Fundamentals of Building a Retrieval Based Chatbot

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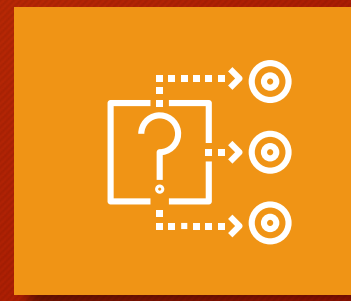
Agenda

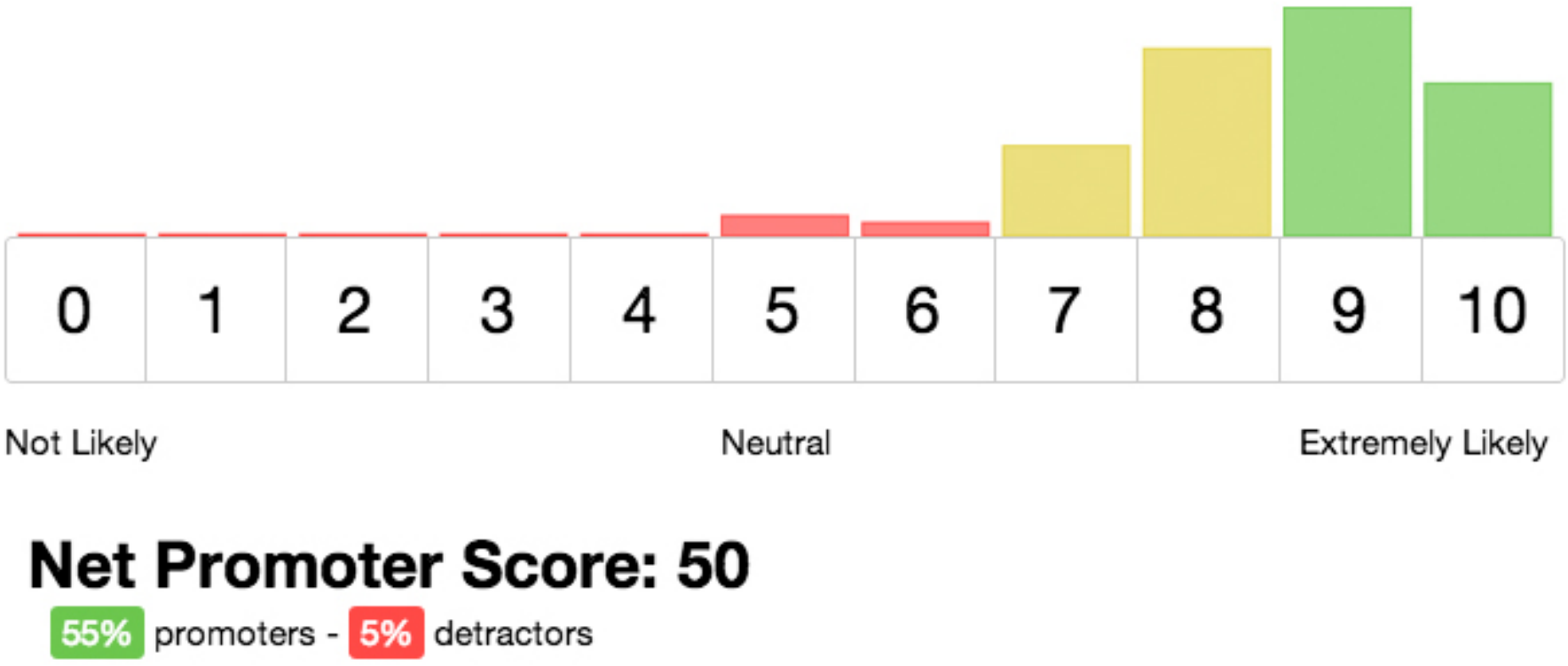
- Business Expectations from Chatbots
  - Value Proposition
  - Business Metrics
  - Conversational Metrics
  - CSAT Metrics
- Options Available for Developers
  - Menu Based Chatbots
  - Keyword Based Chatbots
  - Contextual Chatbots
- Deeper look into Contextual Chatbots
- General Steps when building a chatbot
- Generative Chatbots
- Retrieval Chatbots
- Jupyter Notebook – An illustration using Flight Dataset from Kaggle

Next
Business Expectations from Chatbots



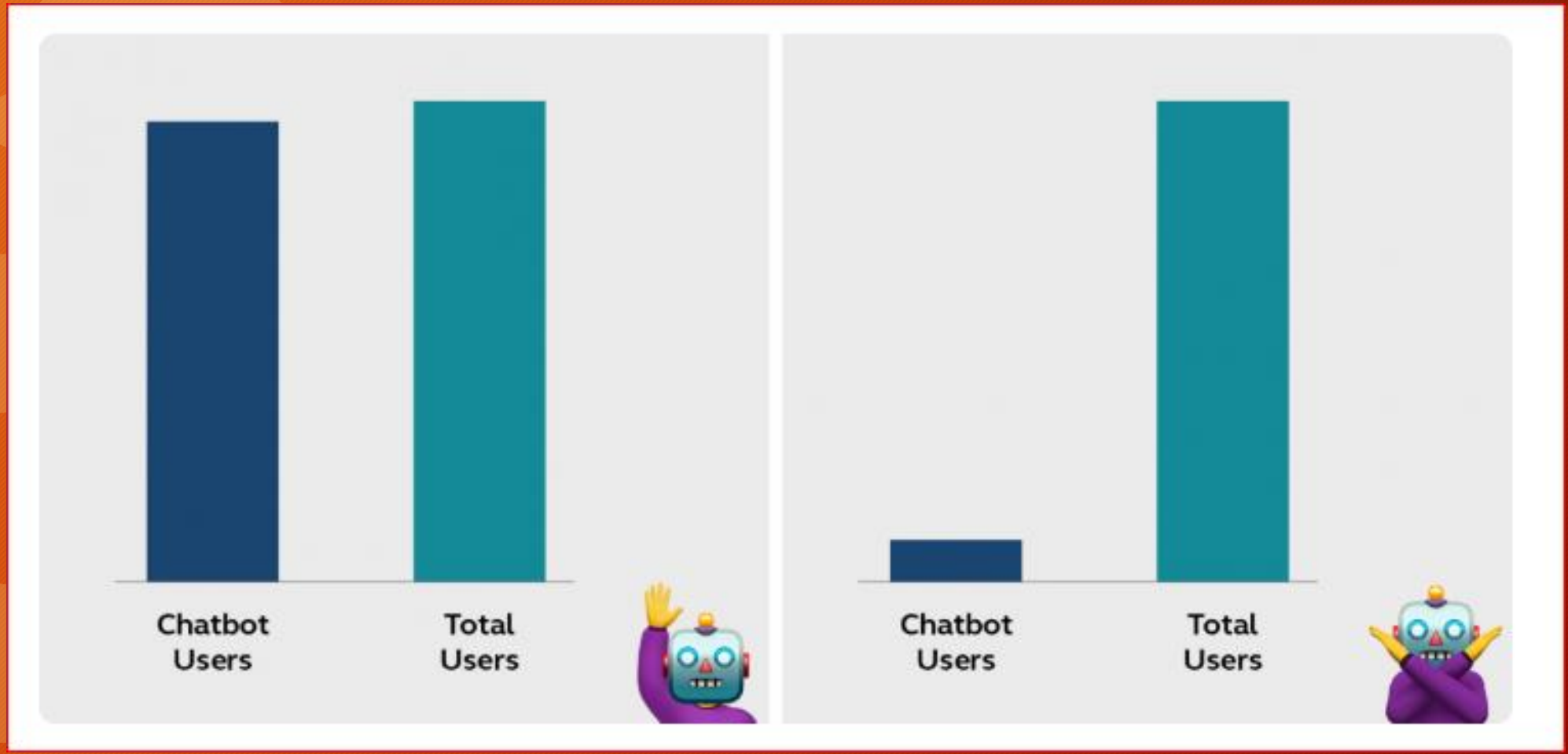
What really is the expectation of Businesses interested in Chatbots

