

**ACADEMIC LECTURER** UNIVERSITAS AIRLANGGA

Machine Translation dan Chatbot

Mata Kuliah :  
Natural Language Processing

Guest Lecture

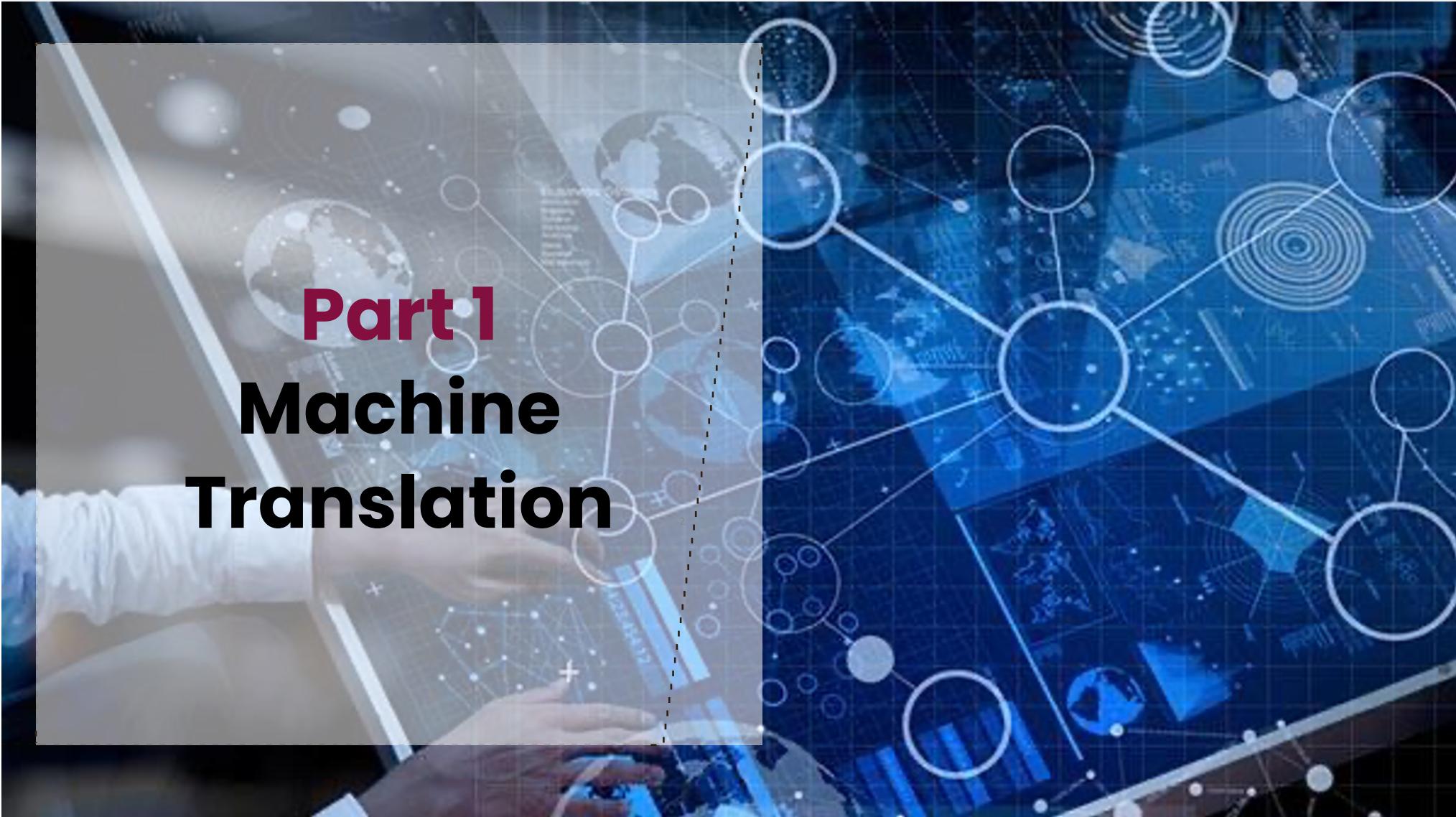
**Assoc. Prof. Dr. Mohd Shahizan bin Othman**  
Universiti Teknologi Malaysia

