Design of Conversational Experiences

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Lecture No. 2

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Agenda

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- Conversational Interfaces
- Terminologies: Chatbot vs Virtual Assistants vs CVA
- Conversational Platforms
- Use cases
- Architecture of Conversational Platforms
- Overview of Deployment channels
- Enterprise Conversational AI platforms
- NLP & NLU → Handson

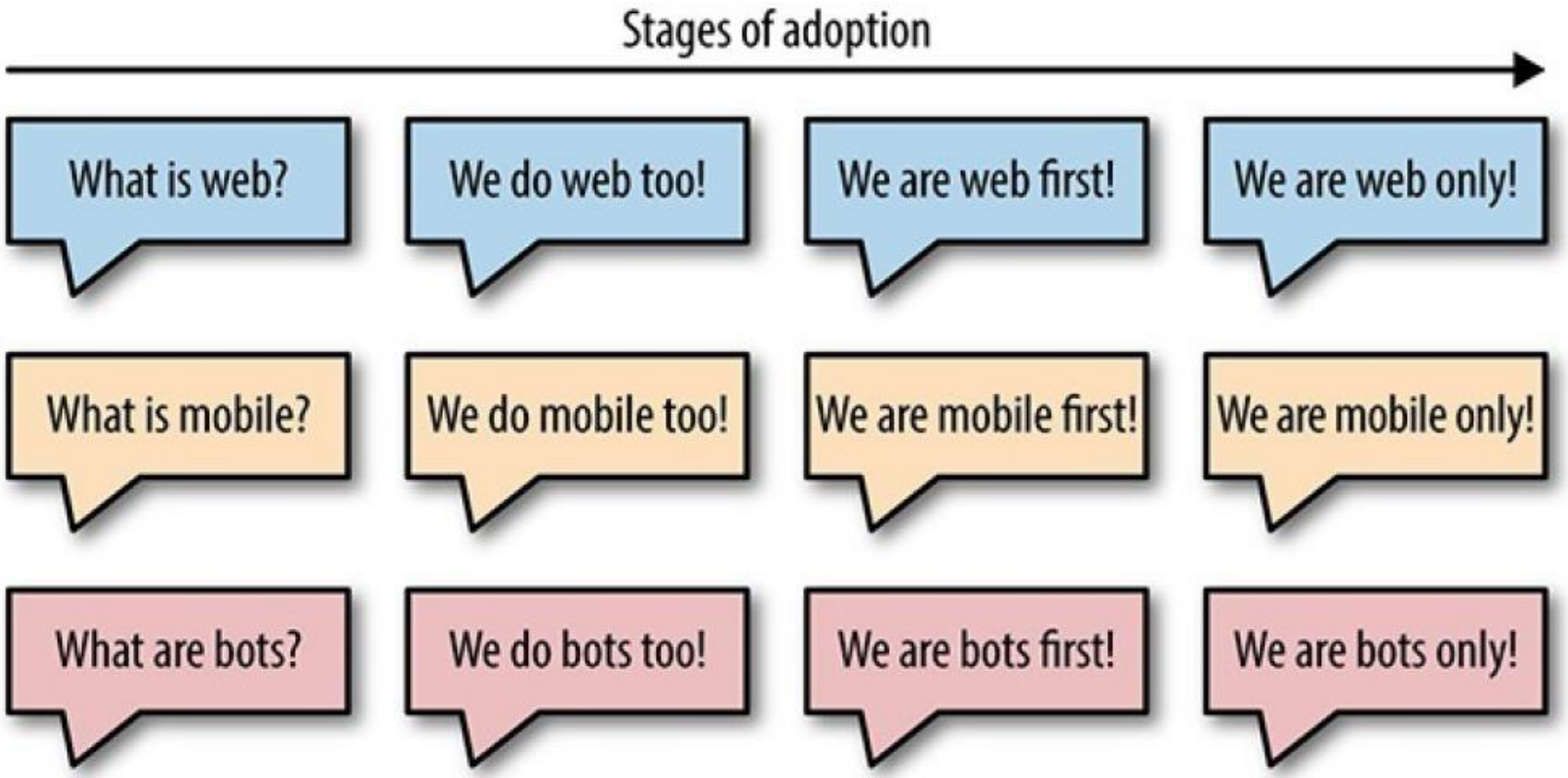
Conversational Interfaces

- Why do we need to expose a service through a Conversation?
- Aren't Web Sites / Web Apps sufficient? [Long document creation]
- Aren't Mobile Apps sufficient? [Location-based services, Camera based services]
- Bot interfaces are another avenue to engage the users
- Bots can be integrated into web apps/ mobile apps / social media apps easily

