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SMARTVERSITAS
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UNIVERSITAS AIRLANGGA
Machine Translation dan Chatbot
Mata Kuliah :
Natural Language Processing
Guest Lecture
Assoc. Prof. Dr. Mohd Shahizan bin Othman
Universiti Teknologi Malaysia
Monday, October 27th 2025
14.00 - 16.30 Indonesian Time
Link : https://zoom.us/j/99558663019
Password : 290290
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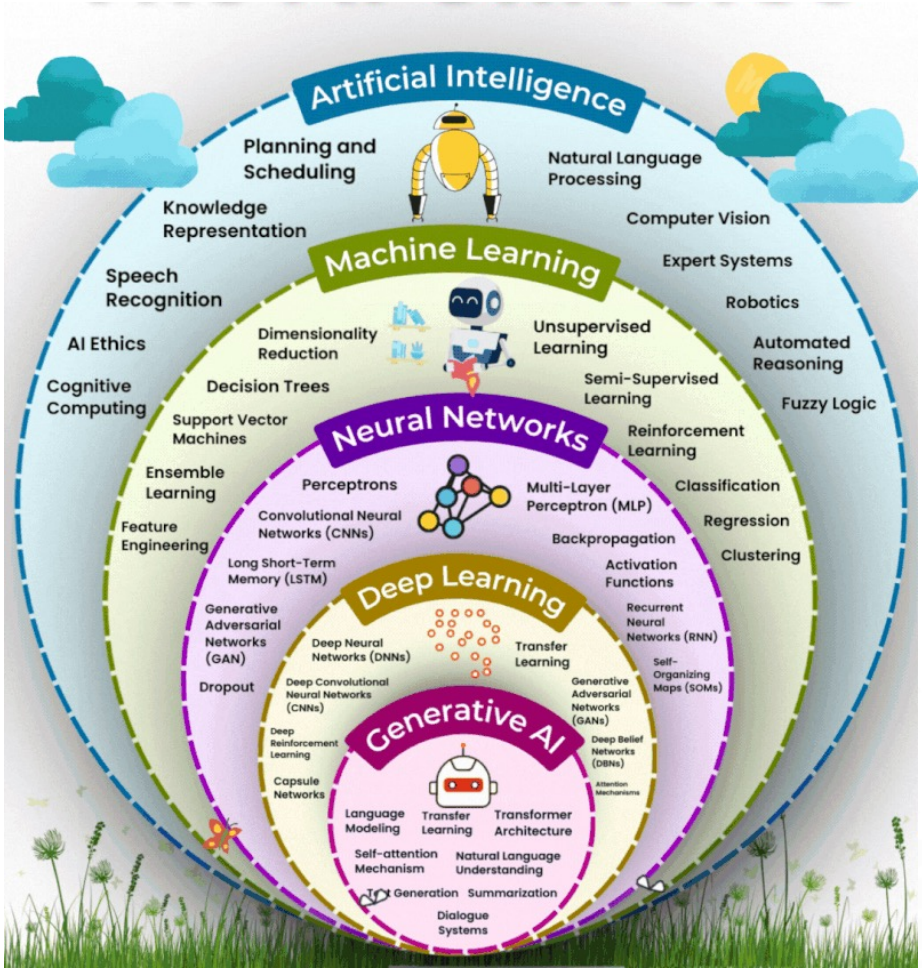
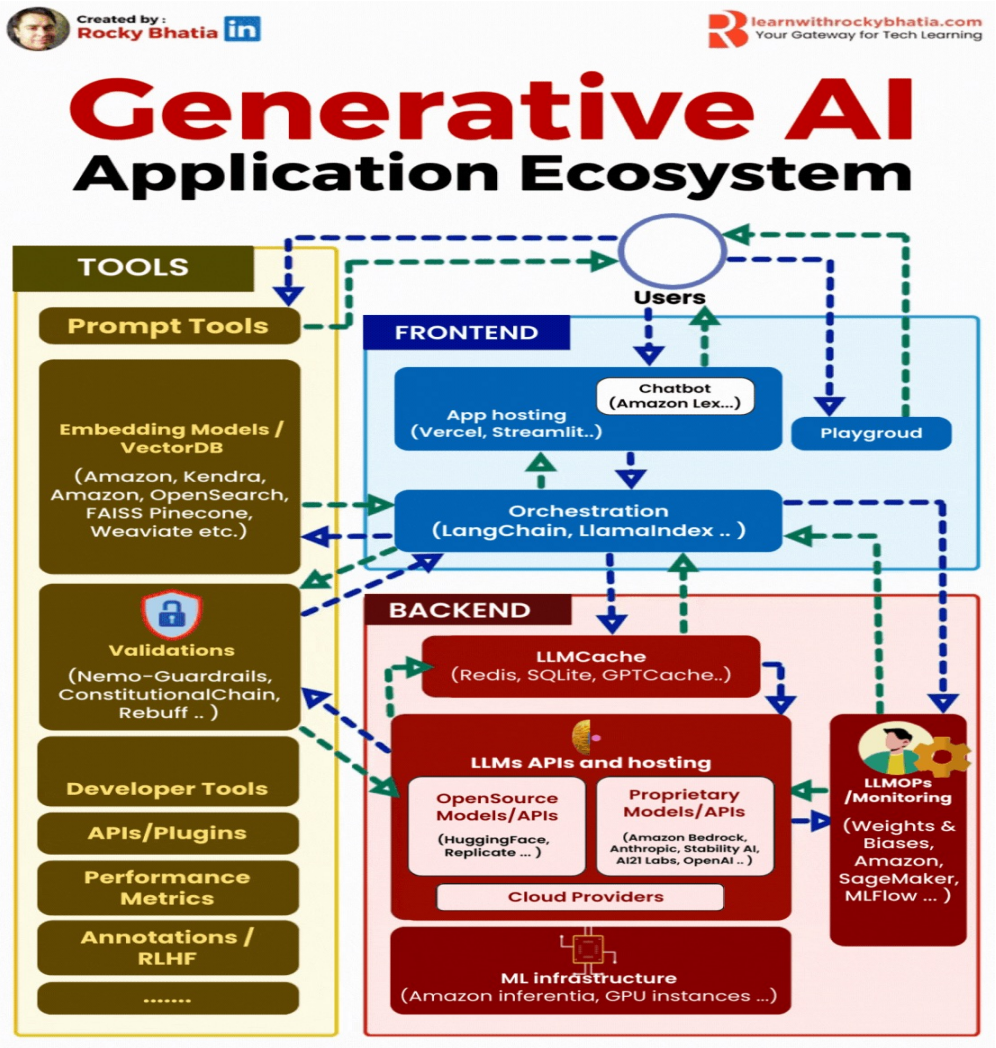
The Landscape of Artificial Intelligence




Created by : Rocky Bhatia
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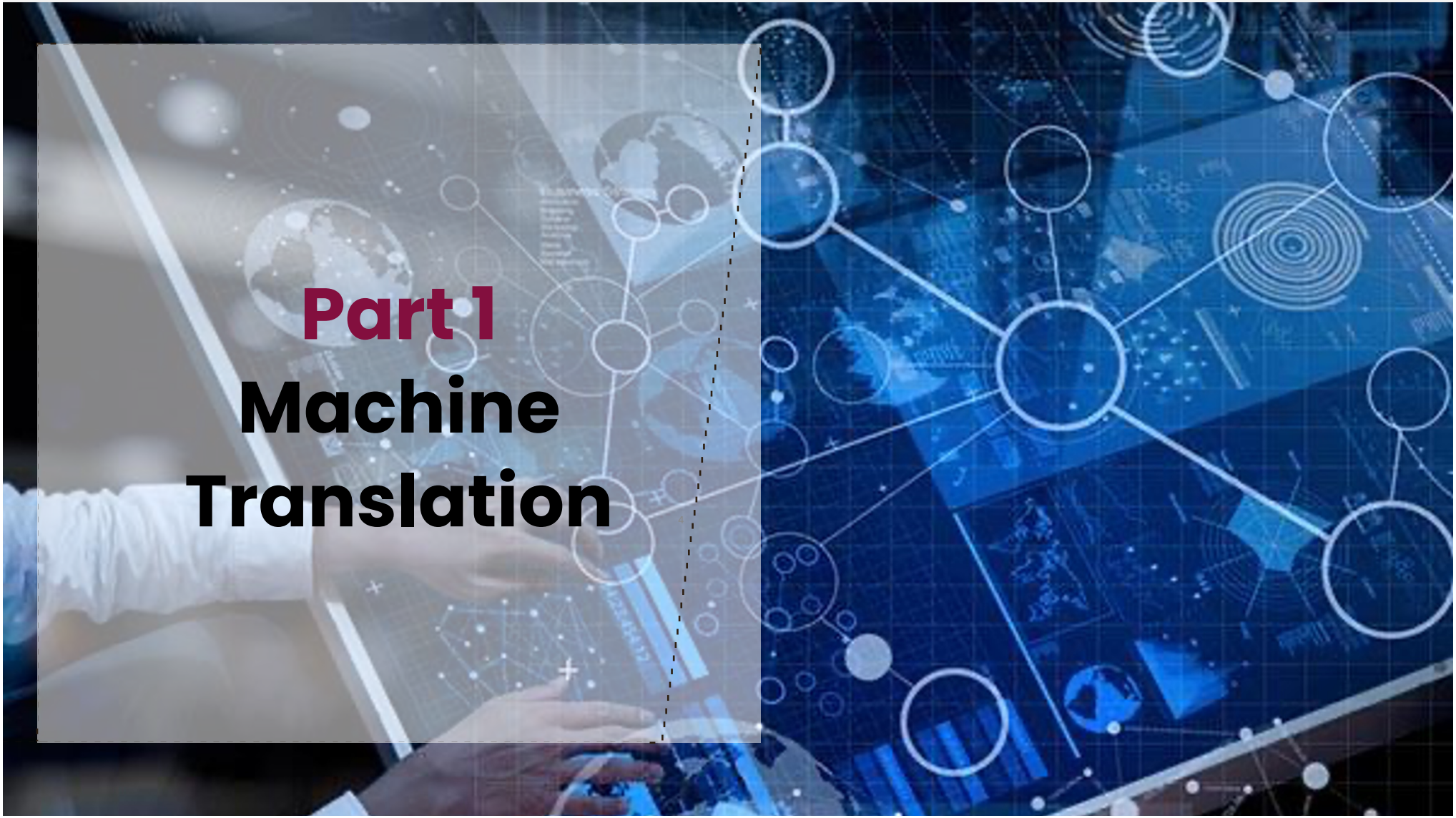
Your Gateway for Tech Learning
Generative AI
Application Ecosystem
TOOLS
Prompt Tools
Embedding Models / VectorDB
(Amazon, Kendra, Amazon, OpenSearch, FAISS Pinecone, Weaviate etc.)
Validations
(Nemo-Guardrails, ConstitutionalChain, Rebuff ..)
Developer Tools
APIs/Plugins
Performance Metrics
Annotations / RLHF
.....
Users
FRONTEND
App hosting
(Vercel, Streamlit..)
Chatbot
(Amazon Lex...)
Playgroud
Orchestration
(LangChain, LlamaIndex ..)
BACKEND
LLMCache
(Redis, SQLite, GPTCache..)
LLMs APIs and hosting
OpenSource Models/APIs
(HuggingFace, Replicate ...)
Proprietary Models/APIs
(Amazon Bedrock, Anthropic, Stability AI, AI21 Labs, OpenAI ..)
Cloud Providers
ML infrastructure
(Amazon inferentia, GPU instances ...)
LLMOPs /Monitoring
(Weights & Biases, Amazon, SageMaker, MLFlow ...)


Part 1
Machine
Translation

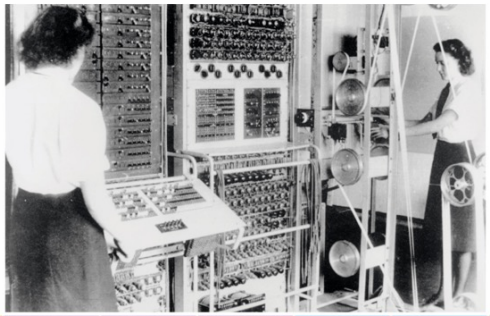
Machine Translation

DEFINITIONS

Machine Translation (MT) is the process of using **computer software** to automatically translate text from one **language** to another. This technology leverages **artificial** intelligence, **natural language** processing, and **deep learning** techniques to understand and translate the linguistic elements of the source **language** into the target language. **MT** can be categorized into different approaches, including rules-based, statistical, hybrid, and **neural machine** translation.

HISTORY

Machine Translation at a Glance



1943
A COLOSSUS MARK 2 CODEBREAKING COMPUTER OPERATED BY DOROTHY DU BOISSON (LEFT) AND ELSIE BOOKER (RIGHT).

1940s | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2010s | 2020s

The field of **machine translation emerges during World War II** when there was a need for quick translation of military and scientific documents.