Selasa, 29 Oktober 2024  
07.30 - 09.30

Link : <https://zoom.us/j/95976498322>  
Password : 516249

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# **Part 1**

# **Machine Translation**

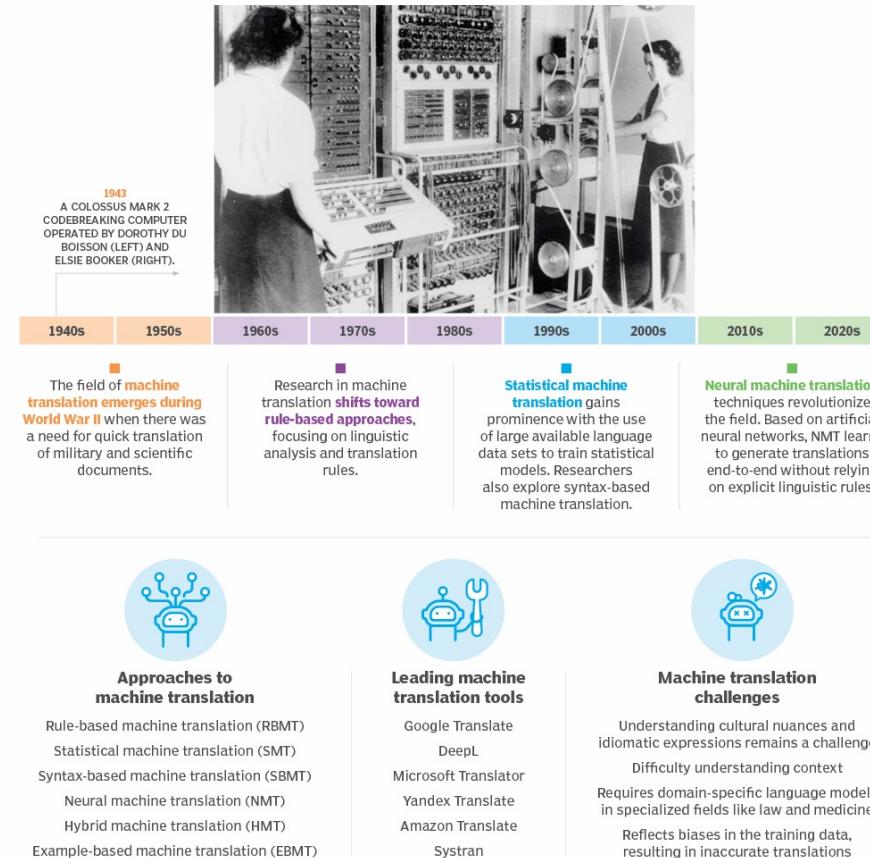