Fig. Interface Evolution-
From web to mobile to conversational interface

Ref: T1 Chapter 1

Stages of Bot adoption



Ref: T1 Chapter 1

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Terminologies

Terminologies

- Chatbot
- Virtual Assistant
- Cognitive Virtual Assistant

Chatbot

- A chatbot is a software application designed to simulate human conversation, typically via text or voice interactions.
- Chatbots operate based on predefined rules and scripts, responding to specific keywords or phrases with corresponding answers.
- They are commonly used for simple, repetitive tasks such as answering frequently asked questions or guiding users through basic workflows.

Meaning of “Assistant”, “Virtual” and “Cognitive”

- The term **Assistant** can be defined as someone or something that can assist in performing a task or activity
- **Virtual** means something that exists in the virtual world such as software
- **Cognition** is a human ability that helps us to acquire knowledge, perform all our mental functions, gain knowledge from an environment, and create new knowledge from that

Virtual Assistant

- A virtual assistant is an AI-powered software application capable of performing a variety of tasks or services for an individual based on commands or questions.
- Virtual assistants leverage natural language processing (NLP) and machine learning algorithms to understand and respond to user queries in a more interactive and natural manner than traditional chatbots.
- They can manage schedules, send messages, control smart home devices, and provide personalized recommendations.

Ex: Apple Siri, Amazon Alexa

Cognitive Virtual Assistant

- A cognitive virtual assistant is an advanced type of virtual assistant that uses cognitive computing technologies to offer more sophisticated and human-like interactions.
- Cognitive virtual assistants utilize advanced machine learning, natural language processing (NLP), and contextual understanding to continuously learn from interactions, maintain context over multiple conversations, and provide personalized, contextually relevant responses.
- They can perform complex tasks, make decisions, and provide in-depth support in various domains such as healthcare, finance, and customer service.
- Ex: IBM Watson Assistant

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Differences

Parameter	Chatbot	Virtual Assistant	Cognitive Virtual Assistant
Basic Functionality	FAQ bots	Google Assistant	IBM Watson Assistant
NLP Capabilities	Basic NLP	Advanced NLP	Highly advanced NLP
Contextual Understanding	Limited	Maintains some context	Maintains context across sessions
Integration Capabilities	Limited	Wide range of devices/services	Extensive enterprise integrations
Personalization	Limited	Some degree of personalization	Highly personalized interactions

VA vs CVA

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Technological Complexity

- Virtual Assistants: Use basic NLP and predefined scripts or rules.
- Cognitive Virtual Assistants: Employ advanced AI, machine learning, and cognitive computing to understand context, learn from interactions, and provide more sophisticated responses.

Contextual Understanding

- Virtual Assistants: Limited or no ability to maintain context across multiple interactions.
- Cognitive Virtual Assistants: Maintain context across multiple sessions, allowing for more natural and continuous conversations.

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VA vs CVA

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Personalization

- Virtual Assistants: Basic personalization based on user settings and preferences.
- Cognitive Virtual Assistants: Highly personalized responses based on detailed analysis of user data and interaction history.

Reasoning and Decision-Making

- Virtual Assistants: Limited decision-making capabilities, primarily based on predefined rules.
- Cognitive Virtual Assistants: Advanced reasoning and decision-making capabilities, enabling them to analyze complex scenarios and provide insightful responses.

Comparison between Alexa and IBM Watson – Conversation & Context

Feature	Amazon Alexa	IBM Watson Assistant
Contextual Understanding	Maintains context within a session for coherent interactions but has limitations across sessions.	Maintains and recalls context across multiple sessions, allowing for more complex interactions.
Multi-turn Dialogues	Can handle multi-turn dialogues but primarily within a single session.	Excels in multi-turn dialogues with deep context retention across sessions.
Personalization	Uses voice profiles to provide personalized responses for different users within a household.	Provides highly personalized interactions based on detailed user data and interaction history.
Integration and Skills	Extensive skills and integration capabilities with various services and smart home devices.	Integrates with enterprise systems, CRM tools, databases, and more for comprehensive support.
Learning and Adaptation	Uses machine learning to improve interactions over time based on user feedback.	Employs advanced AI to continuously learn and adapt, offering more precise and context-aware responses.
Example Scenario: Booking a Flight	Can book a flight, but may need repeated confirmations for details within the same session.	Can handle the entire booking process, recalling previous interactions, preferences, and details across sessions.
Example Scenario: Customer Support	Provides basic customer support, often requiring session-specific details.	Offers advanced customer support, remembering user history and context for seamless interactions.

