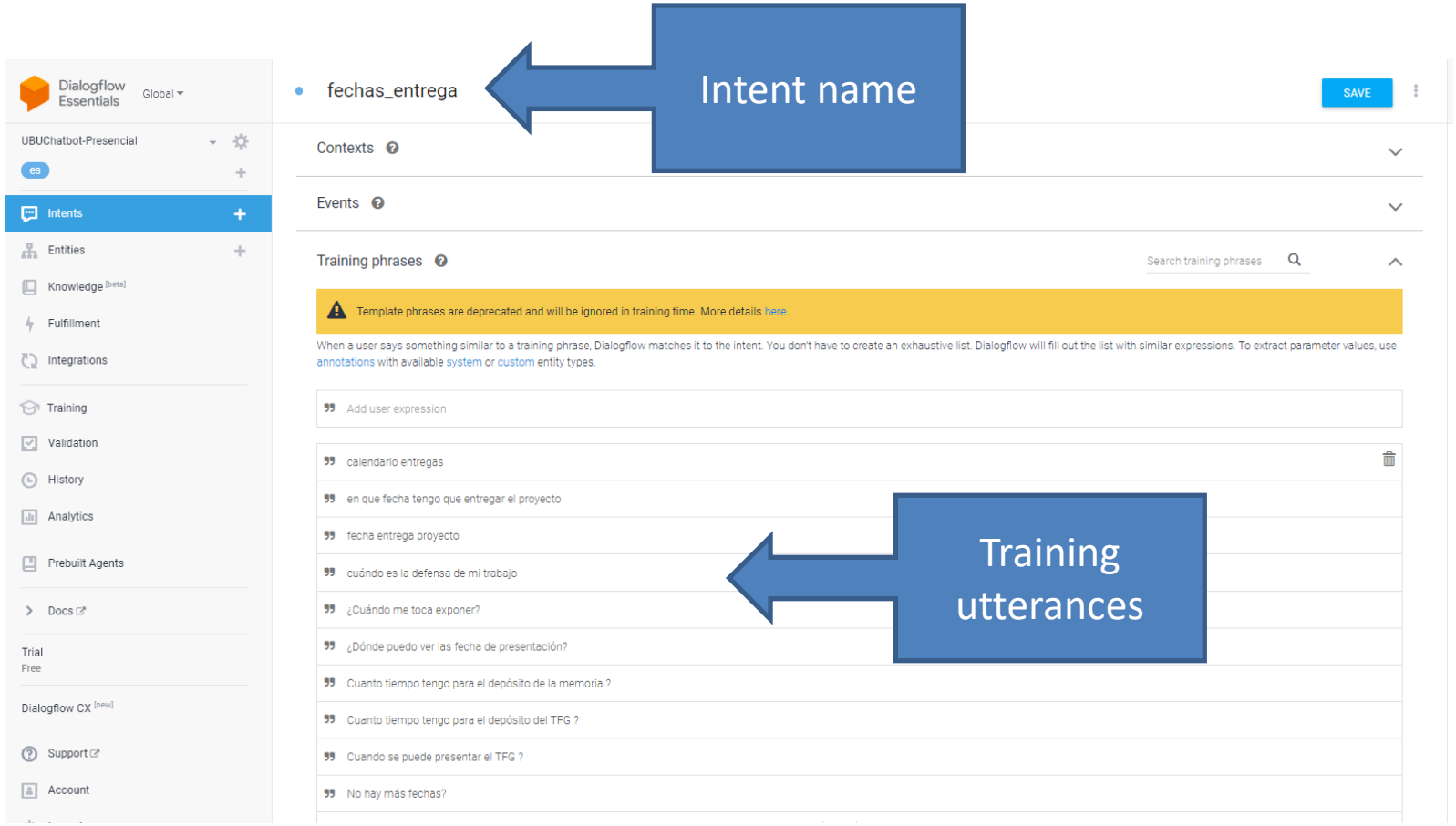
4. Generic aspects

- ## Vocabulary

Element	Definition	Use
Intent	Objective (or intention) that a customer has when asking a question.	Intents are defined as an agglutinator of the different actions. When a question is asked, the **NLU** system searches for the closest intent.
Utterance	Literal phrase entered by the user.	A set of alternative sentences that are equivalent to resolve an intent are defined. The **NLU** system interprets and resolves the intent match.
Entity	Type of data that can be extracted from the user's message or utterance.	They are used as variables that can be defined and take different values, in order to perform customized actions based on those values.