# Machine Translation

**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.

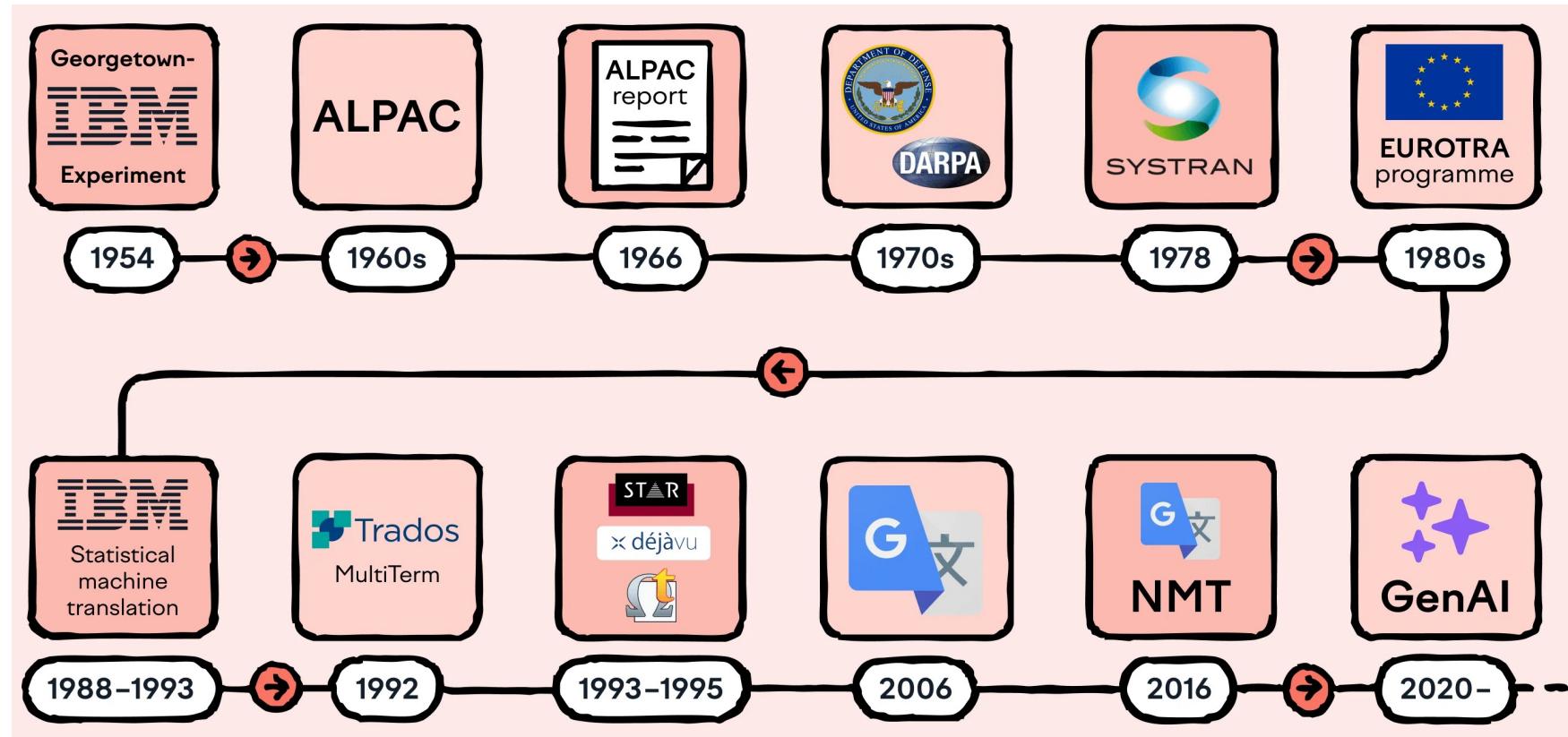


## HISTORY

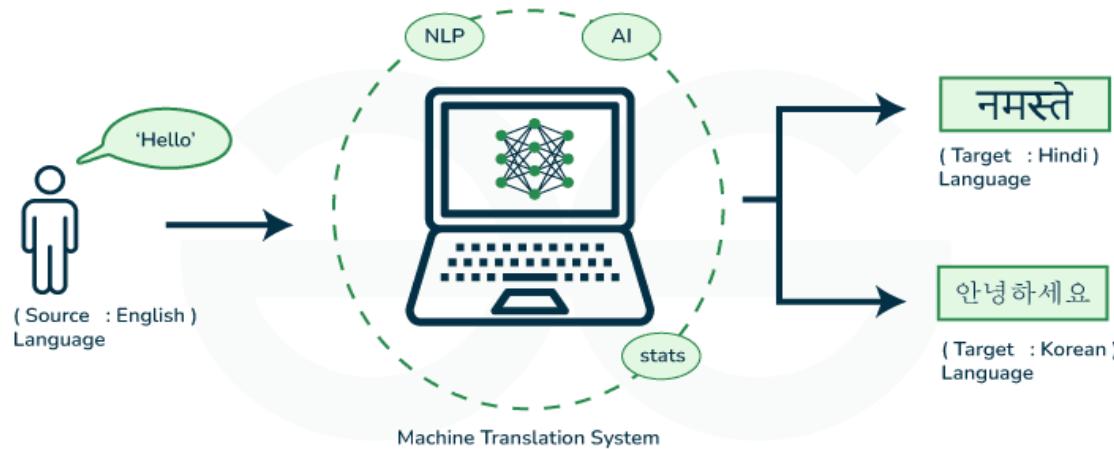
# Machine Translation at a Glance



## HISTORY