Chatbot Value Proposition



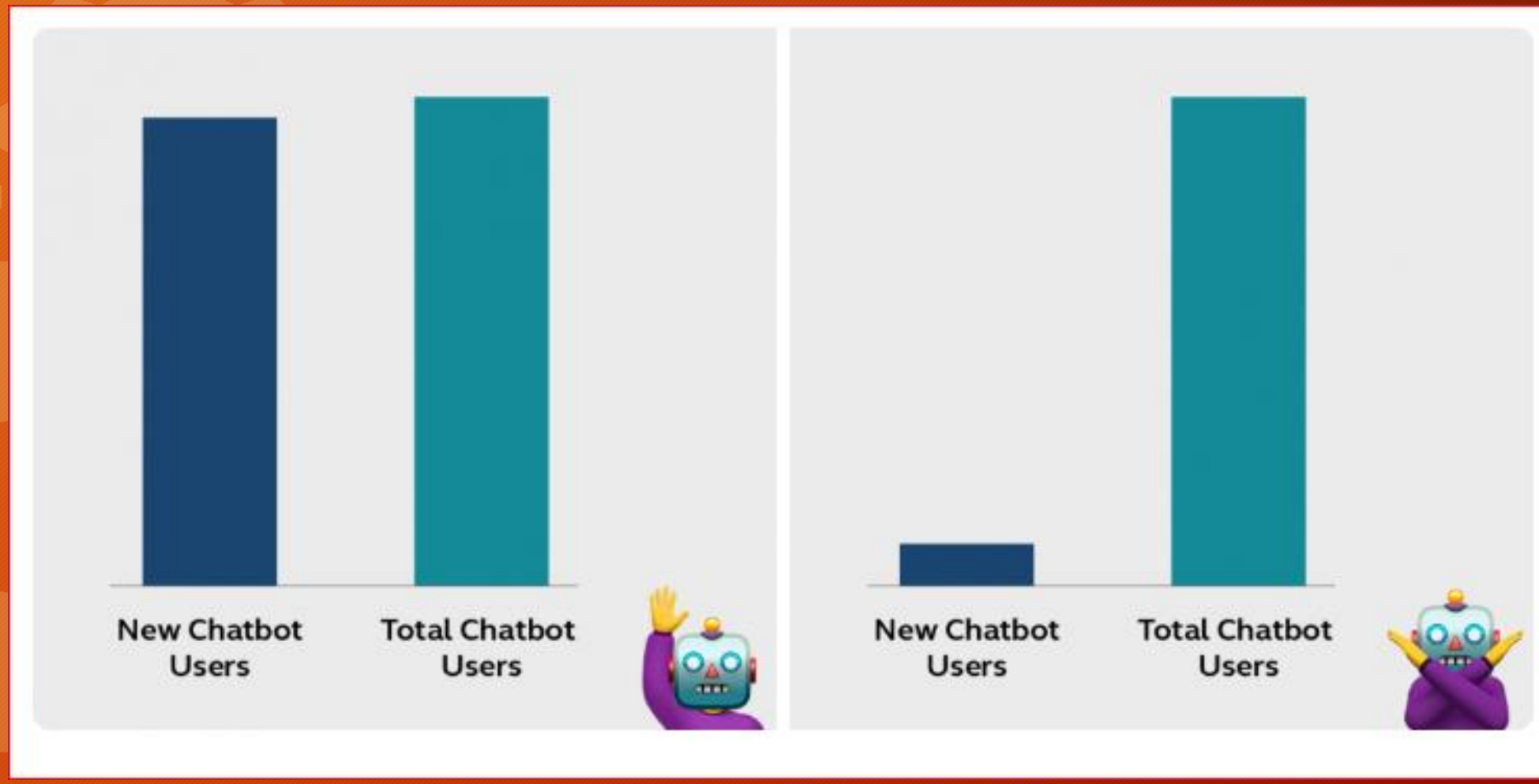
Business Metrics

Total User Metrics - Are you helping your customers?



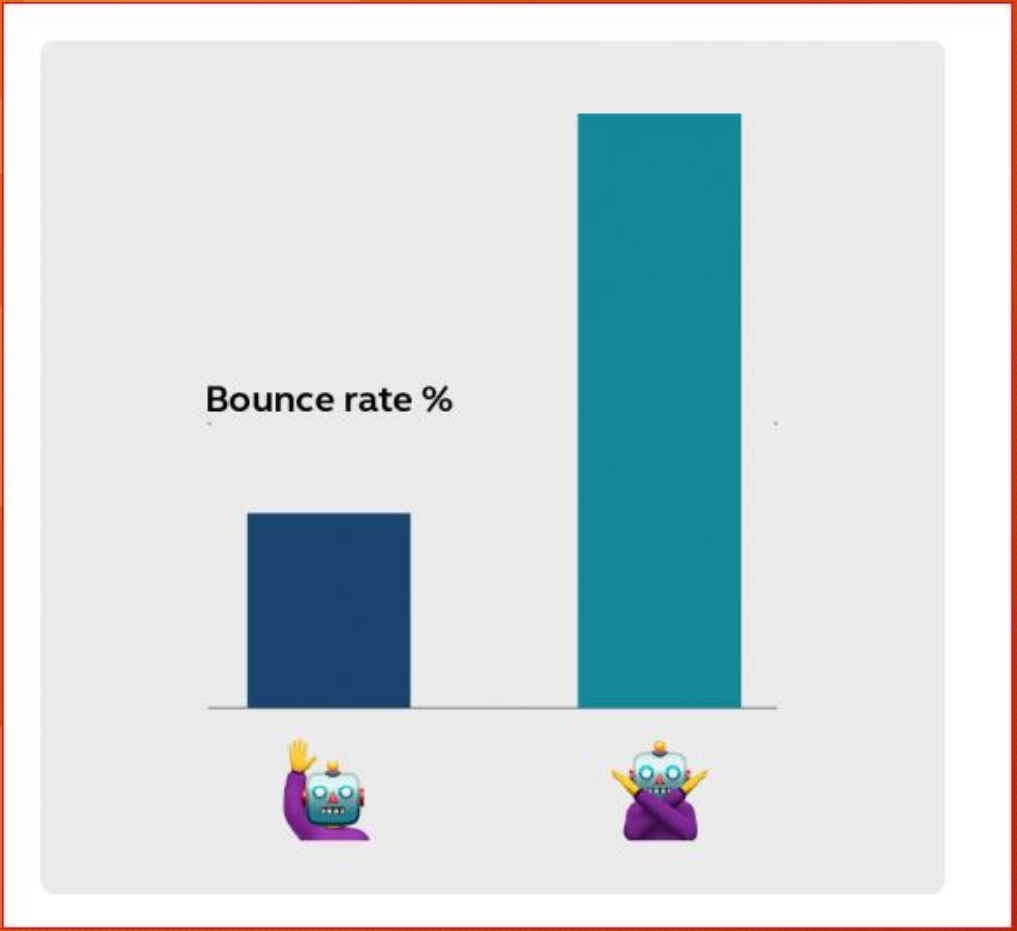
Business Metrics

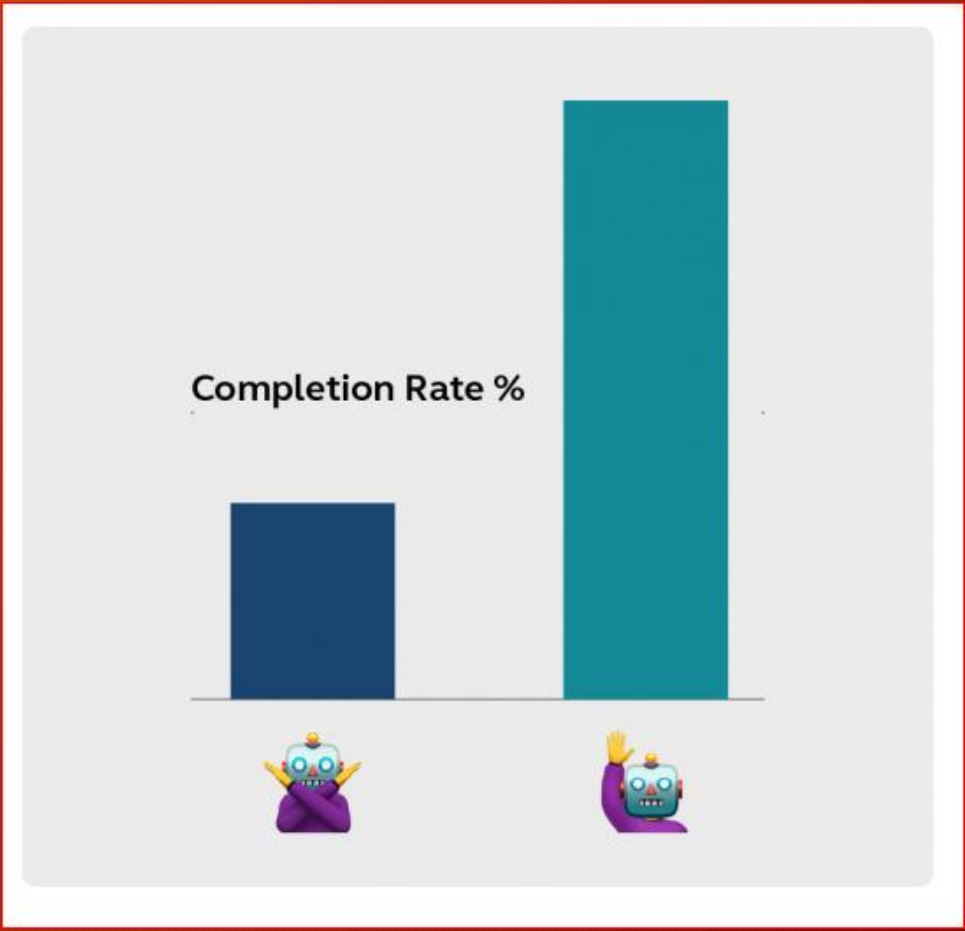
New User Metrics - Are you gaining users?