Context	Similar to a context in a real conversation, defining variables that determine the evolution or path of the conversation.	They are used to define and establish more advanced conversations, where there may be different paths in the conversation.
Fallback	Default intent when the input has not been recognized.	In the event that the chatbot is unable to recognize the user's input, a typical response action should be set. Ideally the number of times a fallback is executed will be reduced as the chatbot is trained and improved.
Event	They trigger the execution of an intent automatically without requiring user input.	It allows the automation of actions, such as launching an initial question when the user enters the website containing the chatbot.

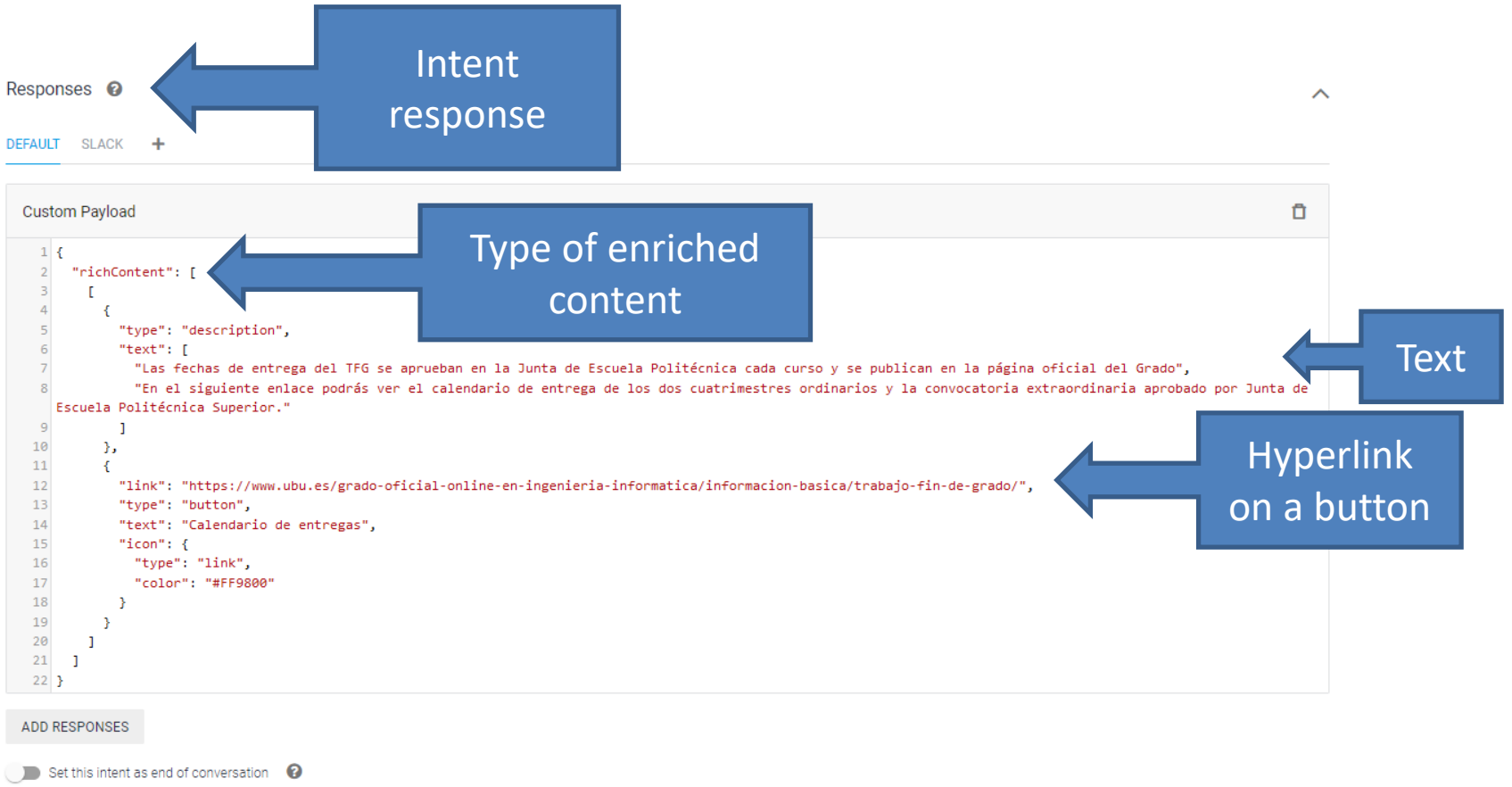
4. Generic aspects

- **Example:** definition of questions (training utterances) for an intent in DialogFlow



4. Generic aspects

- **Example:** definition of responses for an intent in DialogFlow

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          "En el siguiente enlace podrás ver el calendario de entrega de los dos cuatrimestres ordinarios y la convocatoria extraordinaria aprobado por Junta de Escuela Politécnica Superior."