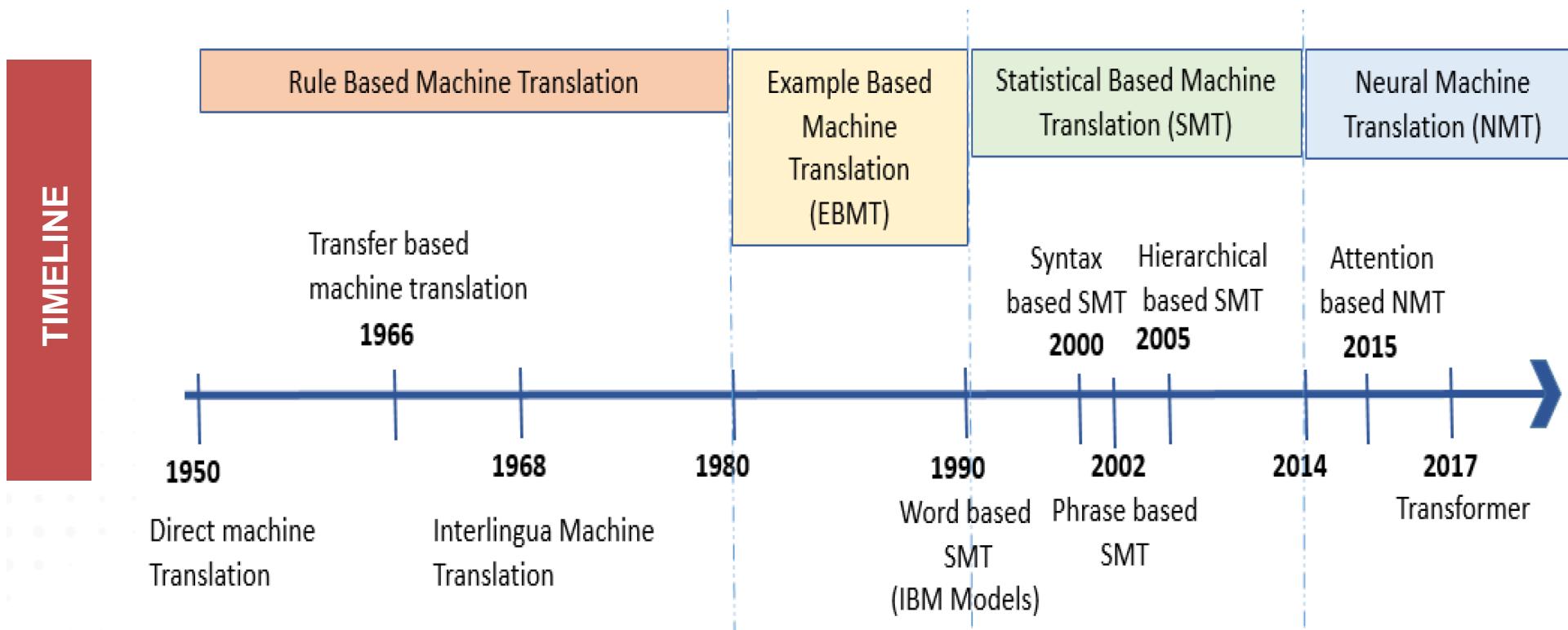


# Machine Translation System



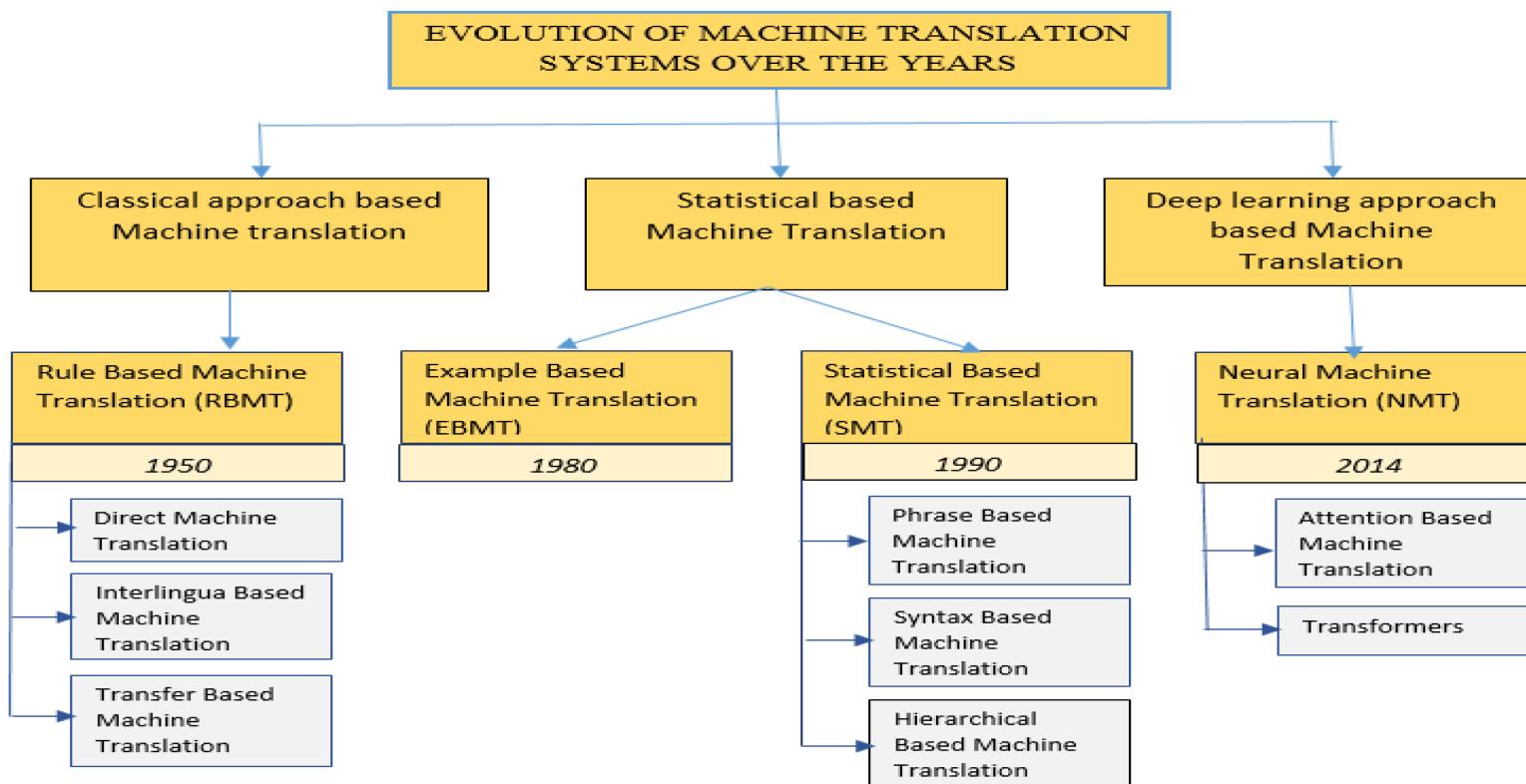
1. Machine translation is a sub-field of computational linguistics that focuses on developing systems capable of automatically translating text or speech from one language to another.
2. In Natural Language Processing (NLP), the goal of machine translation is to produce translations that are not only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