Research in machine translation **shifts toward rule-based approaches**, focusing on linguistic analysis and translation rules.

Statistical machine translation gains prominence with the use of large available language data sets to train statistical models. Researchers also explore syntax-based machine translation.

Neural machine translation techniques revolutionize the field. Based on artificial neural networks, NMT learns to generate translations end-to-end without relying on explicit linguistic rules.

Approaches to machine translation

Rule-based machine translation (RBMT)
Statistical machine translation (SMT)
Syntax-based machine translation (SBMT)
Neural machine translation (NMT)
Hybrid machine translation (HMT)
Example-based machine translation (EBMT)

Leading machine translation tools

Google Translate
DeepL
Microsoft Translator
Yandex Translate
Amazon Translate
Systran

Machine translation challenges

Understanding cultural nuances and idiomatic expressions remains a challenge
Difficulty understanding context
Requires domain-specific language models in specialized fields like law and medicine
Reflects biases in the training data, resulting in inaccurate translations

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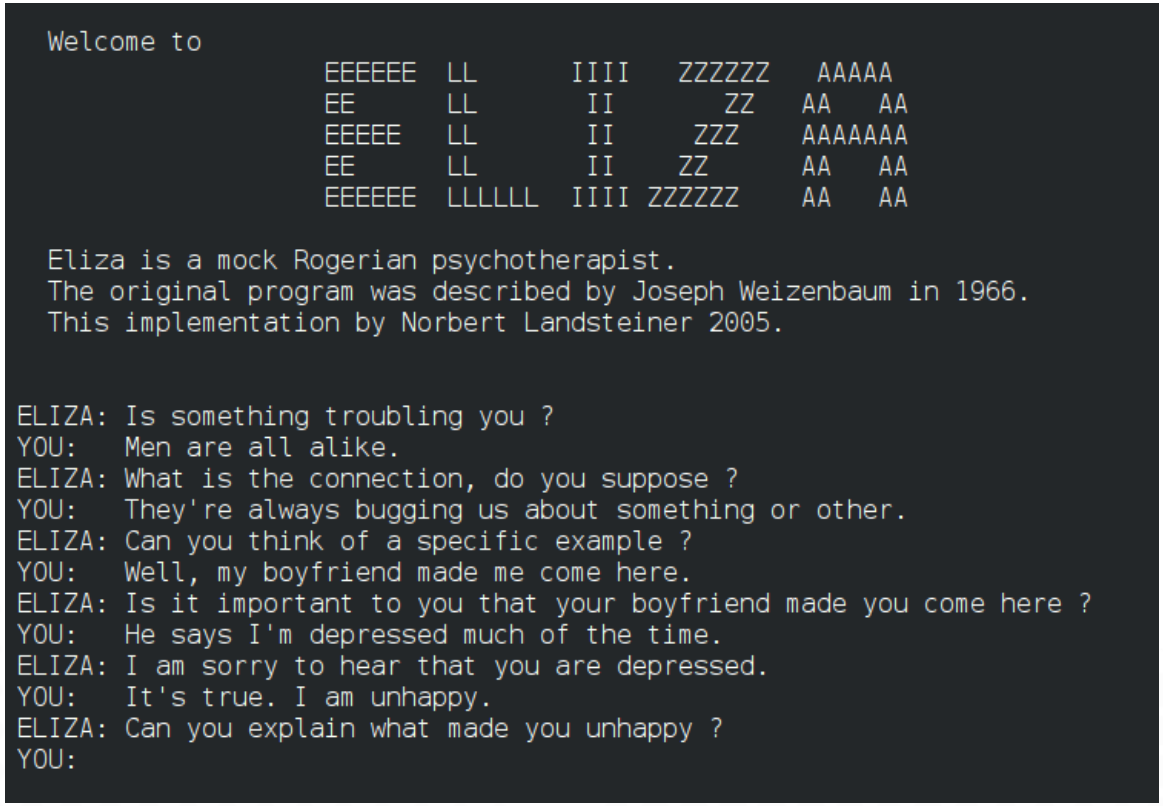
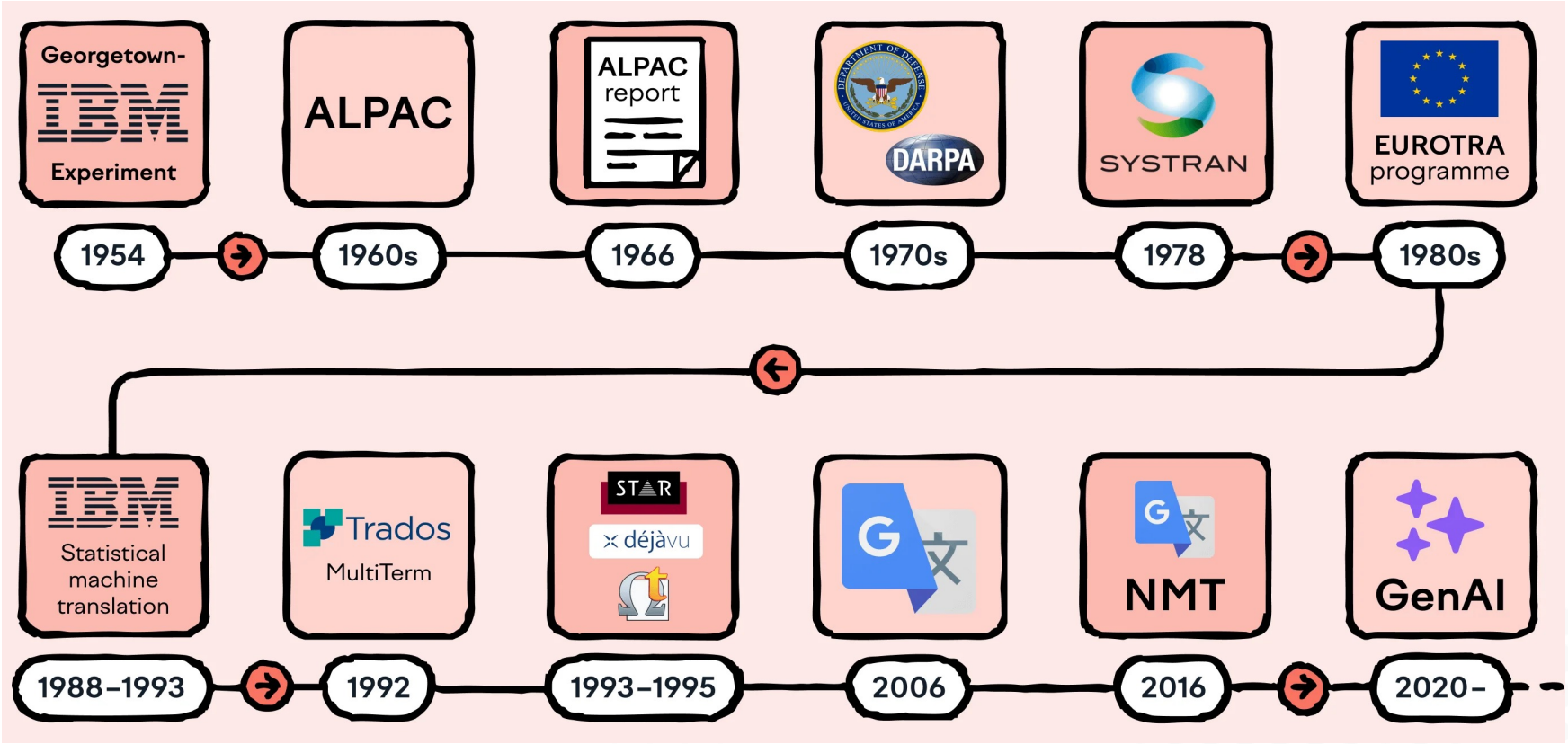
Once Upon A Time... ELIZA

ELIZA is an early natural language processing computer program developed from 1964 to 1967 at MIT by Joseph Weizenbaum. Created to explore communication between humans and machines, ELIZA simulated conversation by using a pattern matching and substitution methodology that gave users an illusion of understanding on the part of the program, but had no representation that could be considered really understanding what was being said by either party.