Business Metrics

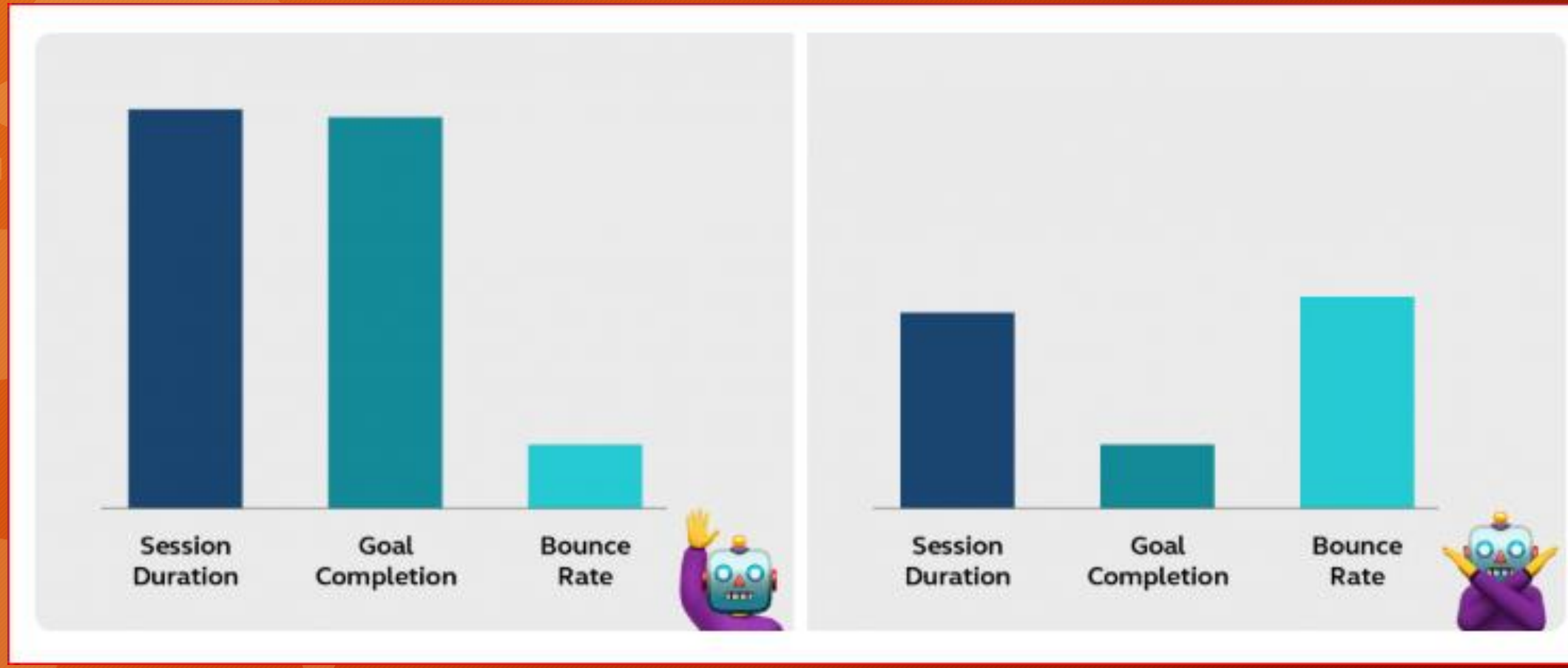
Bounce Rate & Goal Completion - Is the chatbot useful?





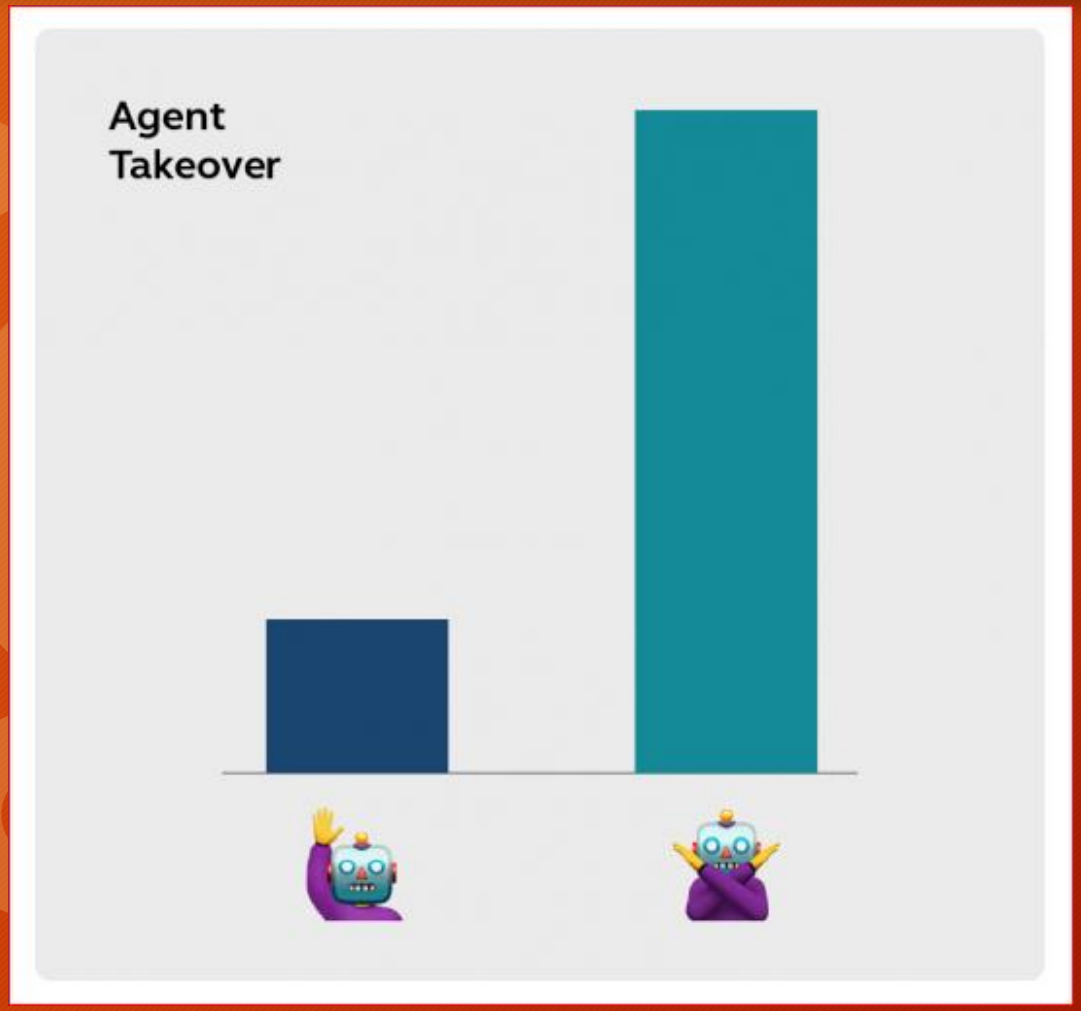
Conversation Metrics

Session duration - Do you have fruitless conversations?