# Timeline of Machine Translation



# Types of Machine Translation

TYPE

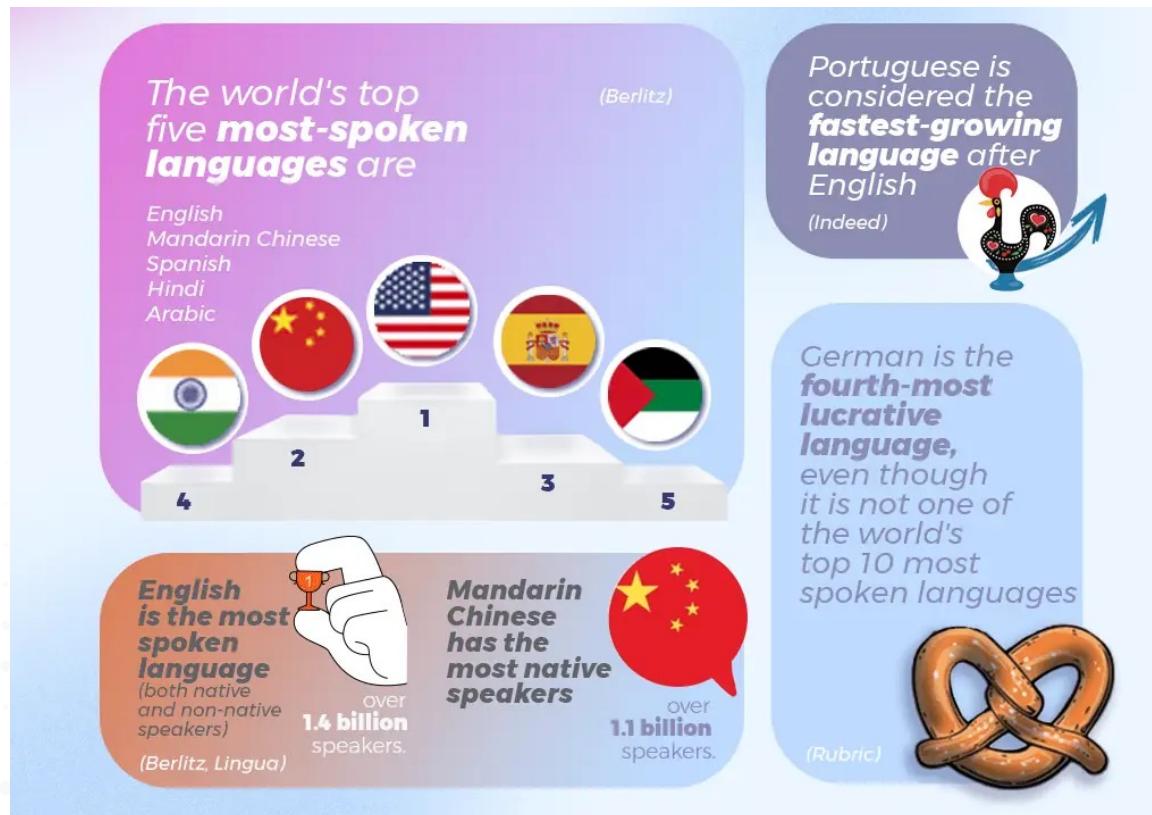


# The Technology Behind Machine Translation

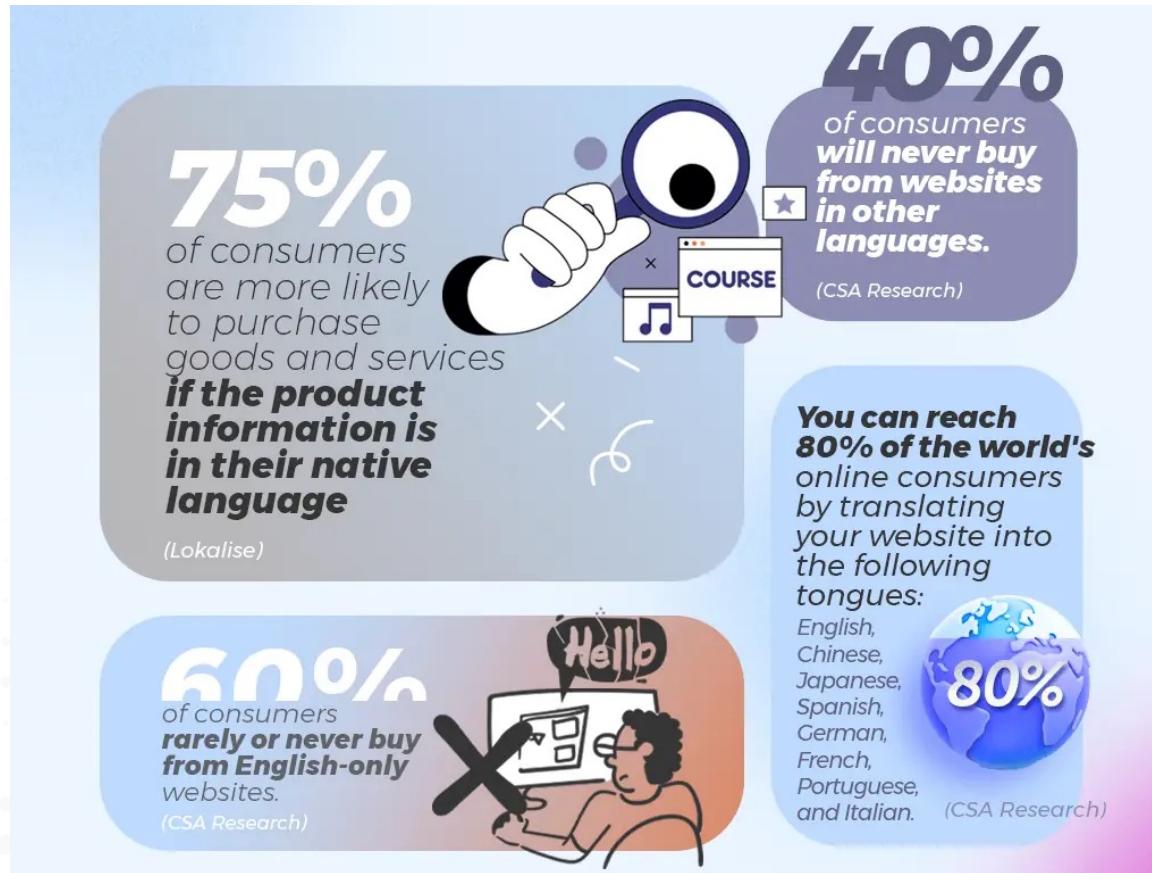


<https://youtu.be/8U-weB8Eo5c?si=y3sq6V0fVVqaXF2n>

# Overview of Language Statistics



# Global Translation Market