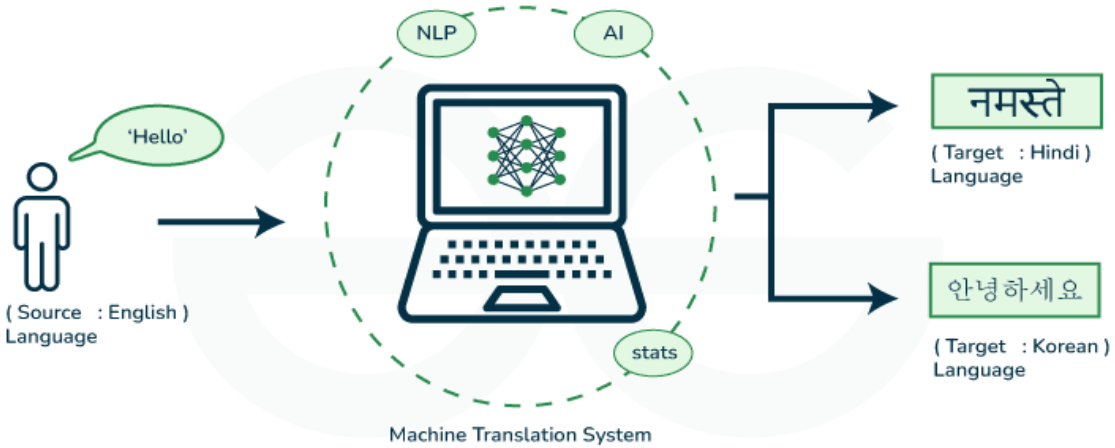
HISTORY

History of Machine Translation



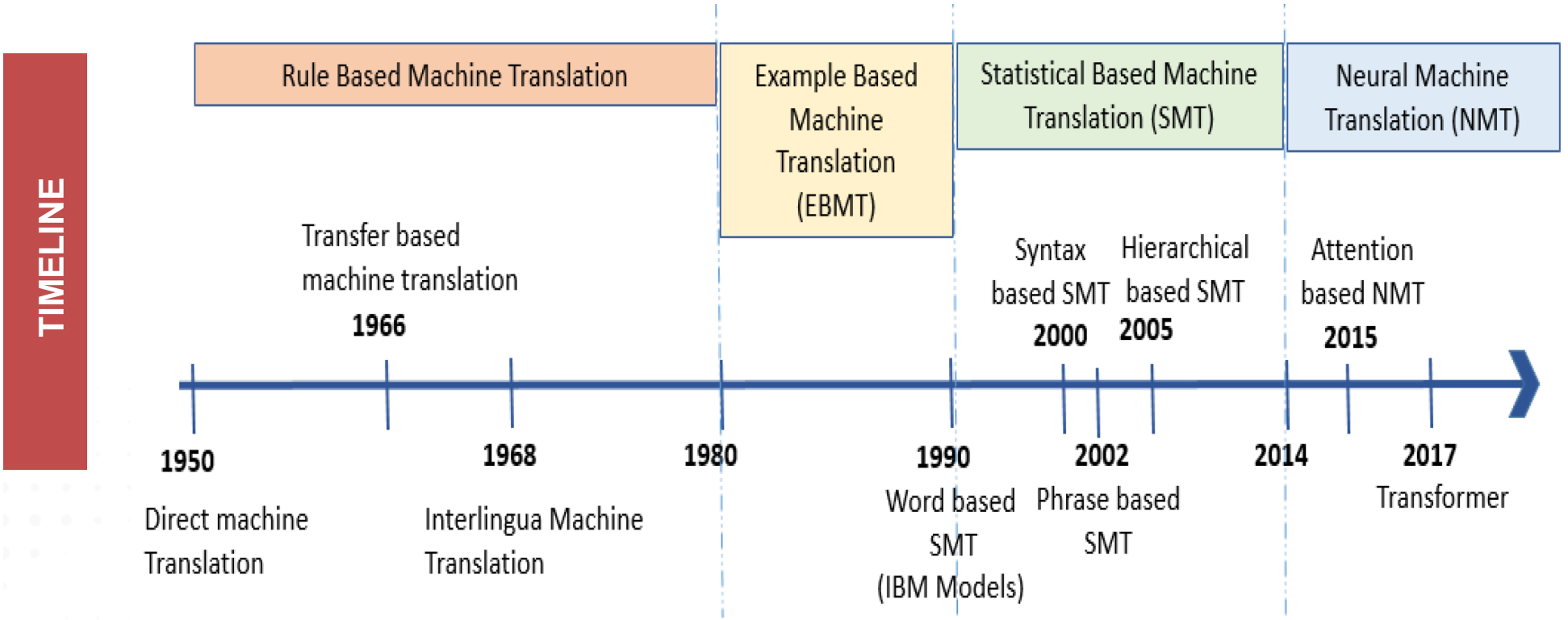
Machine Translation System

System



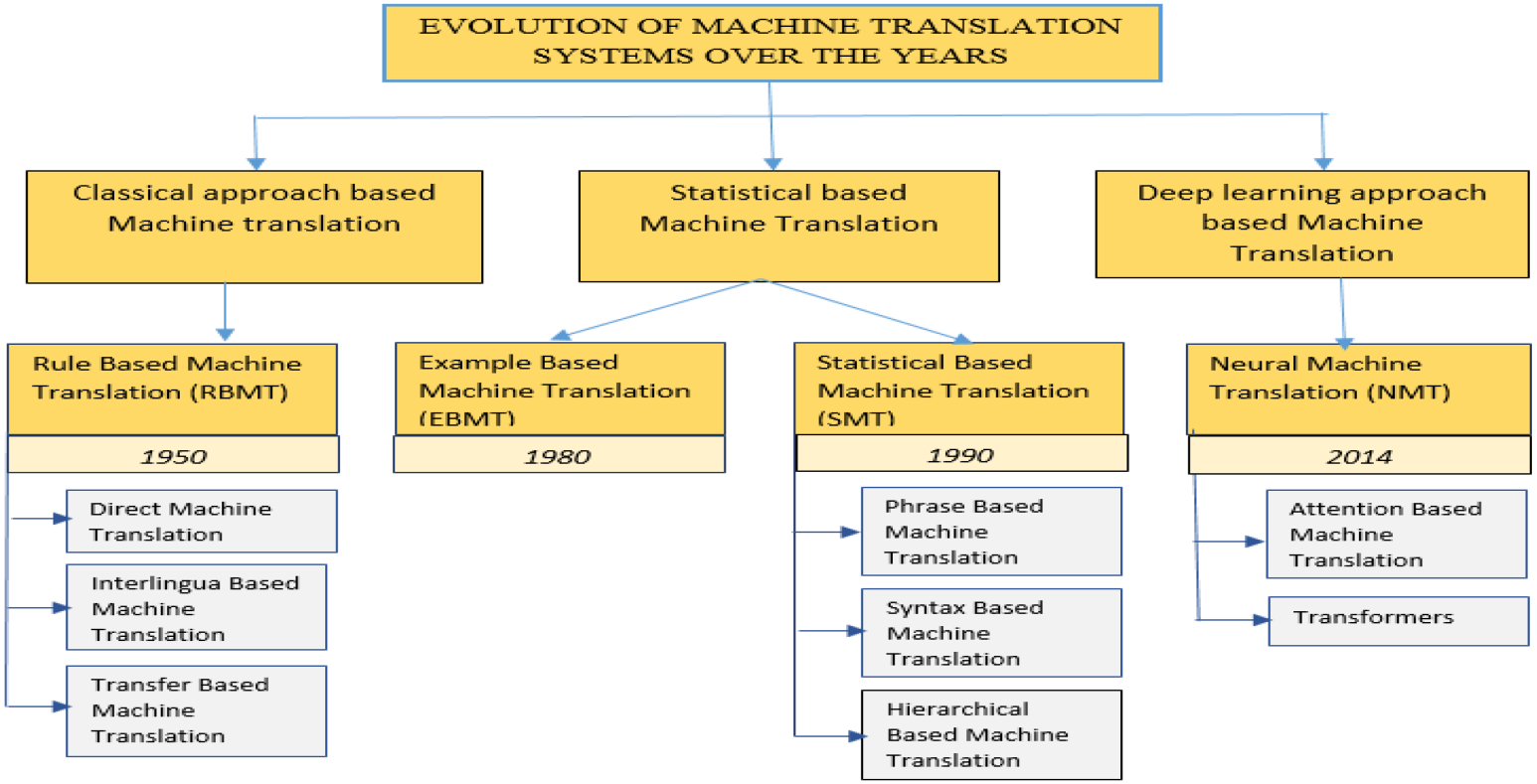
1. Machine translation is a sub-field of computational linguistics that focuses on developing systems capable of automatically translating text or speech from one language to another.
2. In Natural Language Processing (NLP), the goal of machine translation is to produce translations that are not only grammatically correct but also convey the meaning of the original content accurately.

Timeline of Machine Translation



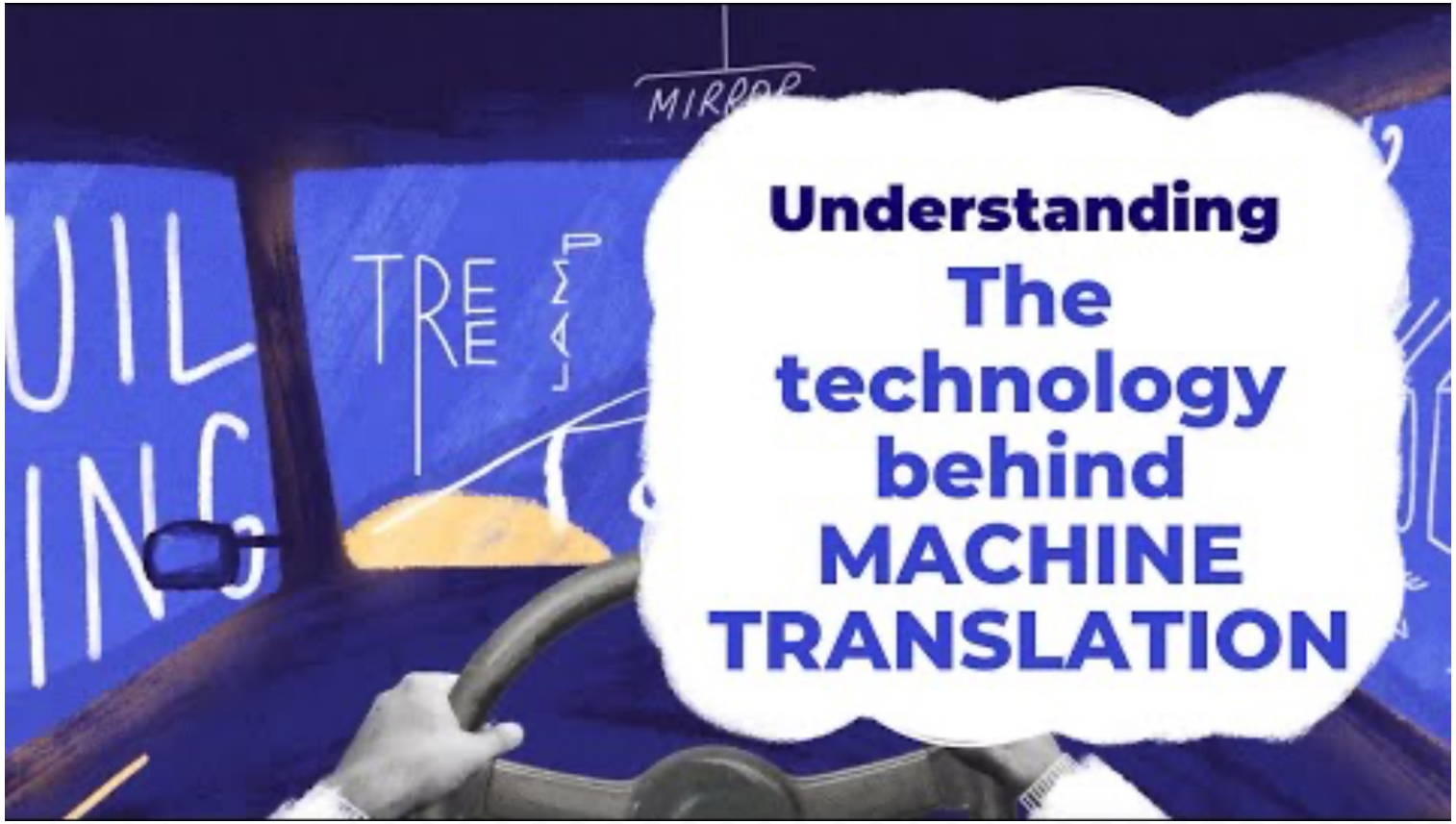
TYPE

Types of Machine Translation



The Technology Behind Machine Translation

YOUTUBE



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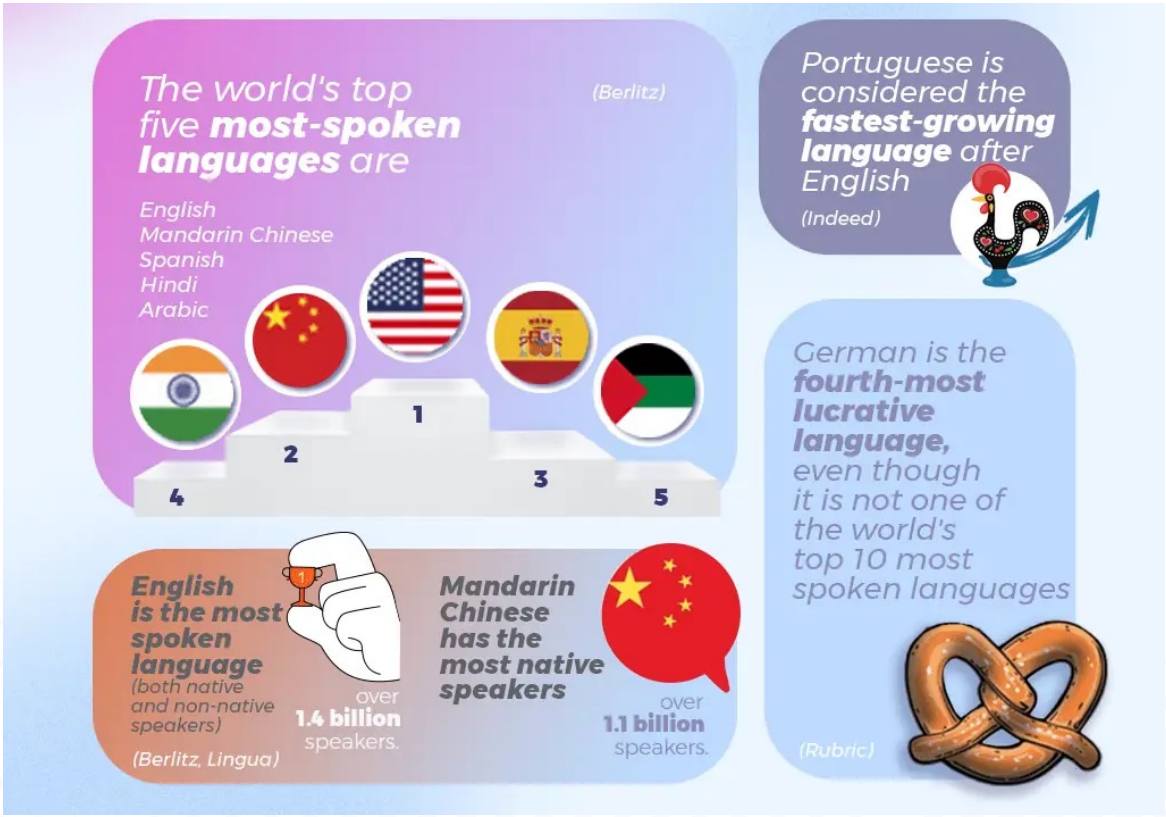
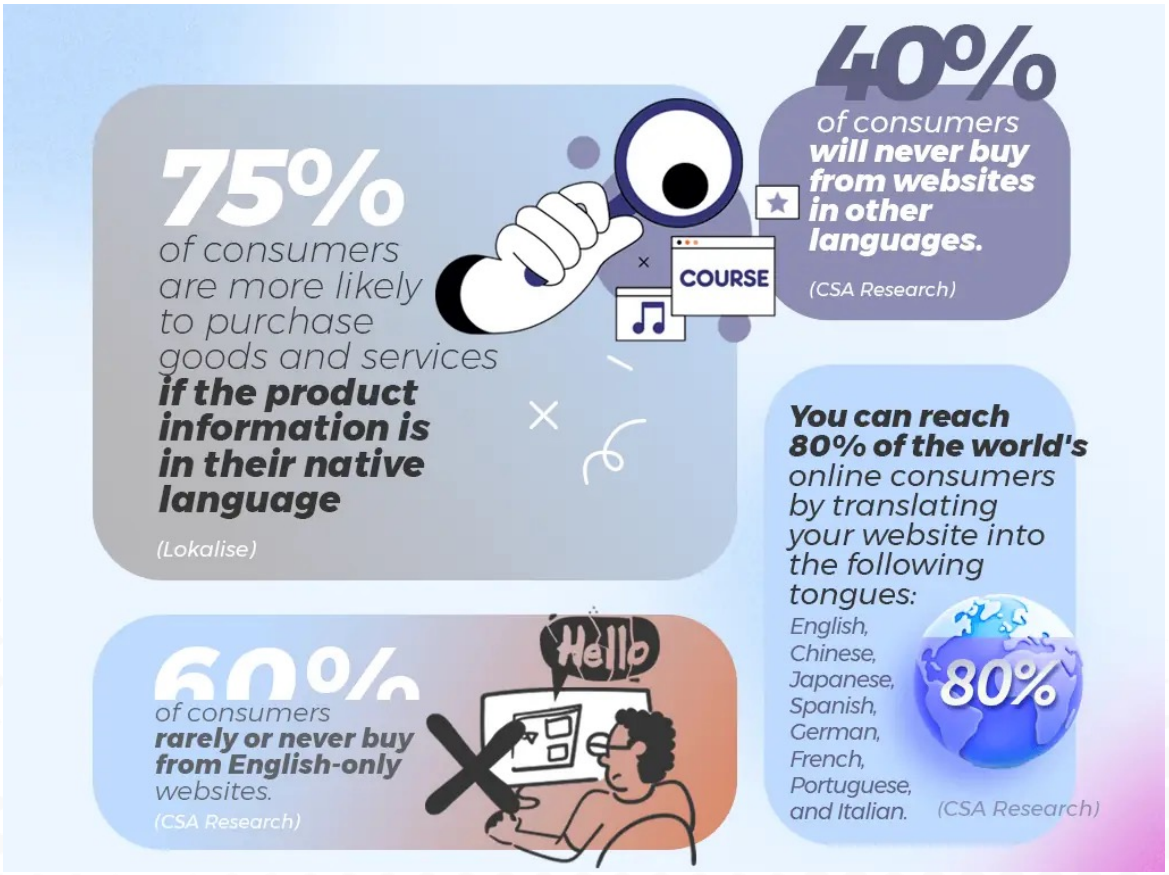
LANGUAGE