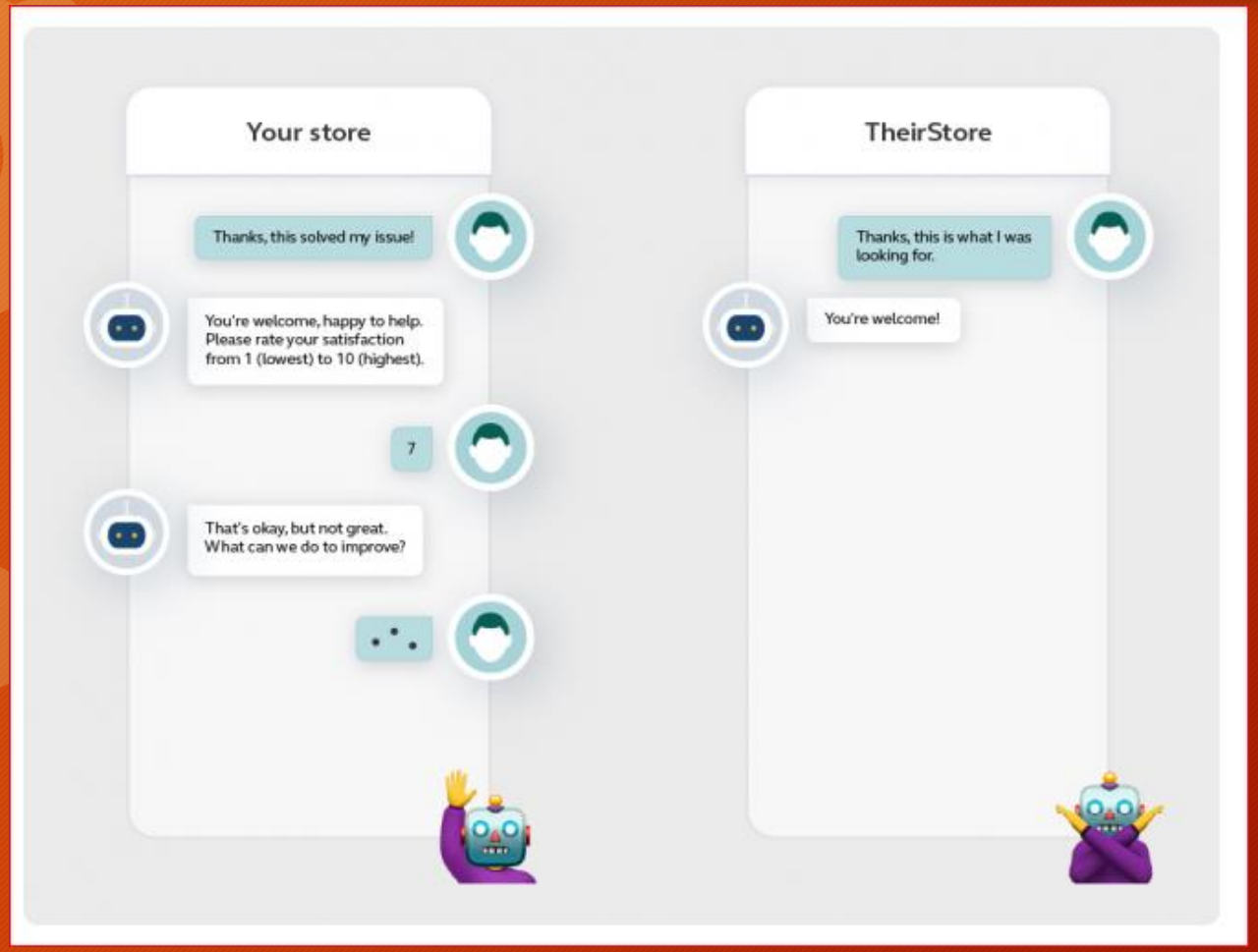
Conversation Metrics

Agent Takeover - Is the chatbot handling Conversations?



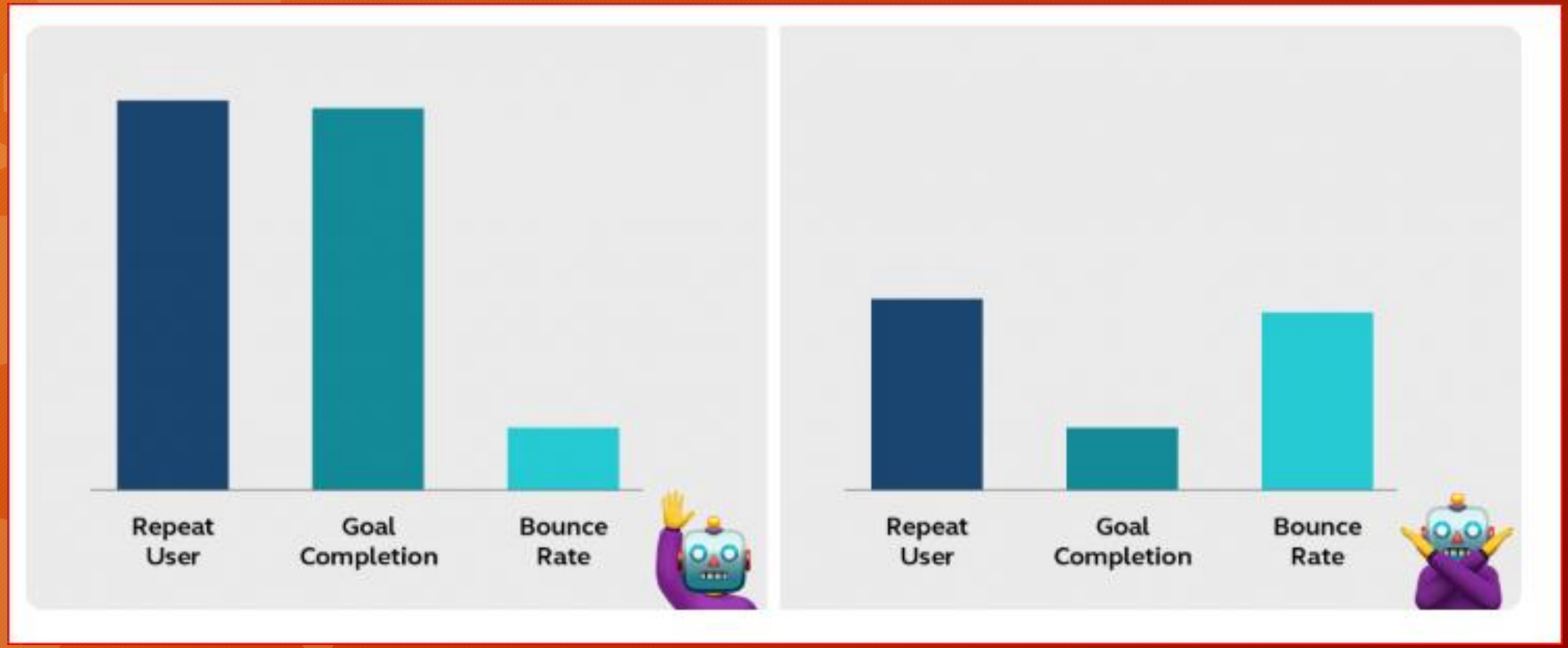
CSAT Metrics

NPS - How is the Net Promoter Score?