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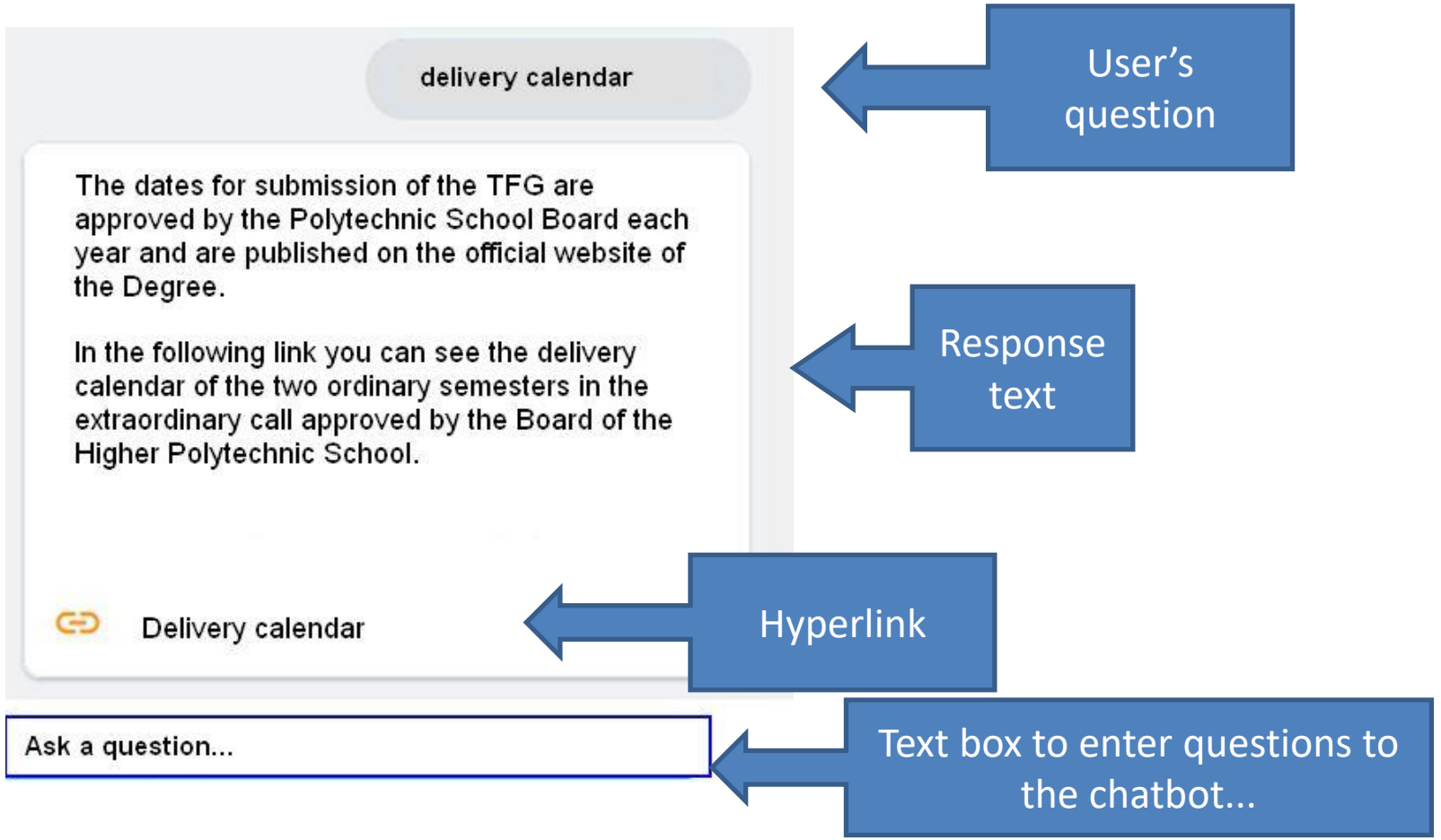
      }
    ]
  ]
}
```

4. Generic aspects

- **Example:** *rich* response result for an intent in DialogFlow



4. Generic aspects

- **Interaction styles:**
  - The chatbot should have a recognizable "personality" tone.