# Machine Translation API

*In general, the longer the sentence, **the better the translation***  
(Bureau Works)

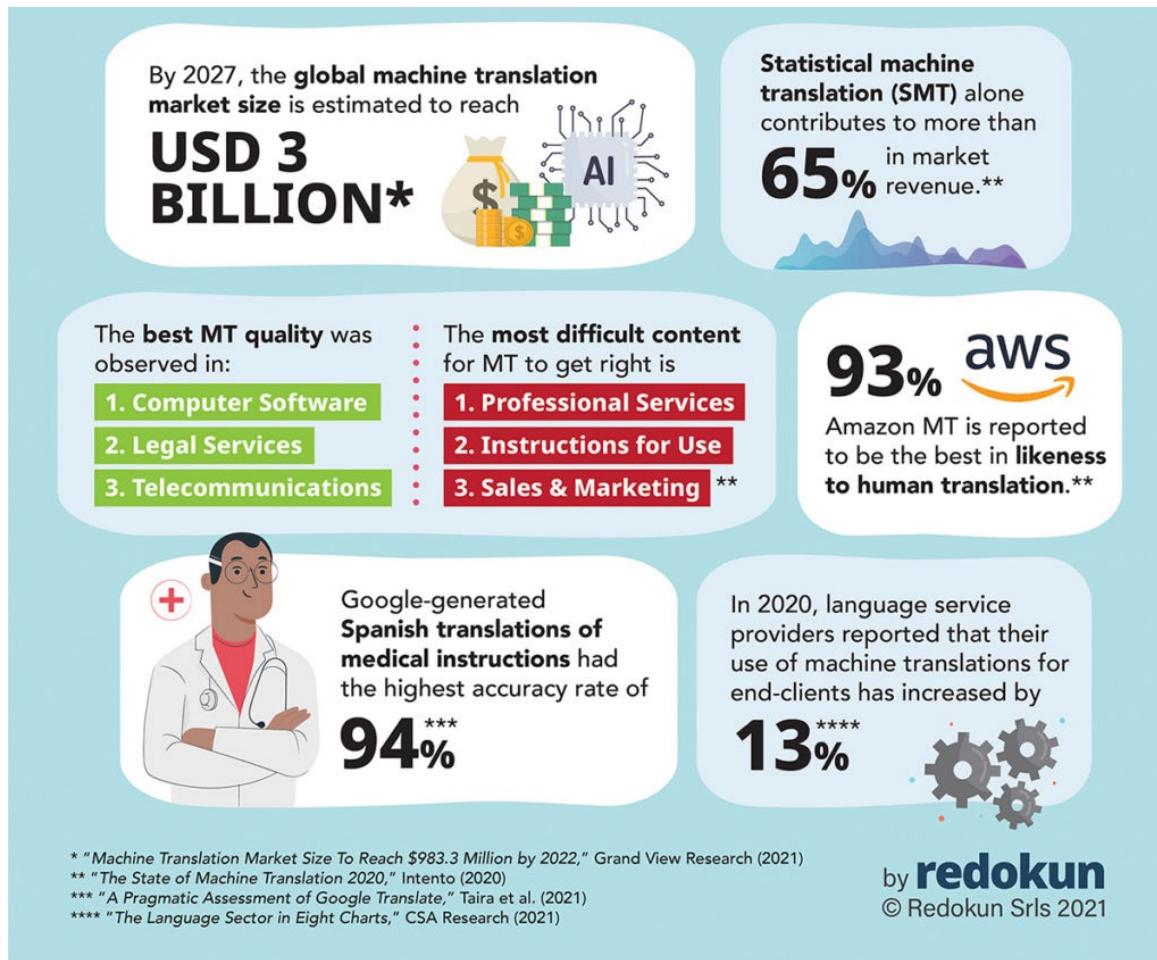
*The engines' API provided low translation time, with the exception of DeepL, in which the median time to translate a single sentence was close to 1 second*  
(Bureau Works)