Overview of Language Statistics



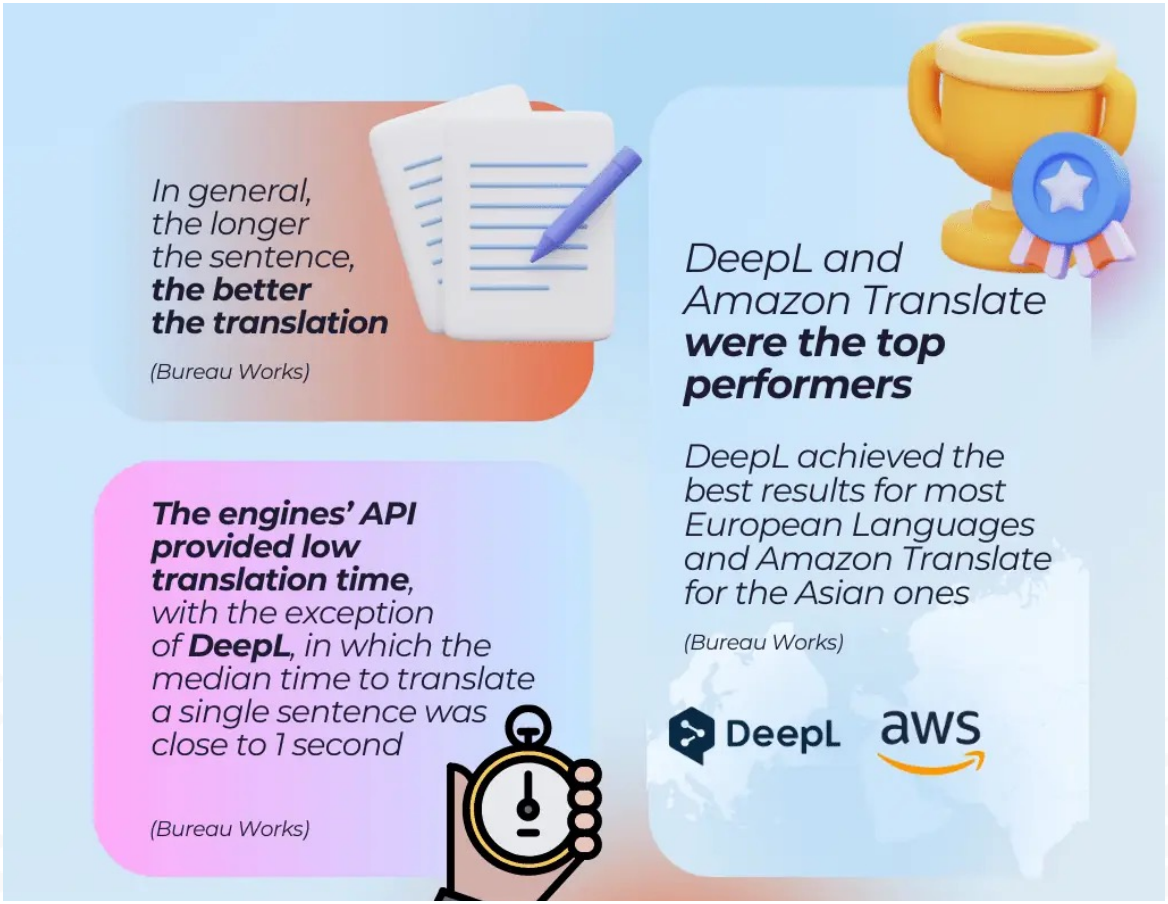
MARKET

Global Translation Market



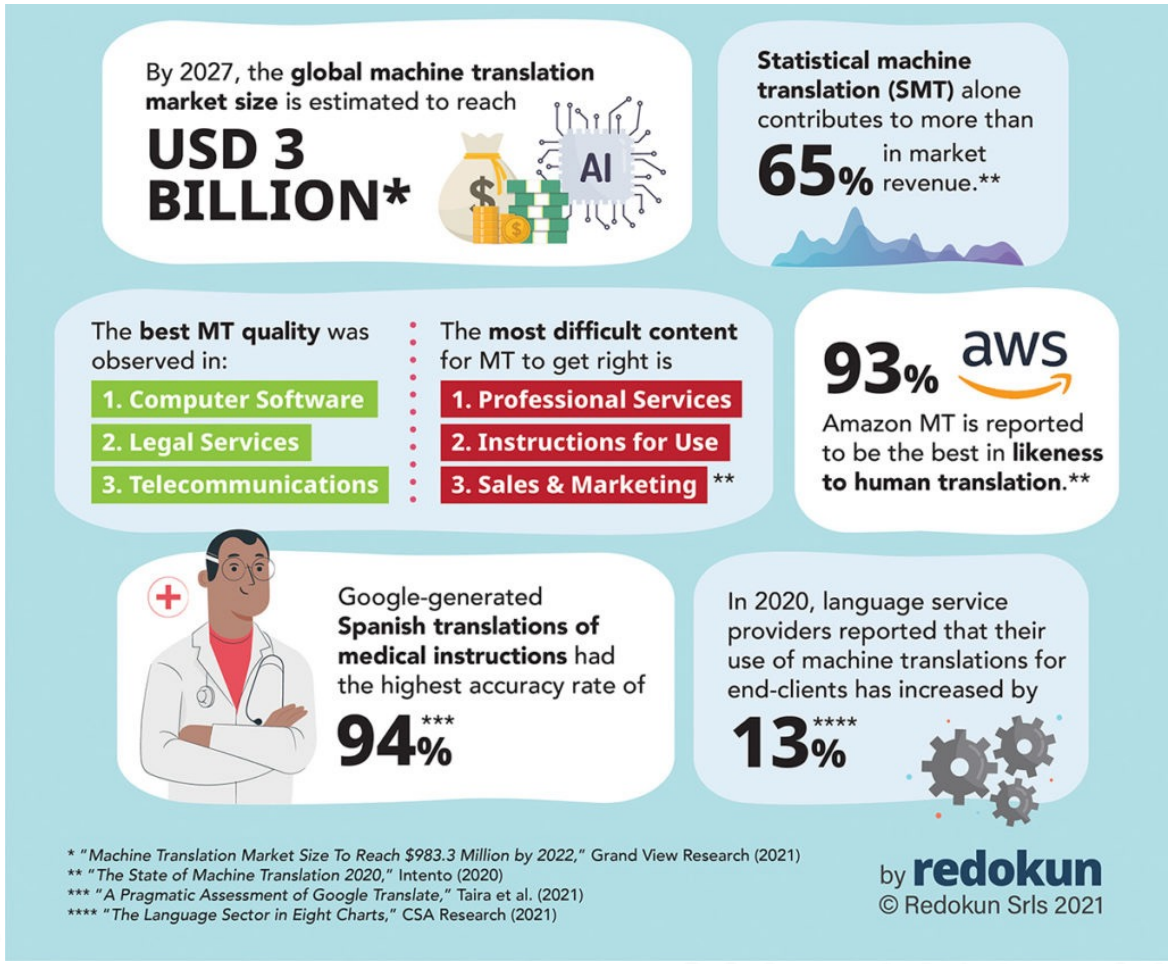
API

Machine Translation API



STATISTICS

Machine Translation Statistics



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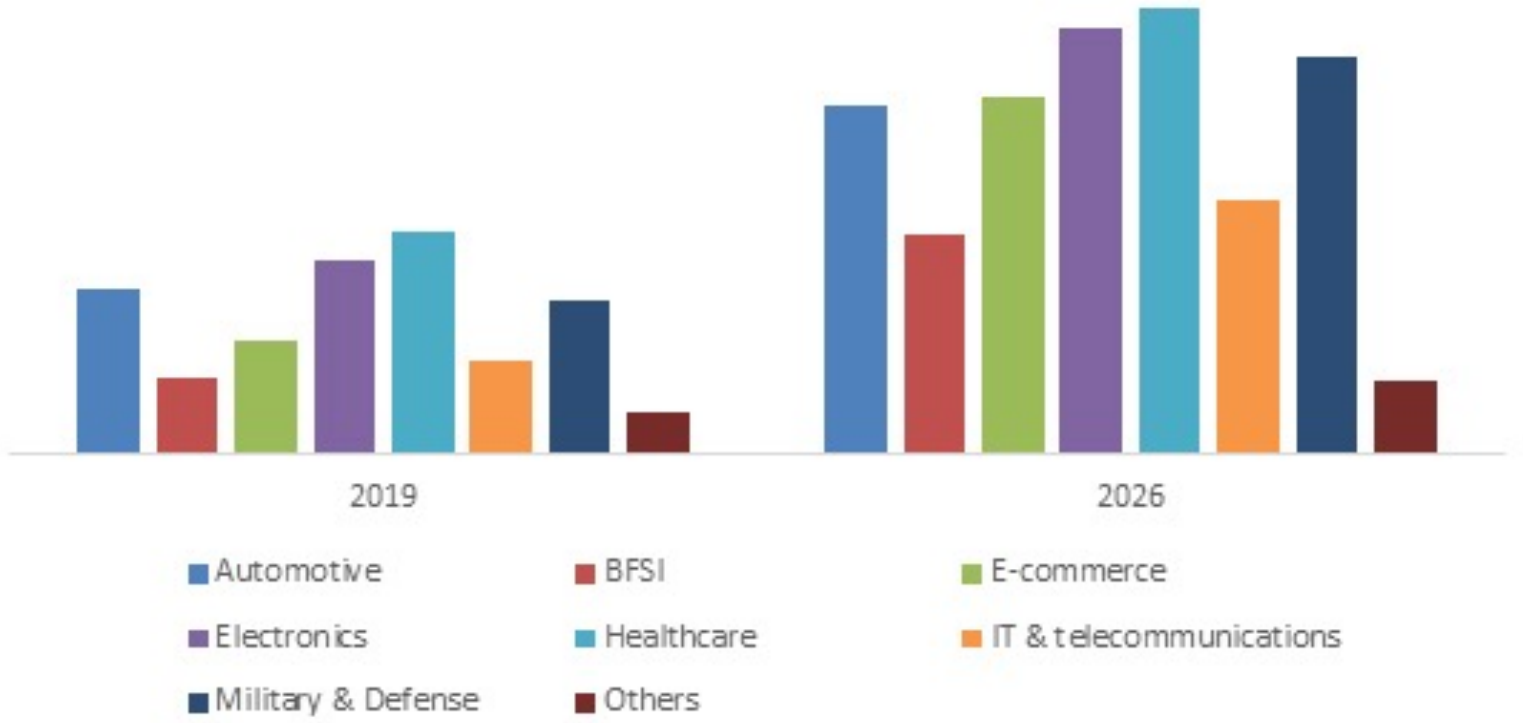
STATISTICS