What is ChatGPT?

ChatGPT is both a **chatbot** and **virtual assistant** developed by OpenAI and launched on November 30, 2022.

Based on large language models, it enables users to refine and steer a conversation towards a desired length, format, style, level of detail, and language.

Any LLM models, if they provide a conversational interface, can be classified under “Chatbots” and “Cognitive Virtual Assistant” categories.

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Use Cases in the Industry

Chatbot Market

Study Period	2019 - 2029
Market Size (2024)	USD 7.01 Billion
Market Size (2029)	USD 20.81 Billion
CAGR (2024 - 2029)	24.32 %
Fastest Growing Market	Asia Pacific
Largest Market	North America

Major Players

avaamo.ai eGain NUANCE creativevirtual The science of conversation™ IBM

*Disclaimer: Major Players sorted in no particular order

Top Chatbot use cases in Industry

- E-commerce - eBay ShopBot [helps users find and buy items on eBay by understanding natural language queries, making personalized recommendations, and even facilitating the purchase process]
- Event reservation - OpenTable [allows users to make restaurant reservations through various platforms, including their website, mobile app etc.]
- Agenda/ Scheduling - Clara [Clara is an AI assistant that schedules meetings by coordinating availability between participants via email, handling all back-and-forth communications.]

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Top Chatbot use cases in Industry

- Conference bots - Eva [Eva from Voicera is an AI-powered conference assistant that can join meetings, take notes, highlight key points, and even send follow-up emails with action items. -- https://eva.bot/]
- Personalized helpers
  - Lark [Lark is a health coach chatbot that provides users with personalized advice on diet, exercise, sleep, and more based on their health data and goals.]
  - Woebot Mental Health App
    - Provides mental health support, using Cognitive Behavioral Therapy (CBT)
    - NLP based self-learning App that advises / chats with users on mental health, developed by Stanford University

Top Chatbot use cases in Industry

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- Travel bots - SkyScanner [Skyscanner's chatbot helps users find and book flights, hotels, and car rentals by providing personalized travel recommendations and real-time pricing.], Another example is Mezi [American Express]
- Business bots

➢ Erica [Erica is Bank of America's virtual financial assistant. It helps customers with various tasks, such as checking balances, tracking spending, paying bills, and finding information about their accounts using natural language processing.]

➢ HDFC Bank's EVA (Electronic Virtual Assistant]. Provide customers with instant responses to their banking queries, from locating the nearest branch or ATM to explaining product features and guiding through simple banking transactions.

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Conversational Platforms

Conversational Platforms

- Conversational platforms are technologies and systems that enable automated, human-like interactions through voice, text, or other communication methods.
- They facilitate communication between humans and machines, making it possible for users to interact with applications, devices, and services in a more natural and intuitive way.

Key Features of Conversational Platforms

1. Natural Language Processing (NLP): Enables the platform to understand and process human language.
2. Speech Recognition and Synthesis: Converts spoken language into text (speech recognition) and text into spoken language (speech synthesis).
3. Dialog Management: Manages the flow of conversation, ensuring coherent and contextually relevant interactions.
4. Machine Learning: Allows the platform to learn from interactions and improve its responses over time.
5. Integration Capabilities: Connects with various services, databases, and APIs to provide comprehensive functionality.

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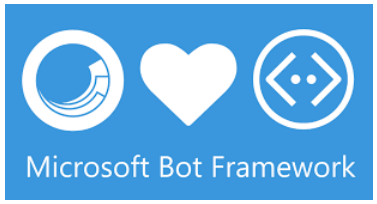
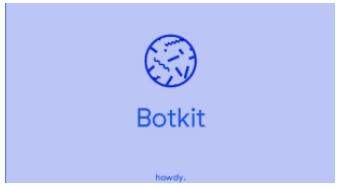
AI enabled Conversational Platforms

Popular Frameworks (Code and Low code)





Popular Tools (No Code)