  - Consistent over time.

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4. Generic aspects

- **Artificial Intelligence**
  - Natural Language Processing (**NLP**).
  - Natural Language Understanding (**NLU**).
  - Text-to-speech conversión (**TTS**) and speech-to-text (**STT**).
  - Prediction models.
  - Image recognition.
  - Conversation management.
  - Sentiment analysis.

Image: Fuente Pixabay

4. Generic aspects

- **Conversation management**
  - Onboarding or first contact.
  - Functional scripting.
  - Feedback and error handling.
  - Help and support.

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4. Generic aspects

- **Enriched interactions**
  - Multimedia elements in the response:
    - Files.
    - Images.
    - Audio.
    - Video.
    - Buttons.
    - Hyperlinks.
    - Etc.

Image: Fuente Pixabay

4. Generic aspects

- **Context and memory**
  - Recalling previous elements of the conversation.
- **Discovery and installation**
  - How is it found? How is the bot installed?
- **Engagement methods**
  - Getting the user used to (hooked on) the bot.
- **Monetization**
  - Obtain economic benefits from its use.

4.1. *Onboarding*

- First contact.
- Heuristics in the design:
  - State the purpose.
  - Show how to use it.
  - Allow configuration.
  - Establish a tone or personality.
  - Make the bot's entry into the conversation explicit.

Image: Fuente Pixabay

4.2. Functional scripting

- By **task:**
  - Command-and-control systems
  - Modeling the states and transitions of a conversation.
  - Recommendations:
    - In the response give the possible set of responses.
    - Error handling if the flow diverges (drifts away).
    - Map intents and control of the conversation.
    - Allow "shorthand" (brief) questions and answers.
    - Group common conversations into "stories" or "flows".
    - Create conversation "funnels" that lead to success.

Image: Fuente Pixabay

4.2. Functional scripting

- By **topic:**
  - Less directed flow.
  - **More circular** in nature.
  - Conversations and discussions without a clear objective.
    - Similar to chats or get-togethers between people.
  - With an objective to **engage** or build **engagement**, entertaining.
  - More complex to define.

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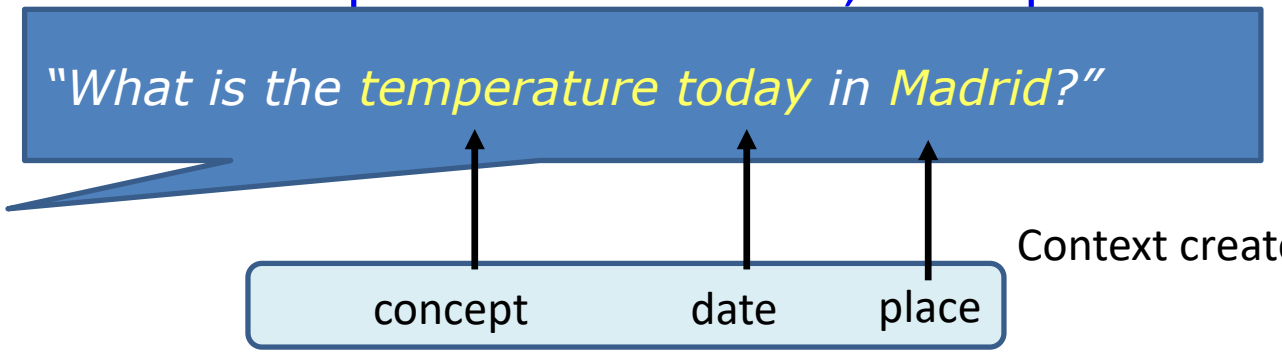
4.3. Entity extraction

- Recall **concepts** and **values** in previous sentences, to help answer.
- Ej: First question



Context created with extracted entities...