USA Machine Translation Market Size



Source: www.gminsights.com

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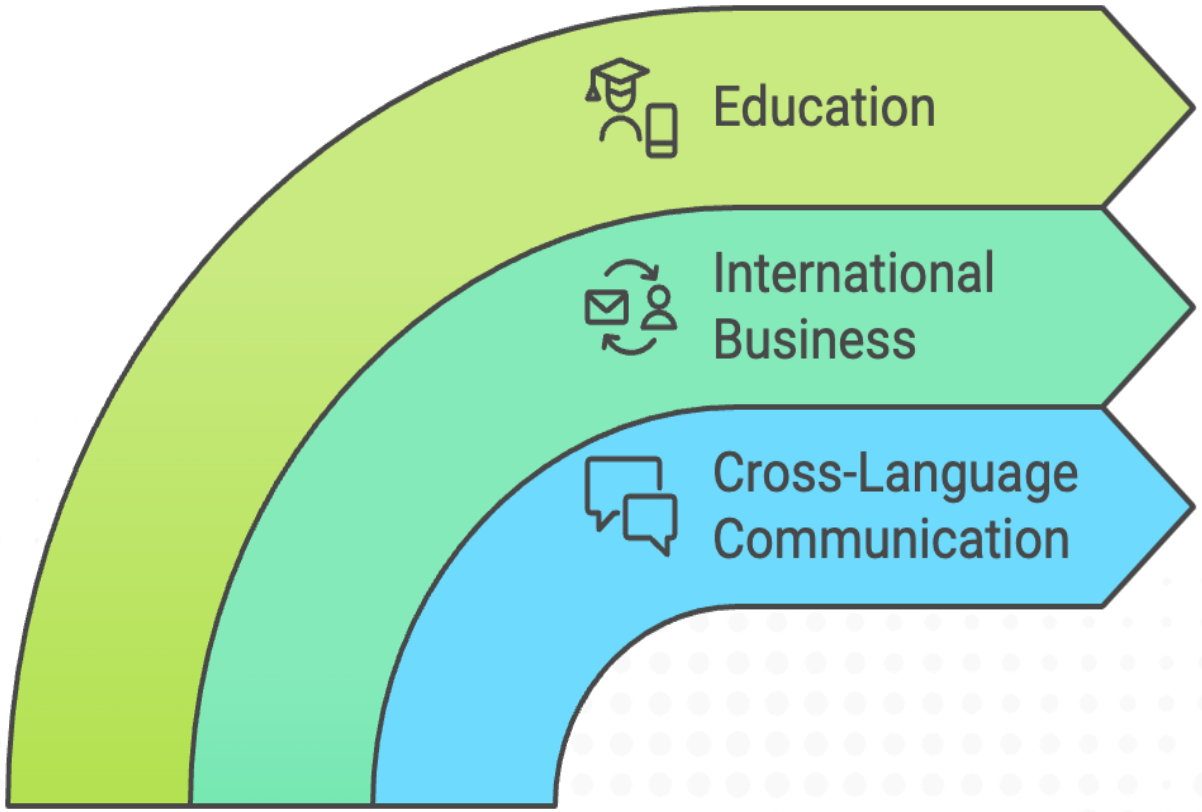
Applications of Machine Translation

APPLICATION



Provides access to learning materials in various languages

Facilitates translation of emails, documents, and contracts

Enables social media and messaging in multiple languages

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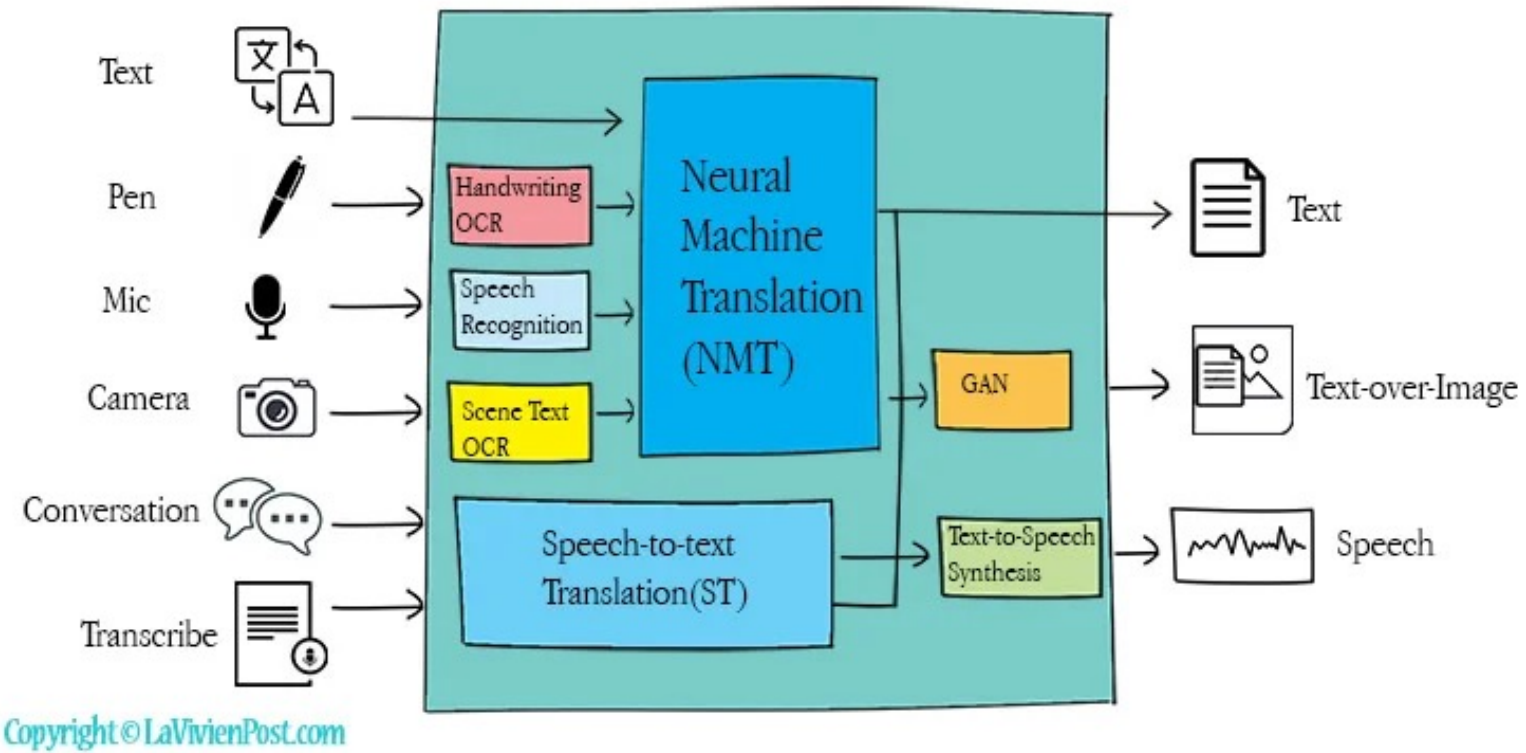
Importance of Machine Translation

IMPORTANCE

1. **Improved Communication:** Enables cross-language communication, facilitating global collaboration.
2. **Cost Savings:** Faster and cheaper than human translation, ideal for large volumes of text.
3. **Increased Accessibility:** Expands digital content reach, enhancing user experience for diverse language speakers.
4. **Efficiency Boost:** Streamlines translation for quick, large-scale processing.
5. **Language Learning Aid:** Supports language learners by translating unfamiliar words and phrases, aiding skill development.

APPLICATION

Google Translate Architecture



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Technologies and Tools

TECHNOLOGIES

Transformer Models
BERT, GPT, T5 – Core models powering advanced machine translation.

Libraries
Hugging Face, OpenNMT, Fairseq* – Frameworks for building and training translation models.

Online Tools
Google Translate API, AWS Translate – APIs for accessible, scalable translation solutions.

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Challenges in Machine Learning

CHALLENGES

1. **Ambiguity in Language**: Some words have multiple meanings, which makes it hard for machines to capture the exact meaning. *Example*: The word "bank" can mean a financial institution or the side of a river. Without knowing the context, a machine might pick the wrong meaning.

2. **Context Understanding**: Machines struggle to understand the context of long sentences, leading to errors in translation. *Example*: "She saw the man with a telescope." It is unclear whether she used the telescope to see the man or if the man had a telescope.

3. **Idioms and Colloquialisms**: Idioms and local expressions can be difficult for machines to translate properly, as they often don't make sense word-for-word. *Example*: The phrase "It's raining cats and dogs" means it's raining heavily. A direct translation might confuse someone who isn't familiar with this expression.

TRENDS

Trends in Translation Technology

1. **Machine Learning & AI**: Revolutionizes translation with improved accuracy, pattern recognition, and adaptability to industry-specific terminology.
2. **Neural Machine Translation (NMT)**: Uses deep learning for contextually accurate translations, enhancing quality and consistency over time.
3. **Cloud-Based Translation**: Scalable, collaborative, and accessible services, integrating AI for efficient and accurate translations.
4. **Computer-Assisted Translation (CAT) Tools**: Boosts productivity with translation memories, glossaries, and quality assurance features.
5. **Blockchain in Translation**: Enables secure, transparent payments and streamlined processes for translation services.
6. **Timeless Human Translation**: Essential for nuanced, culturally aware translations, especially in specialized fields like legal and medical.

Future of Machine Translation

FUTURE

1. **Advances in AI:** Enhanced contextual understanding and accuracy in translations.
2. **Real-Time Translation:** Integration with AR/VR for seamless, instant translations.
3. **Customized MT Systems:** Industry-specific translations for improved relevance and precision.

Machine Translation Article

ARTICLES

- Septarina, A. A., Rahutomo, F., & Sarosa, M. (2019). Machine translation of Indonesian: A review. *Communications in Science and Technology, 4*(1), 12–19.
- Rahutomo, F., Septarina, A. A., Sarosa, M., Setiawan, A., & Huda, M. M. (2019). A review on Indonesian machine translation. *Journal of Physics: Conference Series, 1402*(7), 077040. IOP Publishing. https://doi.org/10.1088/1742-6596/1402/7/077040
- Mulyadi, Y. P., & Marion, E. C. (2022). Analysis of Japanese-Indonesian translation using machine translation. In Proceedings of the 3rd Asia Pacific International Conference on Industrial Engineering and Operations Management (pp. 1-10). Johor Bahru, Malaysia
- Miranda, B. O. S., Yuliansyah, H., & Biddinika, M. K. (2012). Machine translation Indonesian Bengkulu Malay using neural machine translation-LSTM. *Indonesian Journal of Computing and Cybernetics Systems, 18*(3). https://doi.org/10.22146/ijccs.98384

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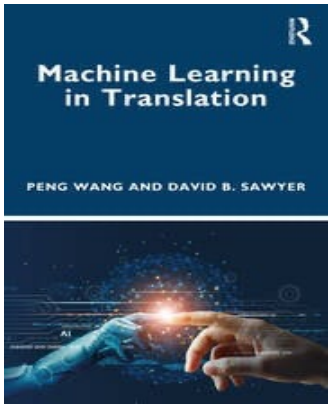
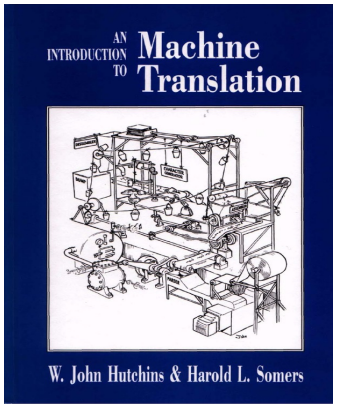
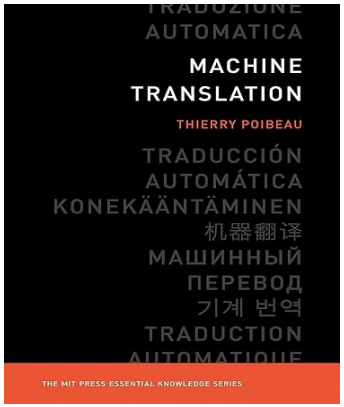
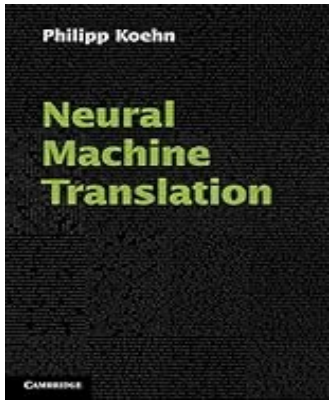
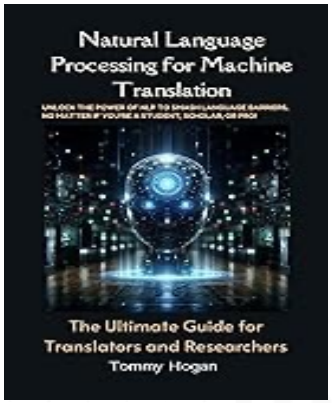
BOOKS