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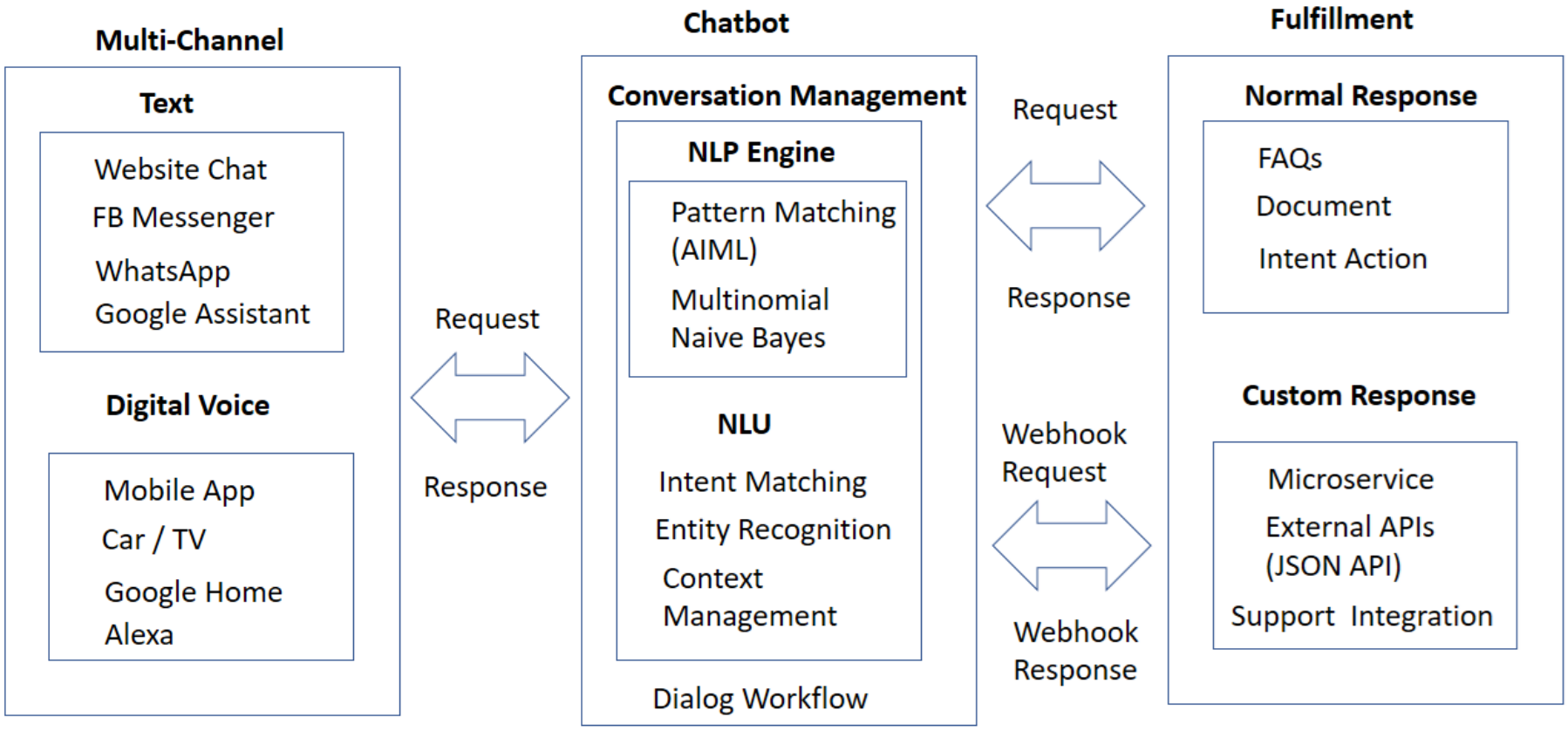
Architecture of Conversational Platforms

General Architecture of Conversational Platforms



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Overview of Deployment

Deployment Platforms / Channels

1. Messaging Platforms
2. Social Media
3. Web and Mobile Applications
4. Customer Support Platforms
5. Enterprise Communication Tools
6. E-commerce Platforms
7. Additional Channels

Deployment Platforms / Channels

1. Messaging Platforms

Facebook Messenger
- Widely used for customer support and marketing.
- Allows integration of chatbots for automated customer interactions.

WhatsApp
- Popular for customer service and notifications.
- Supports chatbot integrations for businesses.