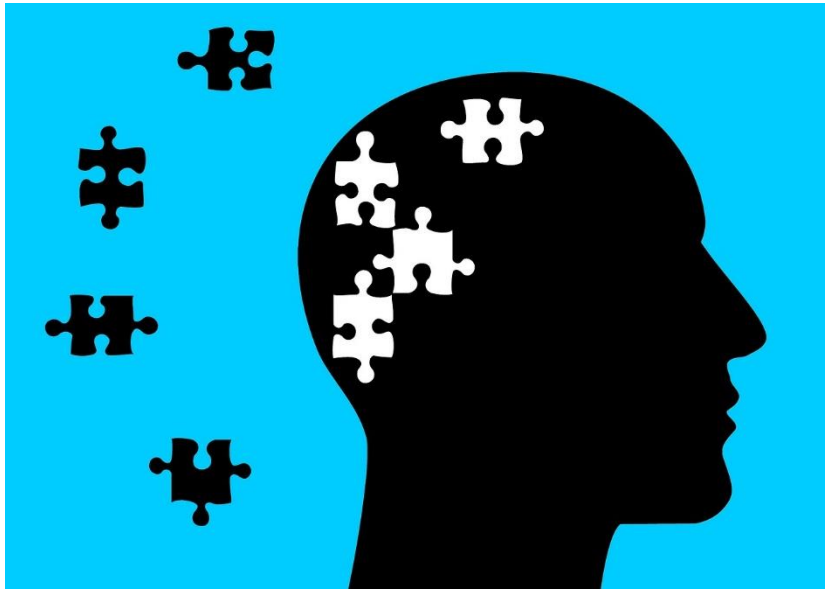
Next question

"And the forecast for the next few days?"

Previously created context:
concept? → temperature
date? → from today…
place? → at Madrid…

4.4. Context and memory

- *Bots* limited to the **question/answer** paradigm.
  - **No memory** of previous conversation.
  - Need to "remember".
- **Context**
  - It resolves **ambiguities**.
  - From previously extracted **entities**.
  - Global variables to all conversations or local to the current conversation.
- **Memory**
  - Recall conversations from the **very distant past.**
  - Under development and research.



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4.5. Error handling

- “Unsuccessful" conversations: what to do?

- **Possible actions:**
  - Redirect the conversation by giving as possible answers those that lead back to the "happy path".
  - Intervene a human being to solve the problem.
  - Restart the conversation (not recommended).
  - Redirect to another "better prepared" bot.

- Additionally: correct the intents by improving the set of training utterances and responses.

Image: Fuente Pixabay

5. Voice assistants

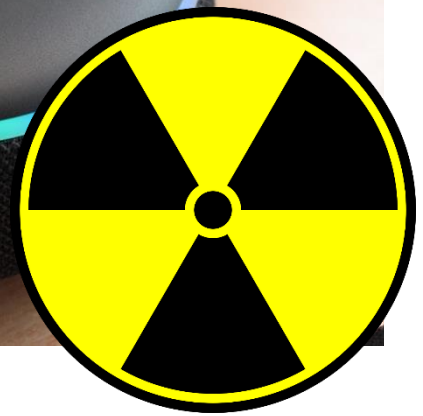
- Breakthroughs in **TTS** and **STT** make bots "listen" and "talk".
- Differentiate the assistant (software) from "smart speakers" (hardware).
  - Examples of speakers: Amazon Echo, Google Home or Harman Kardon Invoke.
- **Advantages:**
  - **Faster question** issuance.
  - **"Hands-free"** leaving the user free to perform other actions while using the bot (and in a safer way).
  - **Intuitivos**: interaction with speech is very natural.
  - **Empathy:** the inclusion of tone, volume, intonation and speed of speech add information that helps to better interpret the answer and avoid misunderstandings.

Image: Fuente unsplash.com

5. Voice assistants

- **Disadvantages:**
  - **Use in public spaces**: speaking or raising your voice in public spaces can give a strange feeling to the other people around you. The problem is exacerbated if several people do this at the same time.
  - **Feeling uncomfortable** talking to a computer.
  - Ingrained **habit** of **typing** to interact with devices.
  - **Privacy**: if you want to discuss sensitive issues (e.g. health) or listen in on private matters (e.g. reading messaging), you don't want anyone else to hear your conversation.

Imagen: Fuente unsplash.com



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5. Voice assistants : Error handling

- **Additional problems with these assistants:**
  - **Absence of speech** ((i.e. the user does not ask a question for a certain amount of time). The conversation may be terminated or asked again.
  - **Problems in recognition.**
    - The question can be asked again.
  - **Problems in handling intentions** (i.e. the sentence is recognised, but there is no appropriate programmed response or the wrong response is given).

Image: Fuente unsplash.com

Image: Fuente Pixabay

5. Voice assistants : Error handling

- **Other problems::**
  - Need for a **wake word.**
    - We don't want the bot to be "listening" all the time.