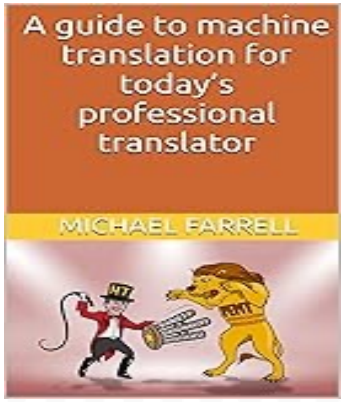


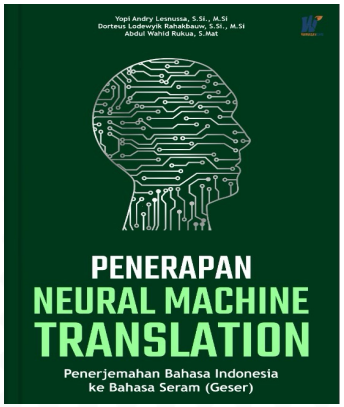


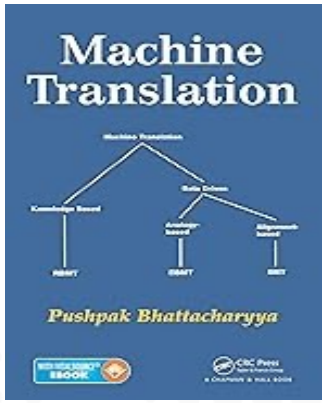












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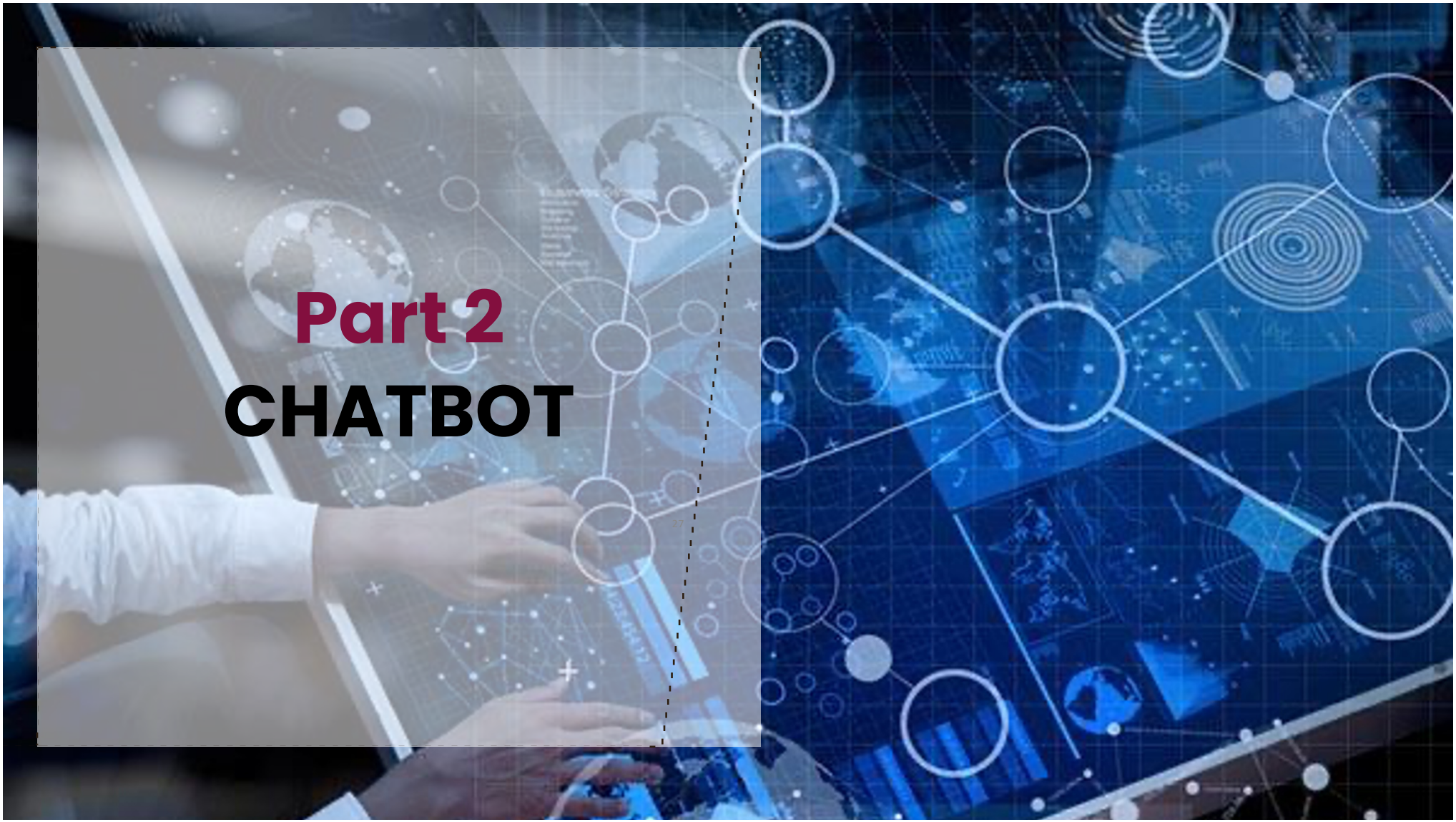
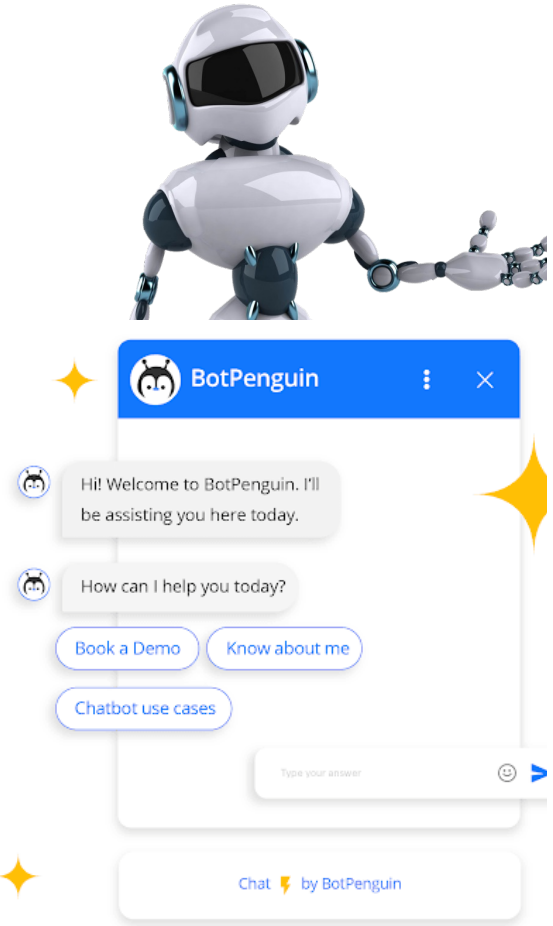

Part 2
CHATBOT

Chatbot

DEFINITIONS

A chatbot is a **computer** program designed to simulate conversation with human users through text or voice interactions. These AI-driven systems use **natural language processing** to understand and respond to user queries, providing information, assistance, or performing specific tasks. Chatbots are widely used in various fields such as customer service, education, and entertainment.



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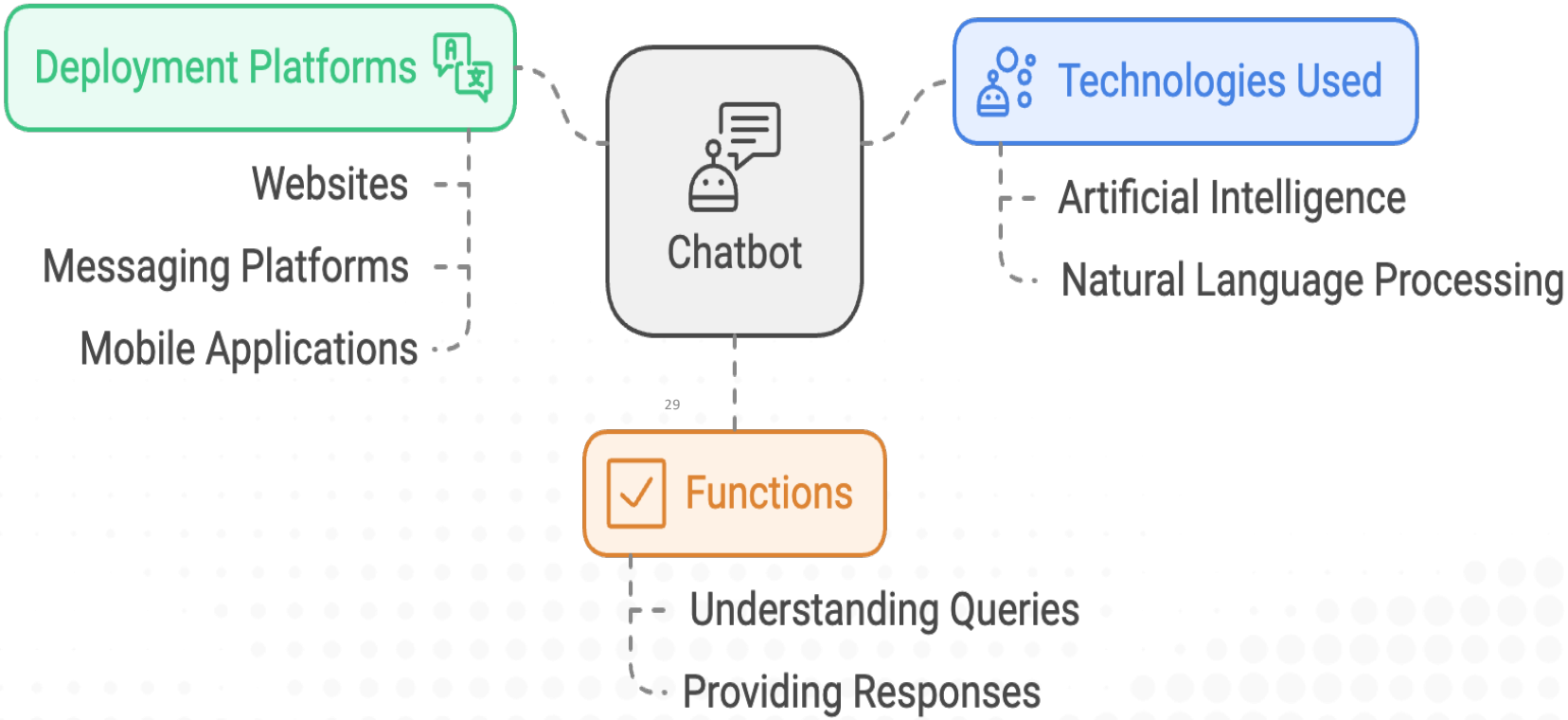
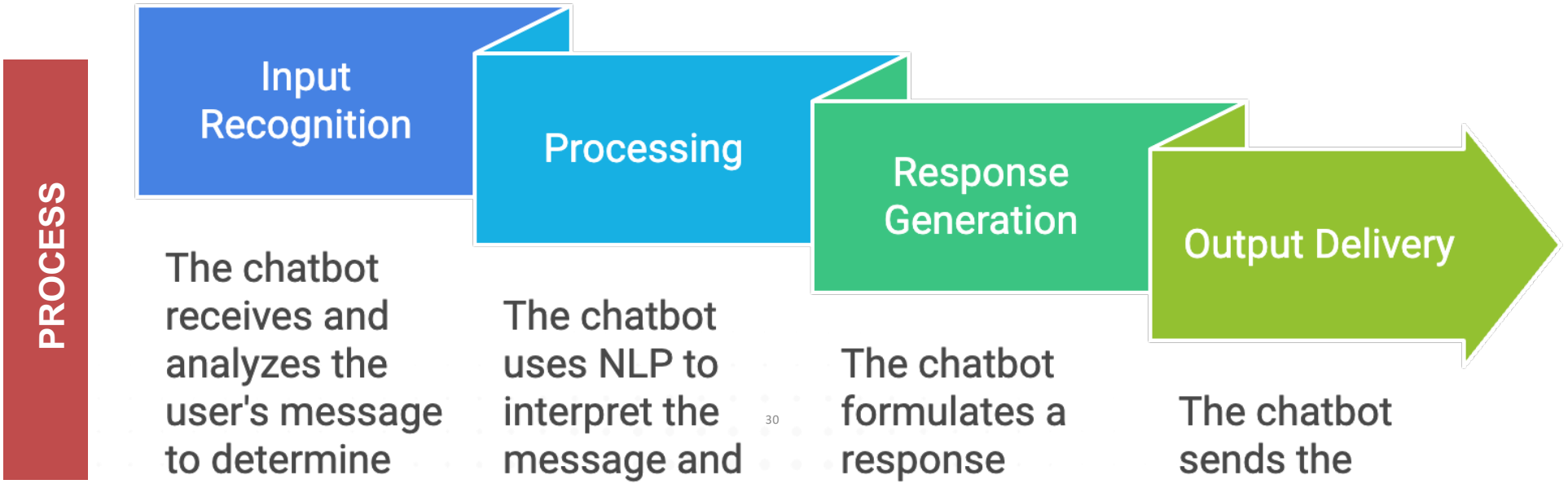
DEFINITIONS