Slack
- Common in business environments for team collaboration.
- Supports Slackbots for automating workflows and answering queries.

Telegram
- Supports bot development for various applications, including customer service and broadcasting messages

Platform	Strength	Typical Use
Facebook Messenger	Broad audience, visual UI	E-commerce, brand support
WhatsApp	High engagement, secure	Real-time support, reminders
Slack	Workplace focus	Internal automation, IT helpdesk
Telegram	Developer-friendly, secure	Content sharing, user communities

Deployment Platforms / Channels

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2. Social Media

Twitter

- Chatbots can be used for customer support and engagement through direct messages.

Instagram

- Utilized for customer interactions and automated responses to messages.

Deployment Platforms / Channels

3. Web and Mobile Applications

Websites

- Chatbots can be embedded into websites to assist with customer queries, provide support, and guide users.
- Tools like LivePerson, Drift, and Intercom are popular for web integration.

Mobile Apps

- Integration into mobile apps to provide support, notifications, and personalized interactions.
- Platforms like Chatfuel and MobileMonkey are often used.

Deployment Platforms / Channels

4. Customer Support Platforms

Zendesk

- Allows the integration of chatbots to automate customer support tasks.

Salesforce

- Einstein Bots within Salesforce can automate responses and help with customer relationship management (CRM).

Deployment Platforms / Channels

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5. Enterprise Communication Tools

Microsoft Teams

- Supports the development of bots for automating workflows and providing support within teams.

Cisco Webex

- Chatbots can be integrated to assist with meetings, scheduling, and other collaborative tasks.

Deployment Platforms / Channels

6. E-commerce Platforms

Shopify

- Integrates with chatbots to assist customers, provide recommendations, and track orders.

Magento

- Supports chatbot integration for customer service and sales automation.

Deployment Platforms / Channels

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7. Additional Channels

SMS

- Chatbots can interact with users through text messages, providing support and updates.
- Platforms like Twilio are commonly used for SMS chatbot deployment.

Email

- Chatbots can automate email responses, manage inboxes, and provide customer support.

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Enterprise Conversational AI platforms

Enterprise Conversational AI

Gartner defines the enterprise conversational AI platform market as the “market for software platforms used to build, orchestrate and maintain multiple use cases and modalities of conversational automation”.

The enterprise conversational AI platform consists of:

- A capability layer providing runtime capabilities that include: Natural language understanding (NLU), Dialogue management, Channel integration, Back-end integration, Access control for platform users, Life cycle management;
- A tooling layer geared toward business users that includes: A no-code environment for building and maintaining, applications, Analytic tools for understanding dialogue flows, NLU intent and entity tuning tools, A/B flow testing tools.

Ref: https://www.gartner.com/reviews/market/enterprise-conversational-ai-platforms

Enterprise Conversational AI

Each Vendor leans in one of the directions

1. Natural-language-portfolio centric
2. Business automation centric
3. User-experience centric

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Assignment I (10%)

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Task: Comparative analysis of Bot Builders.

Sub-tasks:

1. Select one open source bot builder (Ex: Wit.ai) and one commercial bot builder (Ex: Amazon Lex).
2. Write a detailed report comparing the two selected bot builders, based on the following criteria:
    a) Ease of Development (No code, drag and drop functionality etc.)
    b) Features and capabilities.
    c) Integration options with other tools and platforms.
    d) Community support and documentation.
    e) Real world use cases for the bot builder and its usage in the Industry.
    f) Add a **"What surprised me" or "What I learned"** section at the end.
    g) Conclusion: Summary of the comparative strengths and weaknesses

Assignment I (10%)

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- Individual Assignment
- Due date for submission: 23-August-25
- Make sure no other student has selected the same pair — update the shared Excel sheet with your name and bot choices. First come, first serve!

Live Google Sheet will be shared for first-come-first-serve bot selection.
(To Prevent duplicates and encourages tool exploration.)

Submission Checklist for Assignment-1

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- Report (.pdf or .docx format)
- Bot names updated in the Excel sheet
- Original analysis (no duplication)
- Use clear comparisons in table or chart format
- Encourages metacognition and deeper thinking.