  - **Answers should be short:**
    - Cognitive-heavy responses will not be handled well by users.
    - This is best solved with screens (images and text to be read).

Image: Fuente unsplash.com

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6. Solutions for personal assistants

- "The Big Four" in voice-assisted assistants (...and text and images):

  - Amazon Alexa

Image: Fuente Pixabay

  - Google Assistant

Image: Fuente Pixabay

  - Apple Siri

Image: Fuente Pixabay

  - Microsoft Cortana

Image: Fuente Pixabay

6. Solutions for personal assistants

Assistant	Company	Starting date	Referring device	Wake word
Alexa	Amazon	November 2014	Echo	“Alexa”
Siri	Apple	October 2011	iPhone	“Siri”
Assistant	Google	May 2016	Nest	“Ok Google” “Hey Google”
Cortana	Microsoft	January 2015	PC Windows 10	“Hey Cortana”

6. Solutions for personal assistants

- Development platforms for text chatbots (and additionally image and voice)

Product	Description	Features
Amazon Lex	Amazon product for the development of chatbots.	It uses the same **NLU** engine as Alexa, but incurs costs after the second year of implementation, due to the use of Amazon's platform.
Chatcompose	Chatbots platform for marketing and support.	Offers a live chat option, allowing the inclusion of human agents in the conversion. Limited number of chatbots in the free version.
Chatfuel	Integration of chatbots.	Only Facebook Messenger and Instagram integration is available.
DialogFlow	Google product for the development of chatbots.	Simplicity in its use and free of charge. Unlimited chatbots and with an intuitive graphical interface for creation.
Microsoft Bot Framework	Also known as Azure Bot Service. Microsoft solution for the creation and integration of chatbots.	Offers integration into the Microsoft ecosystem with Office and Teams. With certain limitations in the free version.
Rasa	Open source framework for machine learning and chatbots creation.	Developed in Python, with a high learning curve, without cloud hosting and in its free version without graphical interface.
Watson Assistant	IBM product for the development of chatbots.	Focus on more complex developments, with more complex conversational models.

7. Practical applications in health

- **State of the art study (Car et al., 2020)**
- **Objective of the use of bots applied to health:**
  - Improved accessibility.
  - Personalisation.
  - Efficiency in care.
- **Historical precedents:**