Chatbot



Chatbot Interaction Process



Evolution of Chatbot

EVOLUTION

1950
Turing Test

1966
ELIZA
keywords, programmed responses

1972
PARRY
emotional responses

1988
Jabberwacky
contextual pattern matching

1992
AI-powered chatbot

1995
A.L.I.C.E

2010+
Siri, Alexa, Google Assistant
responds to voice commands

NOW
AI-powered conversational chatbots using NLP

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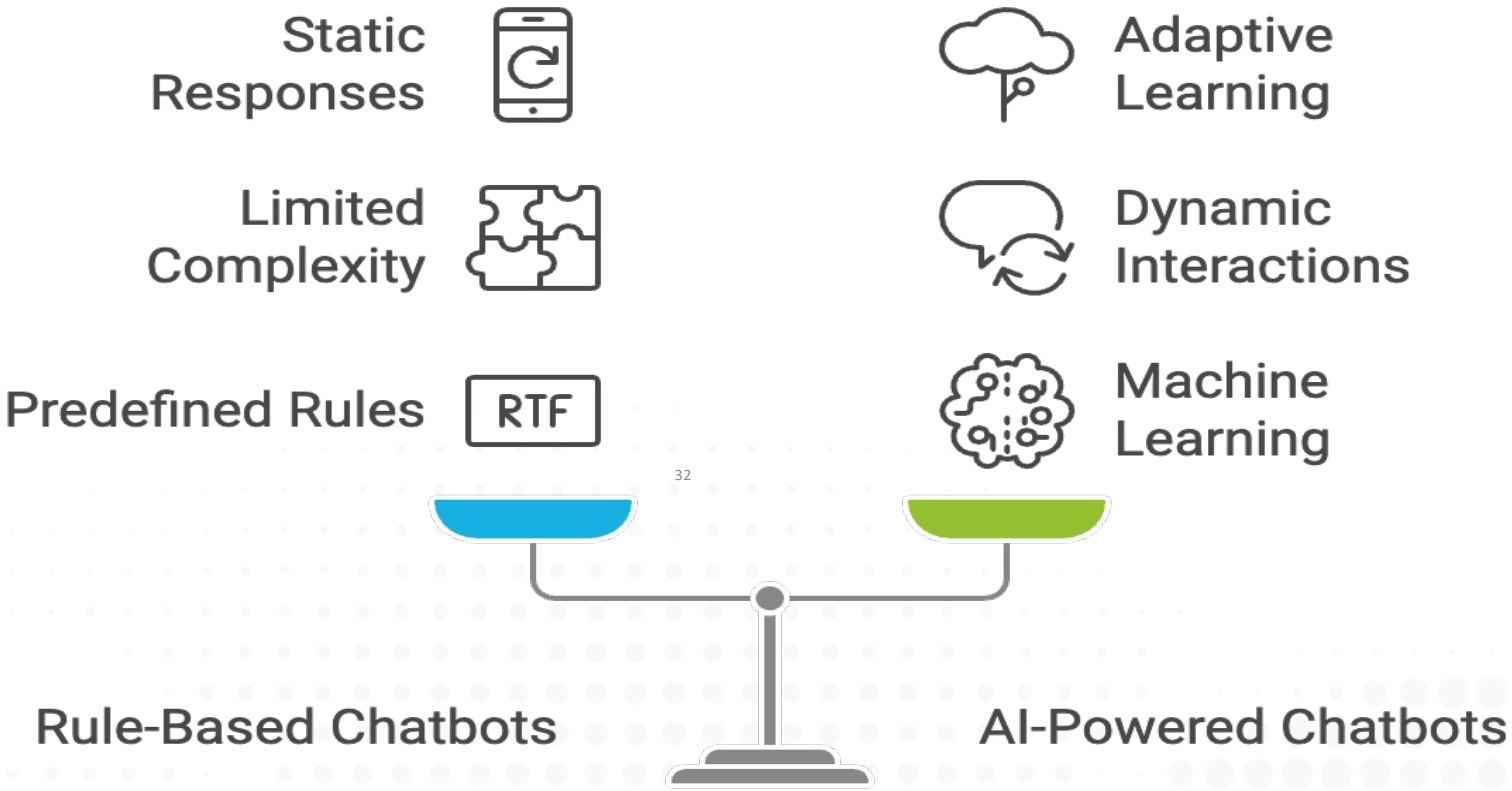
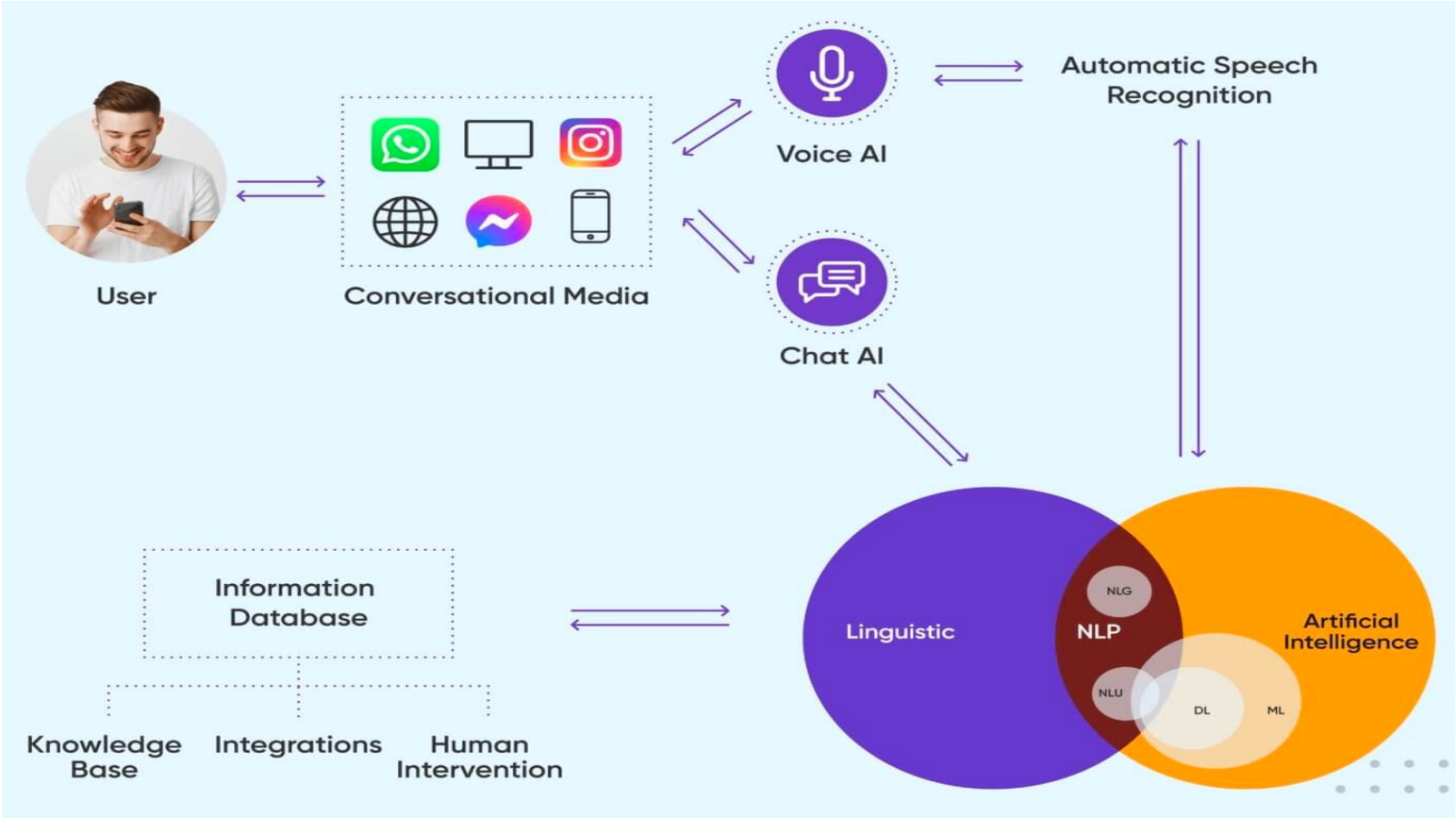
TYPES

Types of Chatbot



NLP CHATBOT

How Does an NLP Chatbot Work?



NLP CHATBOT

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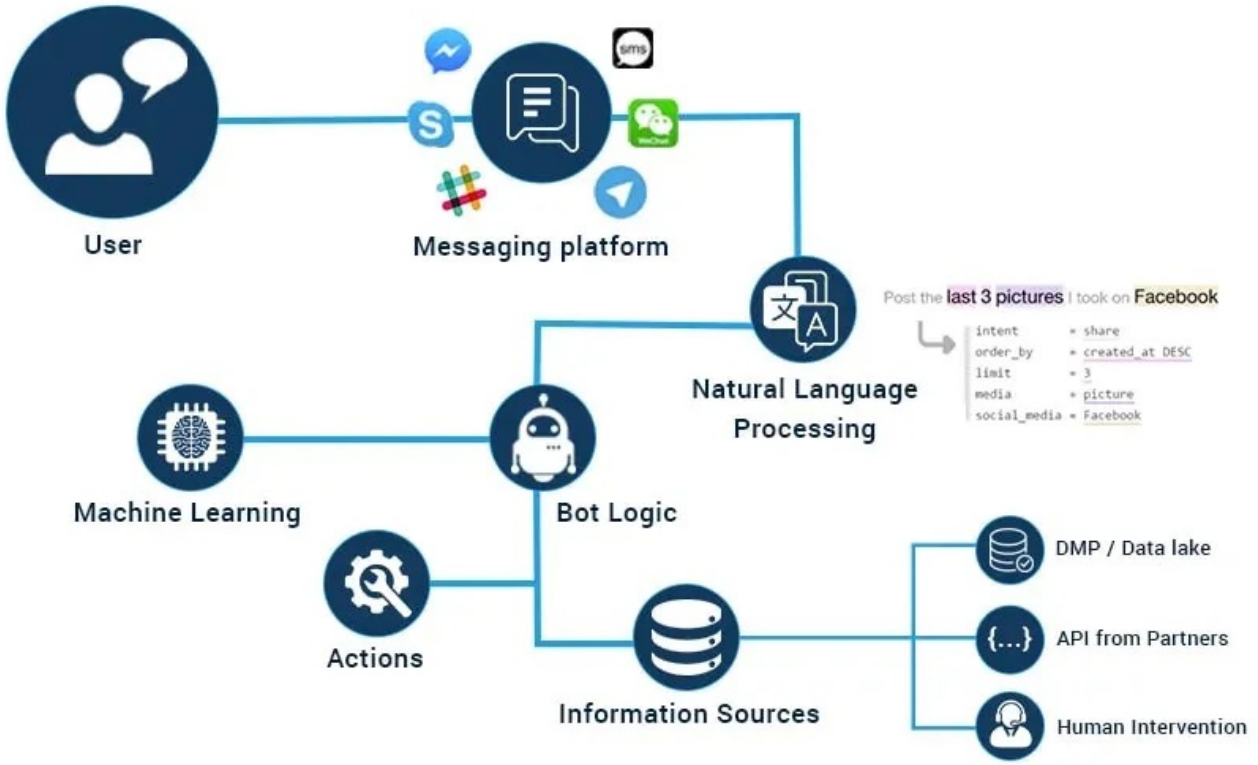