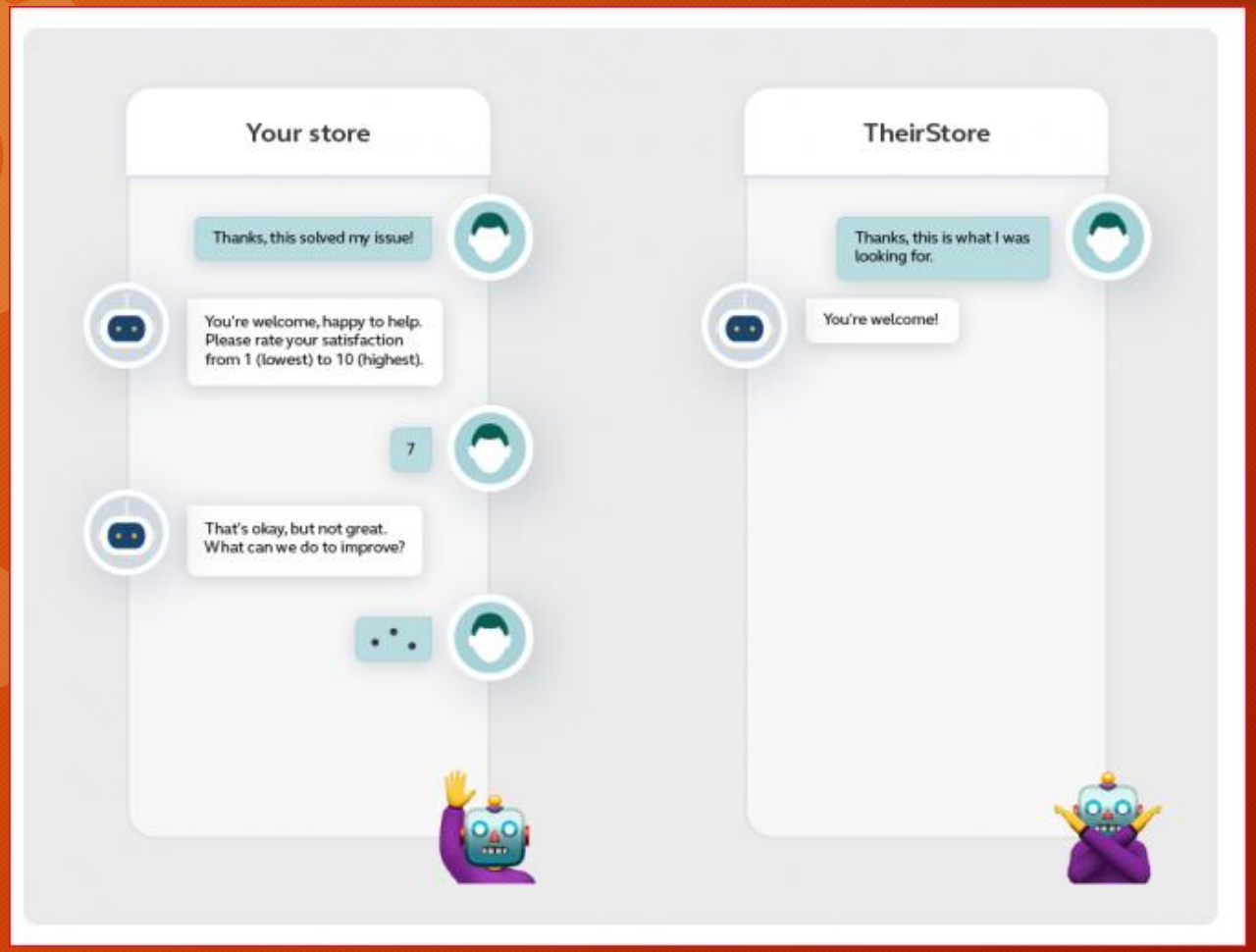
CSAT Metrics

Retention Rate - Do we have any repeat customers?

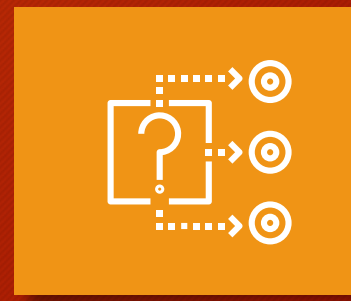


CSAT Metrics

CSAT Metrics - How is the Net Promoter Score?



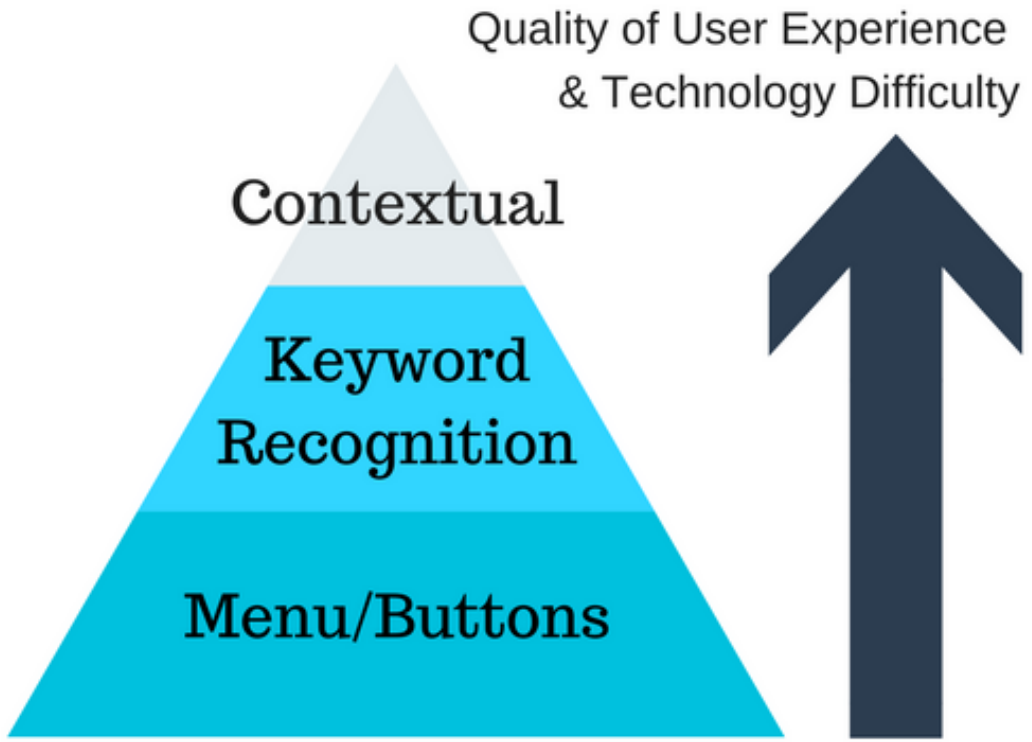
Next
Options Available for Developers



What options do we have for developers to build chatbots meeting business expectations

Types of Chatbots

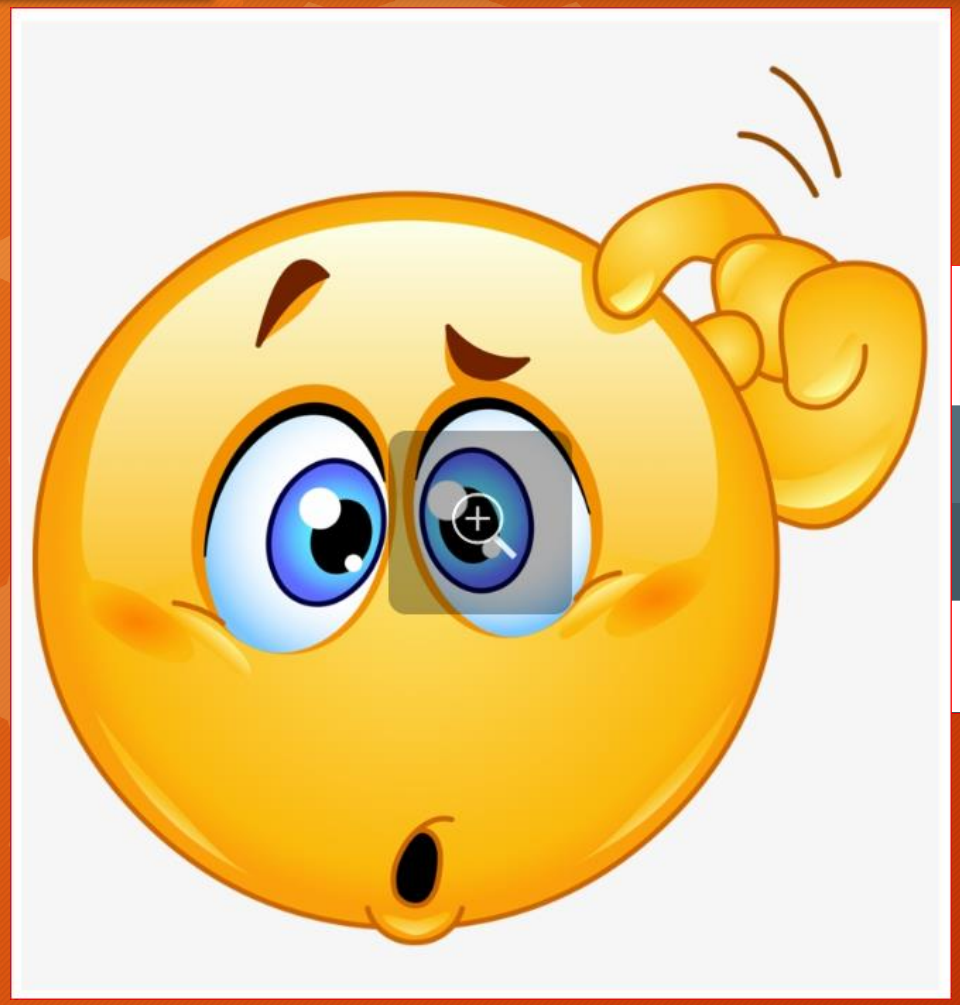
Which one bests meets business expectations



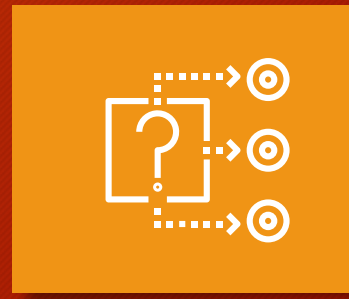
As expected, a chatbot's ceiling for providing a quality user experience rises as its technical complexity increases.

Which one is best?