  - Use of SMSs (Hall et al., 2015; Rathbone & Prescott, 2017)
- **The emergence of smart phones changes everything... also for therapeutic intervention.**

Image: Fuente unsplash.com

7. Practical applications in health

- **Coaching applications using bots**
  - "Virtual coaches"

- **Main lines:**
  - Treatment and monitoring.
  - Support to health services.
  - Patient education.

- **Generally with topic-oriented bots.**
  - Directly on the patient (not the therapist).

Image: Fuente pixabay

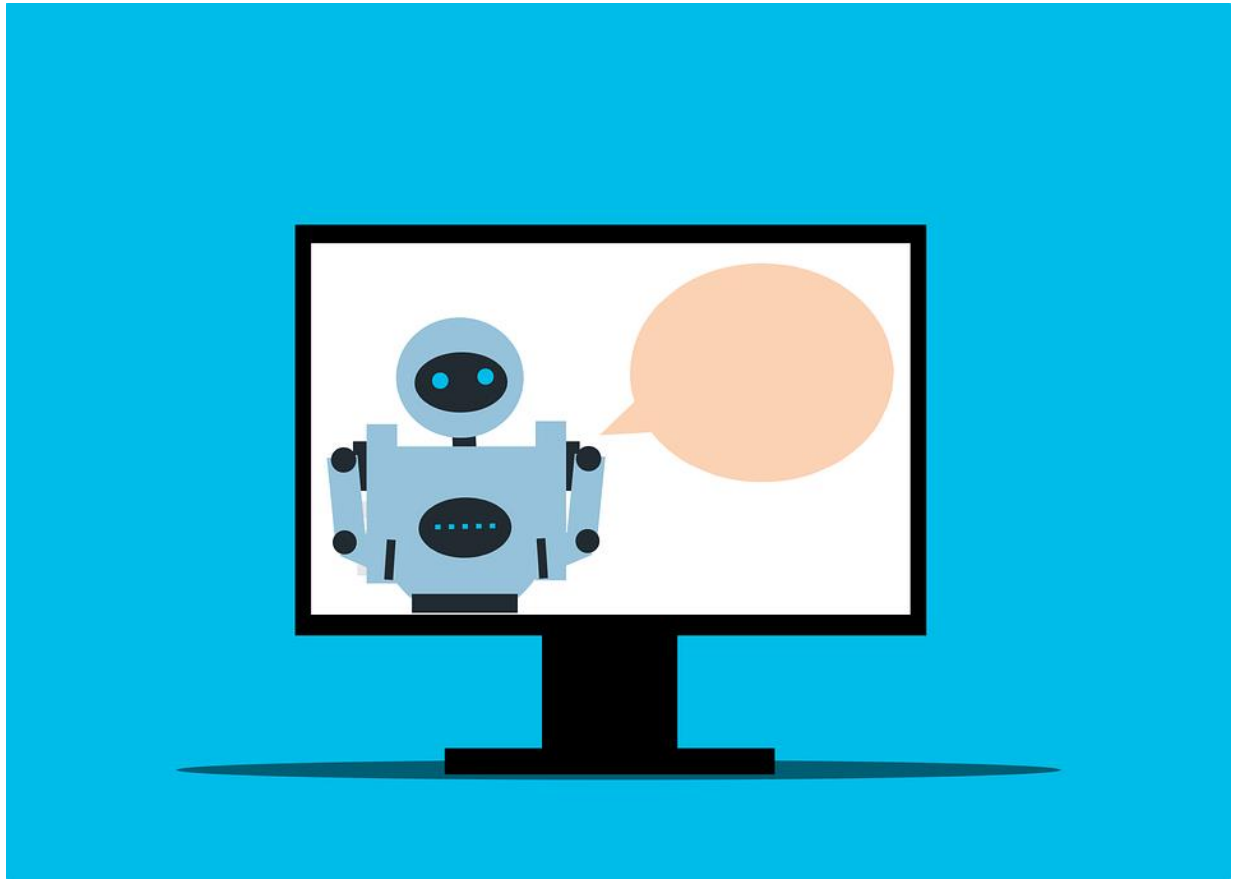
7. Practical applications in health

- **Particular fields where bots are applied:**
  - Mental health (Abd-Alrazaq et al., 2020; Bérubé et al., 2021; Piette et al., 2013).
  - Neurodegeneration (Li et al., 2020; Rahman et al., 2021).
  - Obesity and diabetes (Steinberg et al., 2014)
  - Sexual health (Bauermeister et al., 2017).

Image: Fuente pixabay

7. Practical health applications

- **Other fields where bots are applied:**
  - Primary care (Lee et al., 2021; Fan et al., 2021; Schario et al., 2022).
  - Cardiology (Nahar & Lopez-Jimenez, 2022).
  - Coaching for adolescents (Gabrielli et al., 2020).
  - Dermatology.
  - Disability (Masina et al., 2020).
  - Nursing (education) (Shorey et al., 2019).
  - Cardiovascular diseases (Kowalska et al., 2020).
  - Kidney diseases (Fink et al., 2016).
  - Pulmonary diseases(Gross et al., 2020; Kim et al., 2021).
  - Geriatric (Gudala et al., 2022; Bennion et al., 2020)
  - Stress management (Mauriello et al., 2021).
  - Obstetrics (Chung et al., 2021).
  - Oncology (Bibault et al., 2019; Greer at al., 2019; Chaix et al., 2019; Greer et al., 2019; Hong et al., 2021).
  - Orthopaedics (Bian et al., 2020).
  - Paediatrics (Wong et al., 2021; Espinoza et al., 2020).
  - Vaccination (Ferrand et al., 2020; Wijesundara et al., 2020).



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7. Practical health applications

- **Use in early Education**
  - Precedents using ***PopBots*** (Crompton et al., 2018; Williams et al., 2019).
  - **Patient-oriented** and using **robotics/sensors** and web. NO conversational agents.

- **Open line on the use of bots in early intervention**
  - More **therapist-oriented**.
    - Conversations that guide or assist in such therapy.

Image: Fuente pixabay

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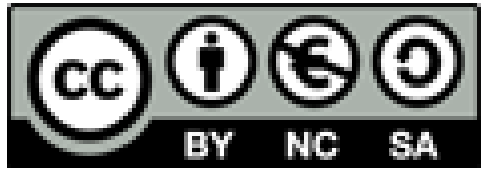

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