Recommended to use Visual Storytelling Approach

- **Comparison tables**
- **Infographics**
- **Process diagrams**
- **Real bot screenshots**

Architecture of Conversational AI Platforms

User Input (Text/Voice)

↓

User Interface (Website, App, Smart Speaker)

↓

NLP Engine (Understand intent + entities)

↓

Dialog Manager (Handles flow + memory)

↓

Backend Systems (Fetch/Send info)

↓

Bot Response → Back to UI → User

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NLP and NLU

NLU NLG

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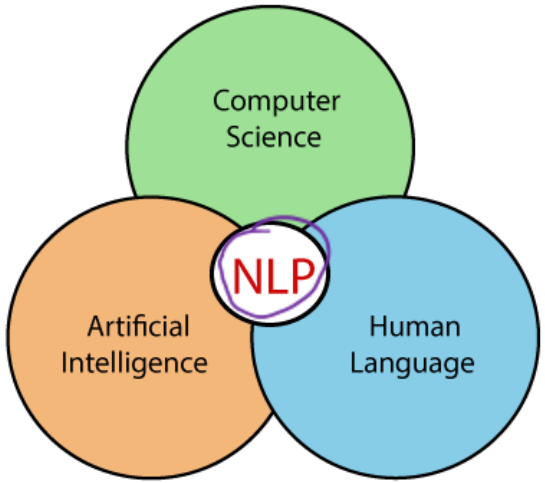
NLP

- NLP stands for Natural Language Processing
- Subfield of Computer Science, Human language (Linguistics), and Artificial Intelligence
- It is the technology that is used by machines to understand, analyze, manipulate, and interpret human's languages.



Basics of NLP

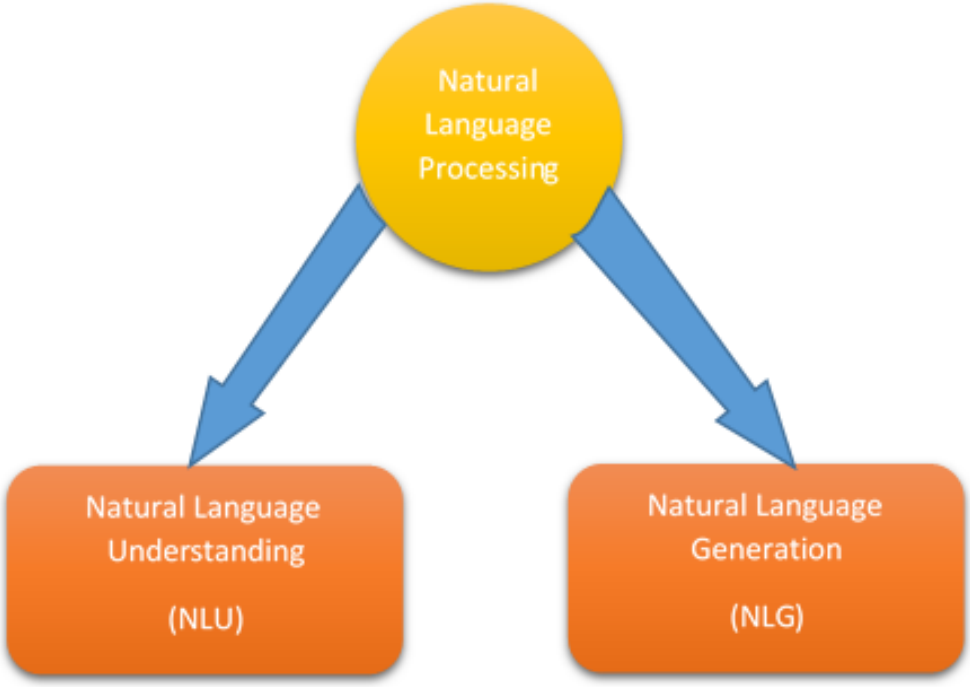
- Users can provide two kinds of input to Machine –> **Text** or **Speech**
- Machine has to first **understand the human speech** in order to act on it

Examples:

- **User types a message "BITS Pilani" in Google Search**
- **User tells Alexa "Play me Kishore Kumar Songs"**

In both the examples, Machine should understand the **Syntax, Semantics, Context and Intent** of the statement, in order to provide a favorable reply.