How do you choose the chatbot to use



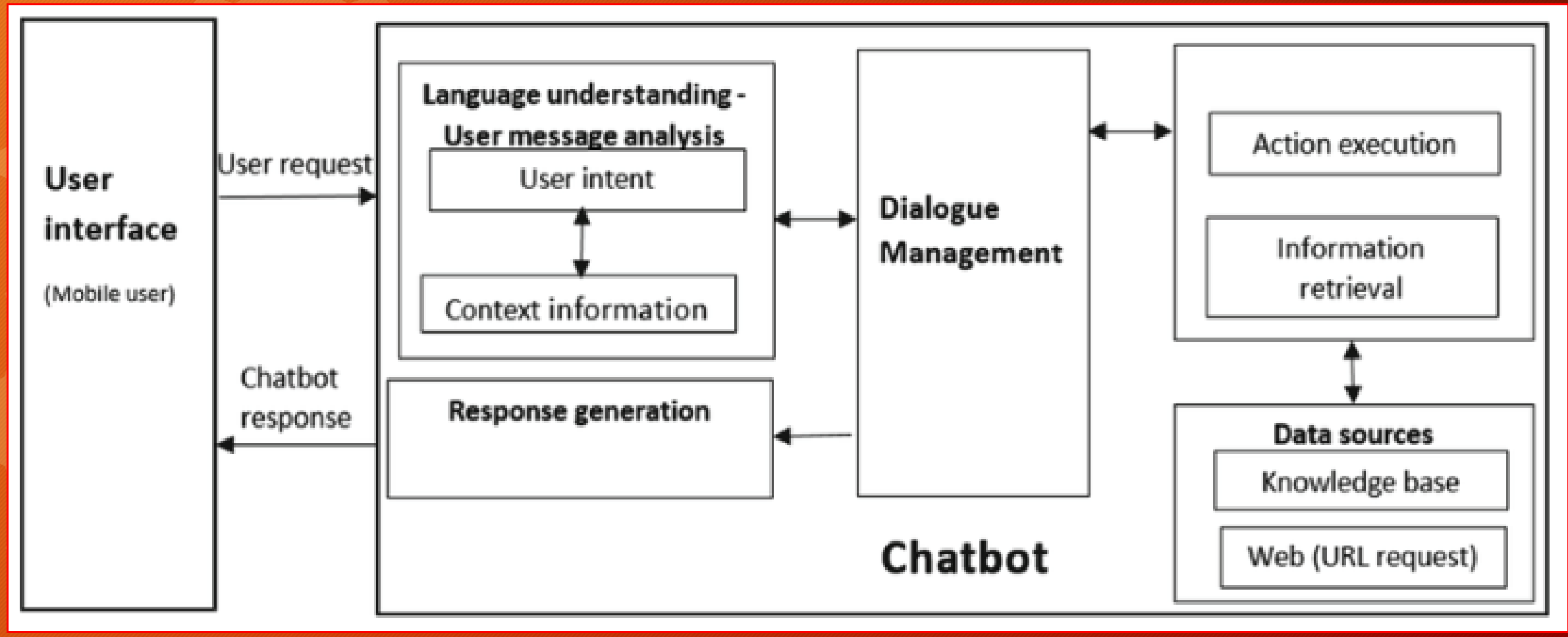
Next Contextual Chatbot



Use of Machine Learning and Artificial Intelligence to build bots that have the ability to remember

Components

High level architecture of a contextual chatbot

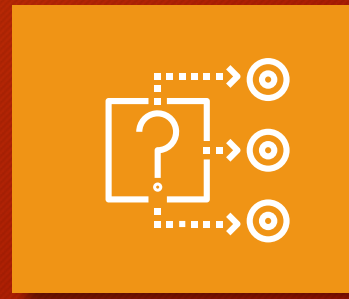


What is context?
The in-memory of a chatbot?

Examples?

Chatbot's ability to maintain a conversation

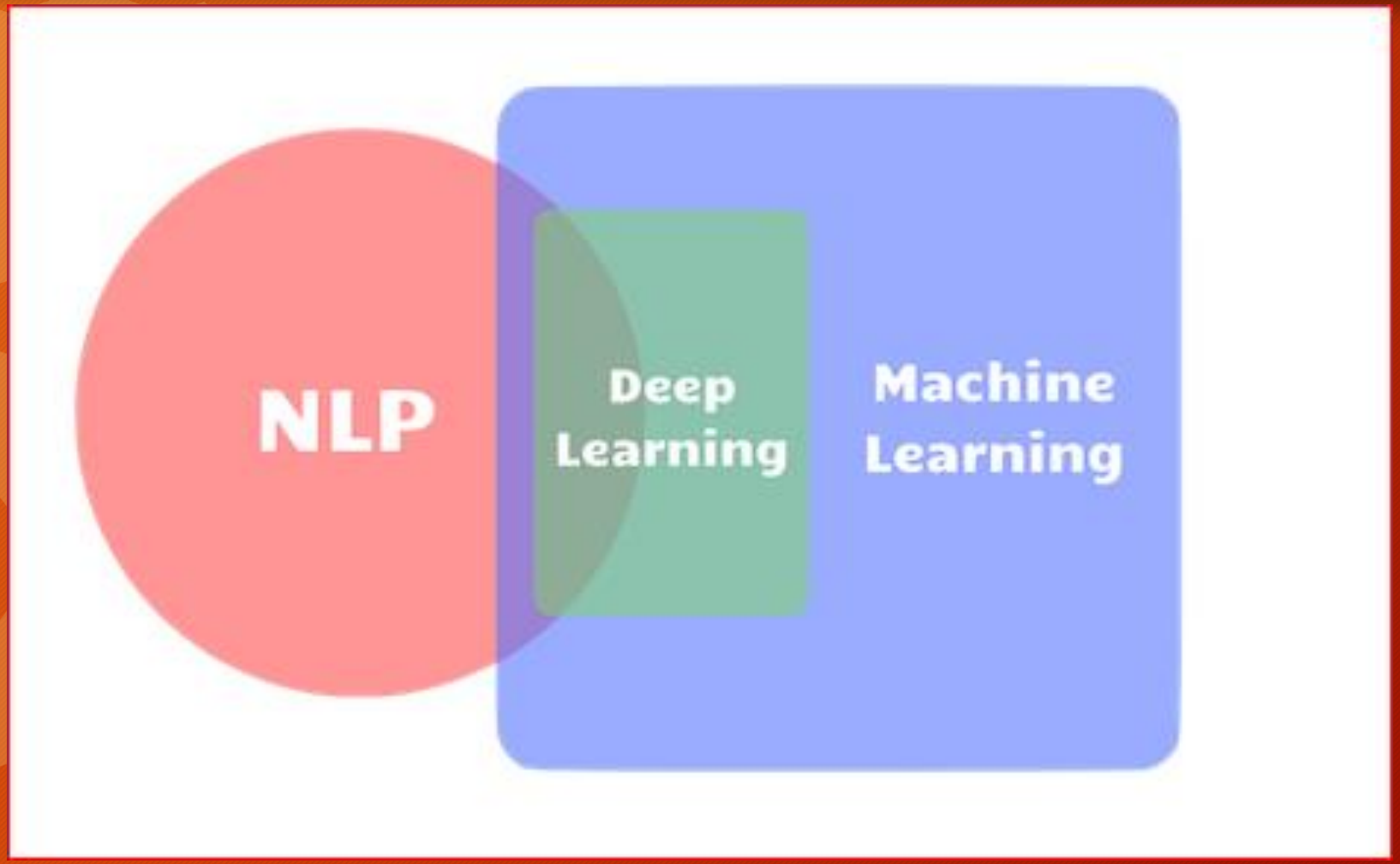
Next
General Process of Building a Contextual Chatbot?



What are the general guidelines when building contextual chatbots

Available Techniques

Common Approaches in Building Contextual Chatbots



General Process

1. Define your goal

Build a chatbot which would satisfactorily converse with customers of ….