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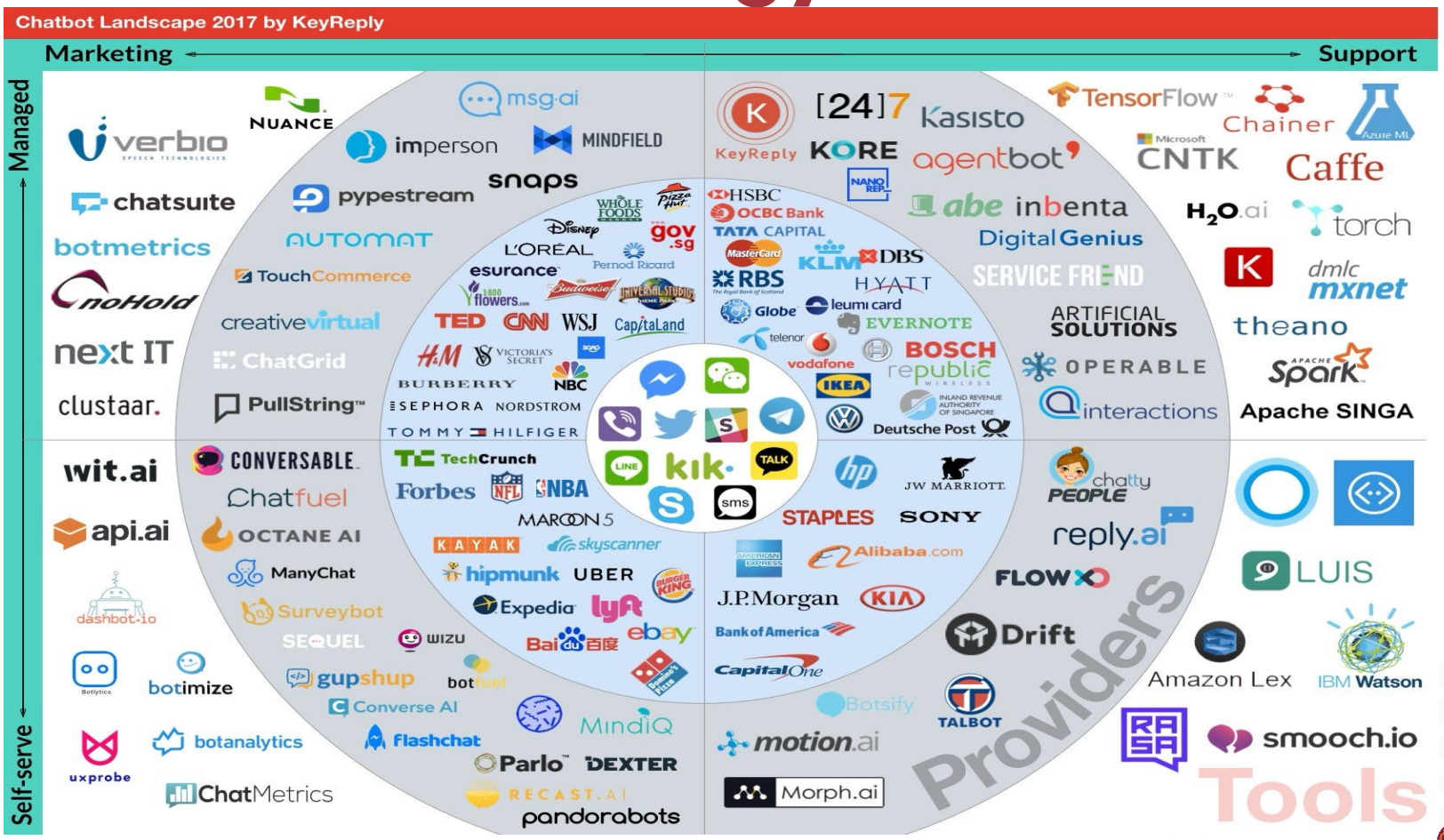
CHATBOT

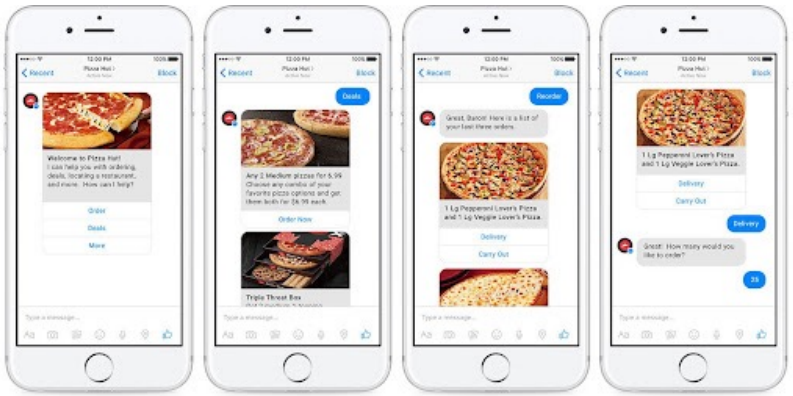
Technology Stack



Chatbot Use Case

USE CASE

1. Customer Support: Reducing response time, 24/7 availability
2. Healthcare: Symptom checking, appointment booking
3. Education: Virtual tutors, assisting with coursework
4. E-commerce: Product recommendations, customer feedback collection



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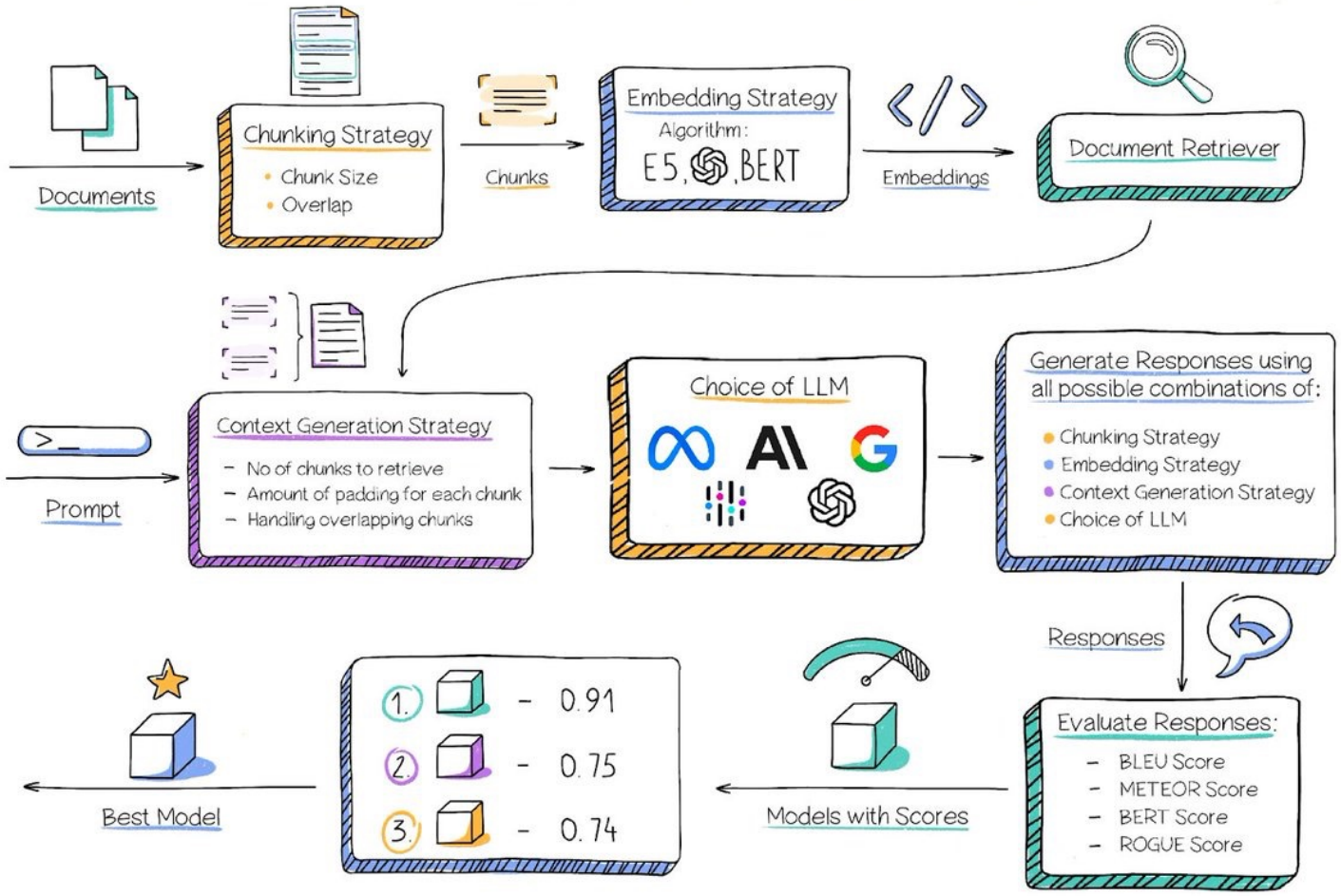
LLM CHATBOT

Create Your Own Custom LLM Chatbot



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AI Chatbot Healthcare

USE CASE

Symptom Assessment and Advice

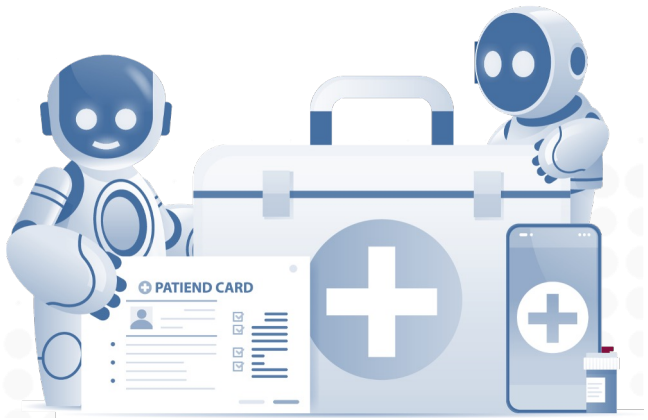
AI Chatbots provide preliminary medical guidance based on symptoms.

Appointment Management

AI Chatbots assist in scheduling and reminding patients of healthcare appointments.

Health Monitoring and Education

AI Chatbots offer personalized health monitoring and educational resources.



AI Chatbot For Social Media

USE CASE

- Customer Support
- Personalized Recommendations
- Lead Generation and Qualification
- Social Listening and Sentiment Analysis
- Interactive Content Delivery
- Automated Posting and Scheduling
- Influencer Marketing
- Social Media Advertising

AI chatbots have become increasingly popular for social media platforms as they offer businesses and users a range of benefits.

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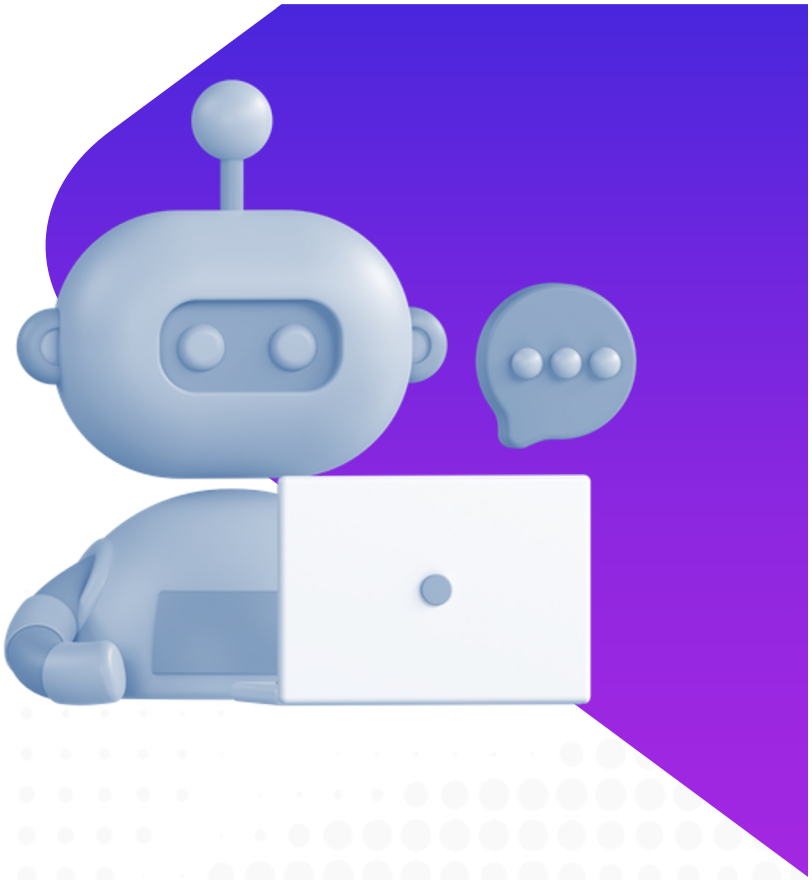
Future Trends in Technology

CHATBOT

Future trends in technology include advancements in AI Chatbot capabilities, such as improved natural language understanding and contextual conversations.



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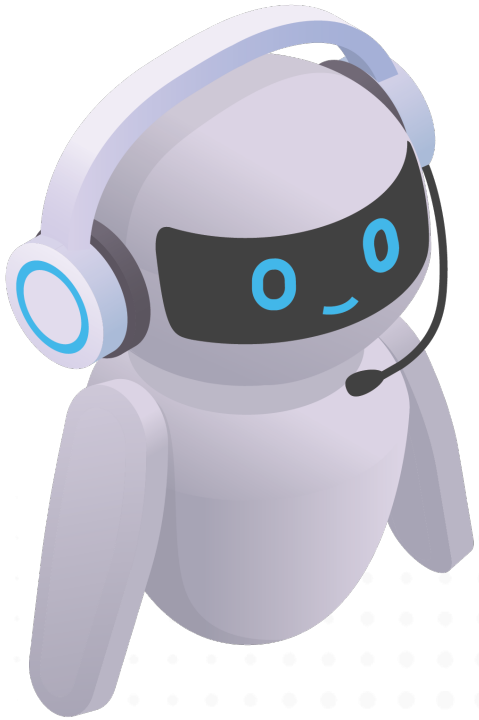
CHATBOT



"AI is like a canvas, and human creativity is the paintbrush that brings it to life."

innovative ● entrepreneurial ● global

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Thank You