Components of NLP



Understands the Human Speech

Process and Action

Components of NLP

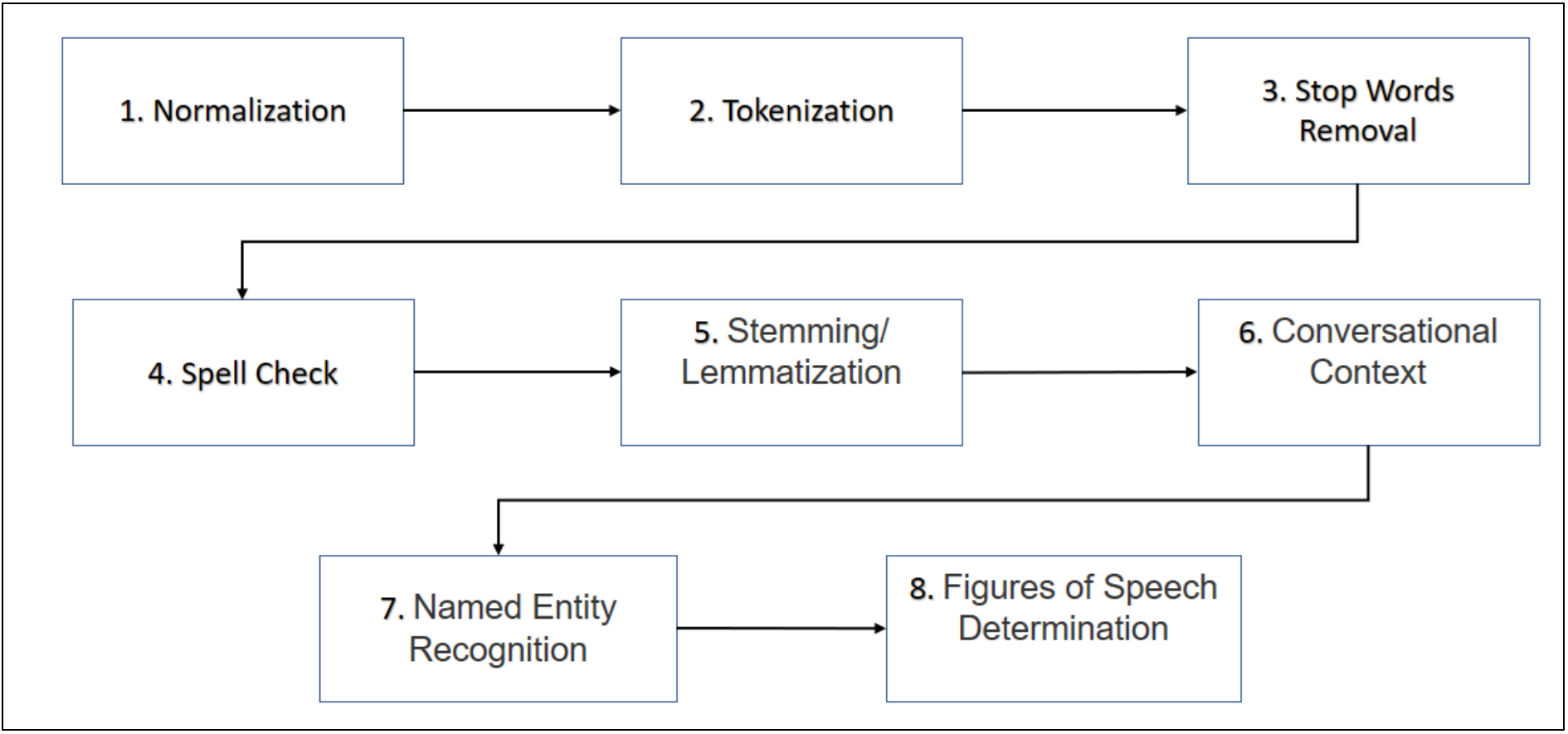
NLU

- Understand the Text
- Understand Syntax, Context, Sentiment, Semantics and Intent from the text
- Syntactic Analysis
  - Lemmatization, Stemming, Word Segmentation, POS tagging etc.
- Semantic Analysis
  - Named Entity Recognition (NER), Word Sense Disambiguation etc.

NLG

- Produce meaningful sentences in human-understandable text
- NLG Models:
  - Markov Chain
  - Recurrent Neural Network (RNN)
  - Long Short-Term Memory (LSTM)
  - Transformer

Sample NLP Pipeline for NLU



Tools for NLU

- Stanford CoreNLP Parser (Python)
- NLTK – Natural Language Toolkit (Python)
- SpaCy (Python)
- Apache OpenNLP (opensource Java Library)

Demo

Sample Python Program to demonstrate NLU (NLP Pipeline) using NLTK

Thank You!