General Process

2. Create an Ontology

Consolidate conversations between customers and support staff in order to teach the machine

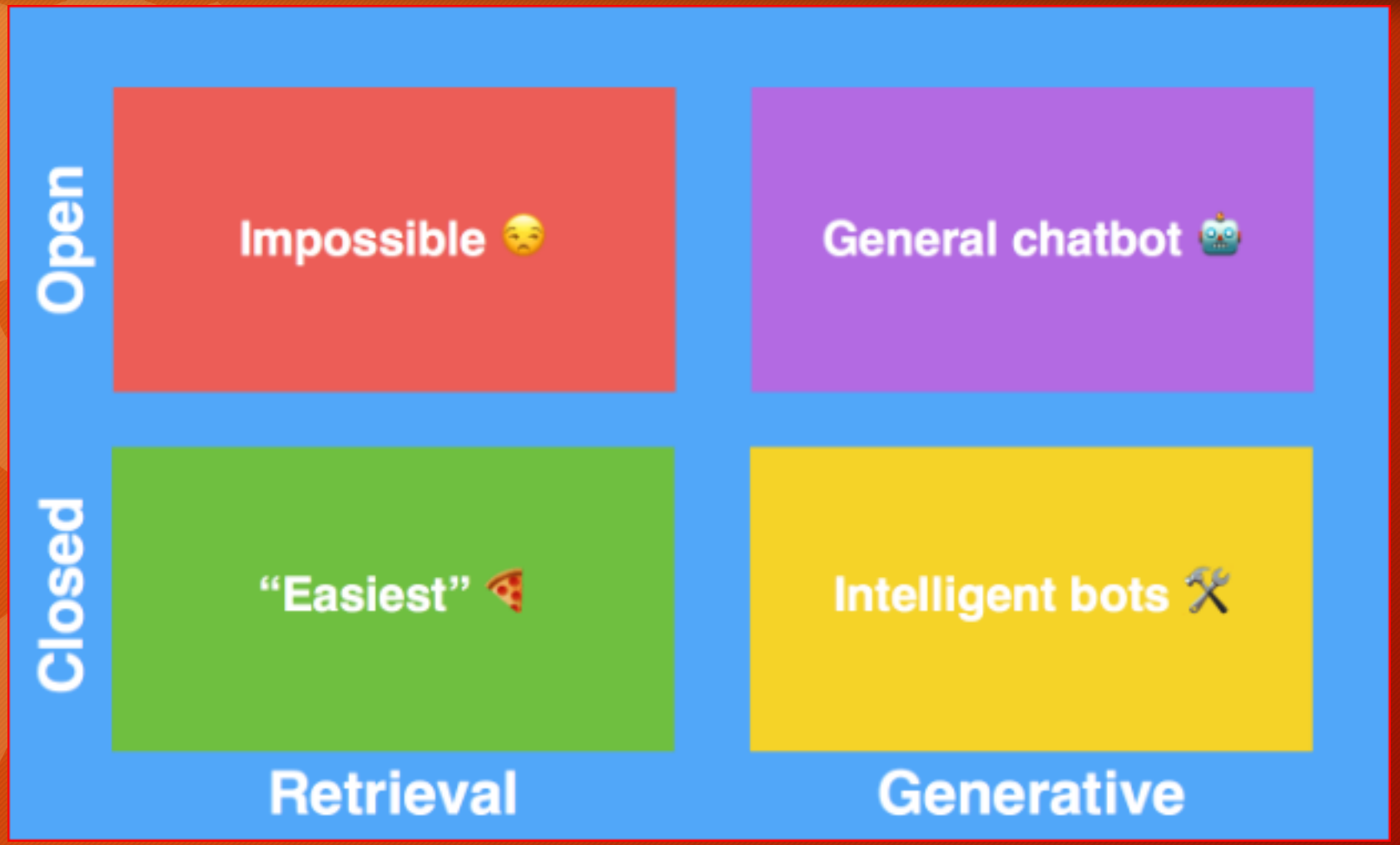
General Process

3. Pre-Process using NLTK library

Incorporate grammar into machine understanding e.g. tokenization, stemming, lemmatization.

General Process

4. Define and Agree on the chatbot you want



General Process

5. Create a corpora

Corpora consisting on inputs of context (conversations with prior sentences).

General Process

6-a. Convert the words into vectors - CBOW

like	watching	movie
I	watching	movie
I	like	movie
I	like	watching
enjoy	watching	movie
I	watching	movie
I	enjoy	movie
I	enjoy	watching

I
Like
watching
movie
I
enjoy
watching
movie

Vectorized input

I	like	watching	movie	enjoy
0	1	1	1	0
1	0	1	1	0
1	1	0	1	0
1	1	1	0	0
0	0	1	1	1
1	0	1	1	0
1	0	0	1	1
1	0	1	0	1

Output Vector

I	like	watching	movie	enjoy
1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
1	0	0	0	0
0	0	0	0	1
0	0	1	0	0
0	0	0	1	0

General Process

6-b. Convert the words into vectors - CBOW

like	watching	movie
I	watching	movie
I	like	movie
I	like	watching
enjoy	watching	movie
I	watching	movie
I	enjoy	movie
I	enjoy	watching

I
Like
watching
movie
I
enjoy
watching
movie

Vectorized input

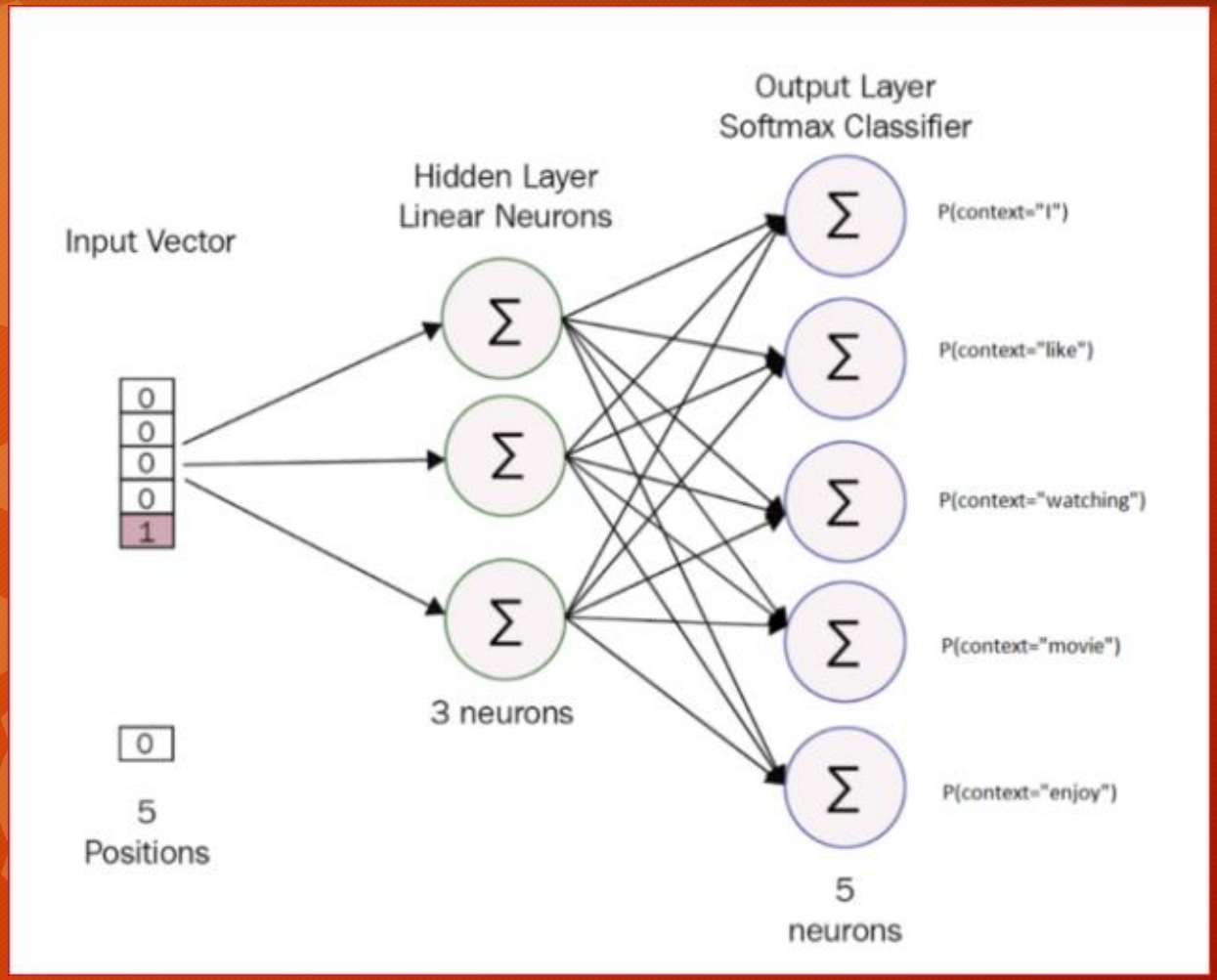
I	like	watching	movie	enjoy
0	1	1	1	0
1	0	1	1	0
1	1	0	1	0
1	1	1	0	0
0	0	1	1	1
1	0	1	1	0
1	0	0	1	1
1	0	1	0	1

Output Vector

I	like	watching	movie	enjoy
1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
1	0	0	0	0
0	0	0	0	1
0	0	1	0	0
0	0	0	1	0

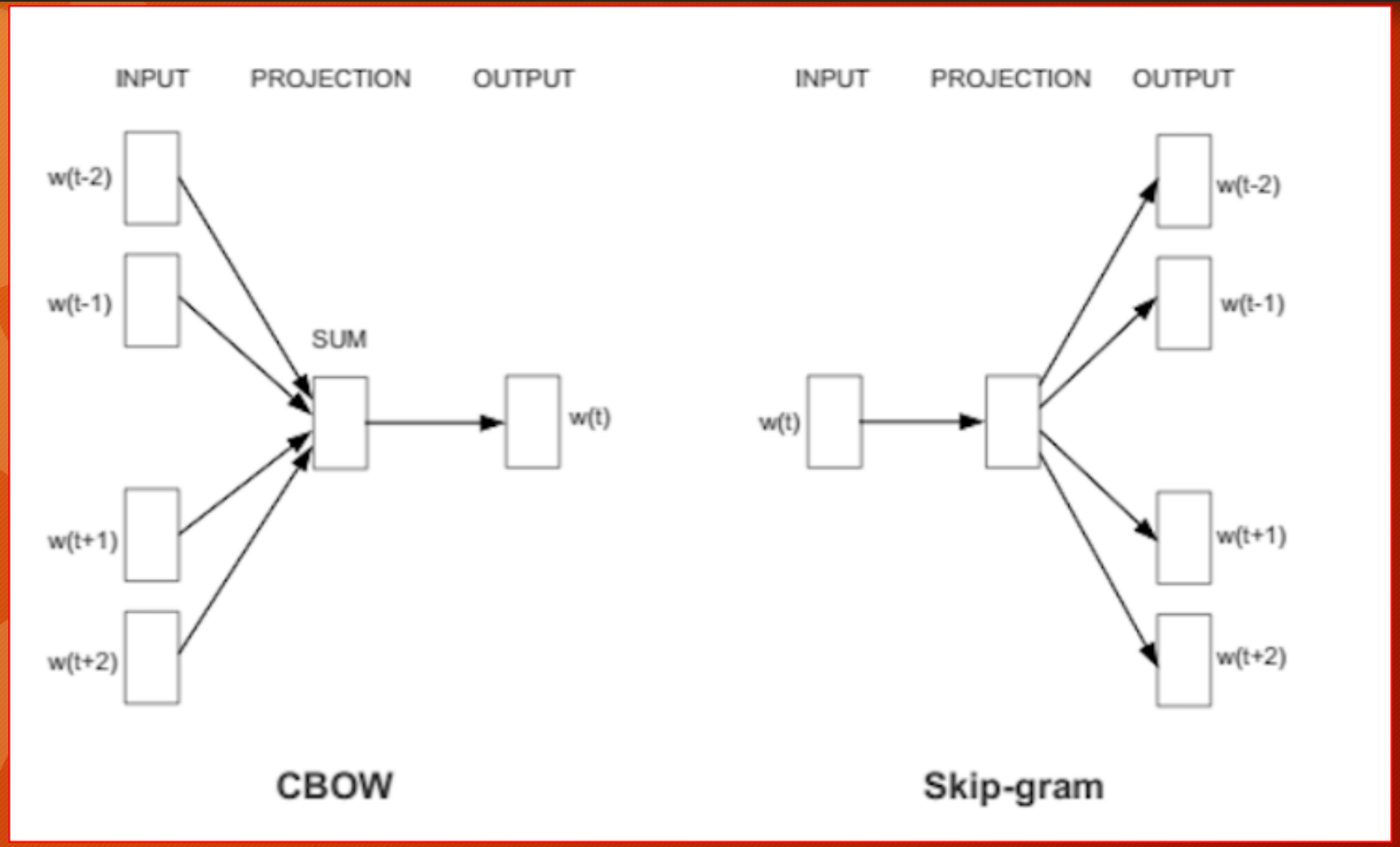
General Process

6-c. Convert the words into vectors - CBOW

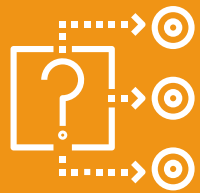


General Process

6-d. Convert the words into vectors - Word2Vec



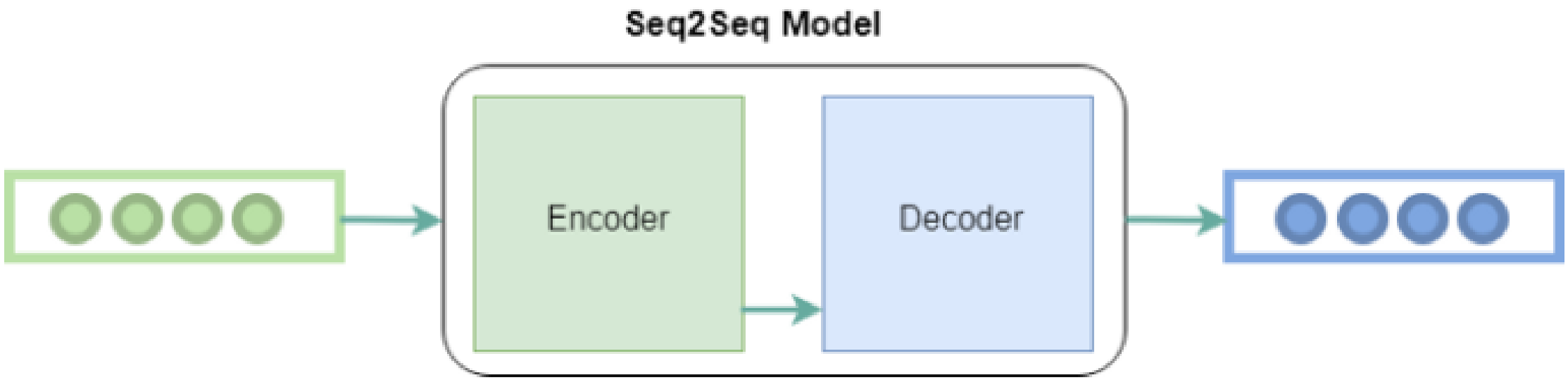
Next Generative Techniques?



Teaching your Chatbot how to answer questions using deep learning generative techniques

Deep Learning Techniques

Tensorflow's seq2seq - Generative



Source Geeks for Geeks

Deep Learning Techniques

Generative Approach - Important Notes

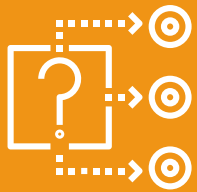
Task Involved	Description
Context Mappings	This is the process where you consolidate customer verbatims within a certain conversation and mapping these to support stuff utterances & replies
Vocabulary Definitions	Define a set of vocabulary that best suits the domain in question
Define Tokens	Tokens defined could be used to identify presence of special entities within the conversations and are needed. Very helpful to incorporate and retain important words present in the corpora but missing in the vocabulary

Deep Learning Techniques

Why we cannot use Generative Approach

- Spelling Mistakes
- Incoherent responses
- irrelevant responses
- Size of data needed
- generic responses
- Inconsistent responses
- Difficult to Optimize

Next Econometric Techniques?



Teaching your Chatbot how to answer questions using an ensemble of Machine Learning Classifiers

The Reality

What business expects

Quick Turn-Around Time

Almost immediate Business Impact

Low Costs

Reduced Costs

High NPS Score

Constant Delivery

The Reality

Skills and Technical Capabilities

Few Machine Learning Engineers

Little or No Experience

Patience is Needed

Machine Learning is an Art and a Science

Failing is REAL

Econometric Techniques

Fastest way to deliver the desire results

Use of a pre-defined list of responses and some heuristic to pick an appropriate response based on input and context.

Most flexible heuristic is an ensemble of machine learning classifiers.

Econometric Techniques
The Steps Involved

Step	Description
1.	Label the dataset
2.	Pre-Process the data
3.	Word Vectorization
4.	Modelling and choosing the best approach
5.	Create a pipeline
6.	Running Tests
7.	Metrics Intepretations
8.	Implementing the response generation workflow ***

Next Jupyter Notebook?

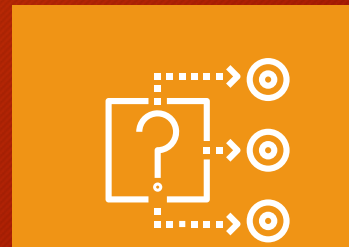


Illustration of Concepts using flight booking dataset from Kaggle

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