*DeepL and Amazon Translate were the top performers*  
DeepL achieved the best results for most European Languages and Amazon Translate for the Asian ones  
(Bureau Works)

DeepL AWS

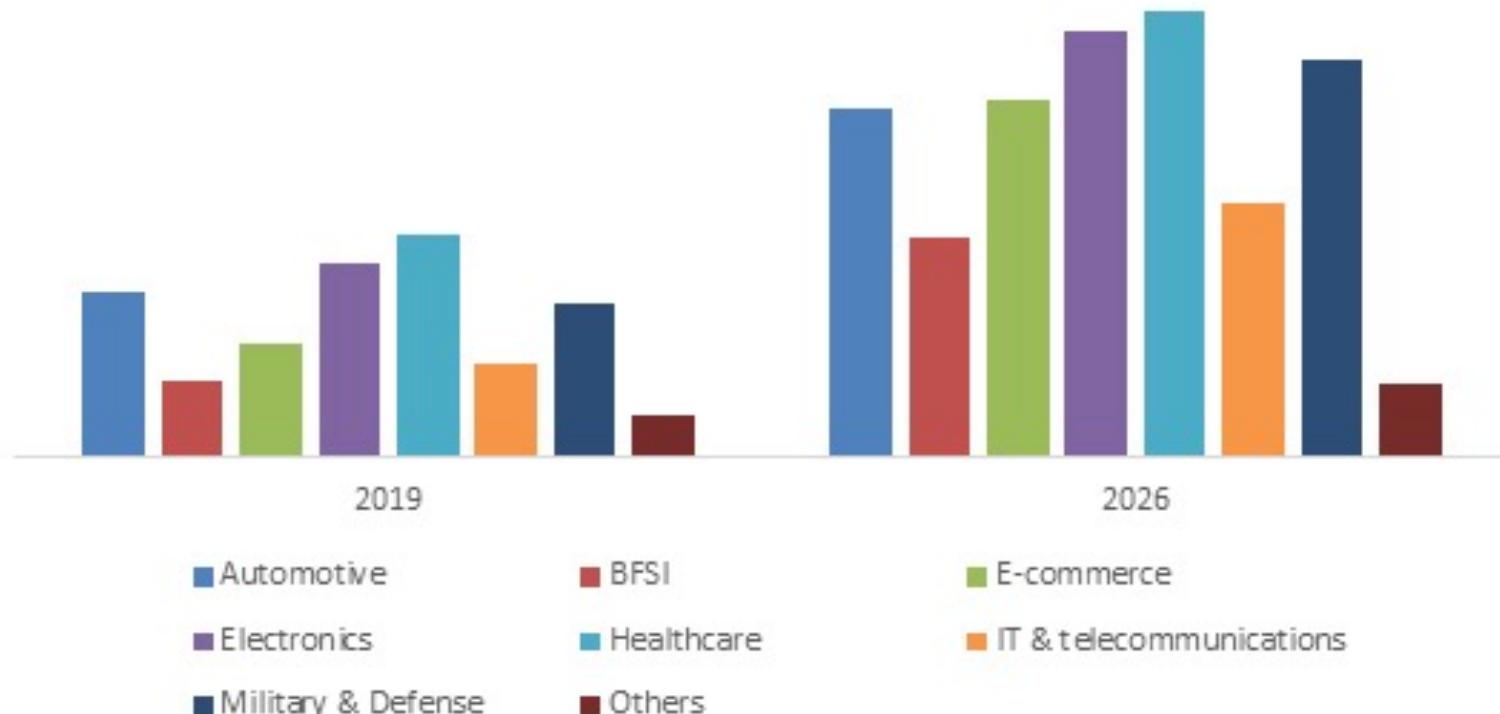
## STATISTICS

# Machine Translation Statistics



## STATISTICS

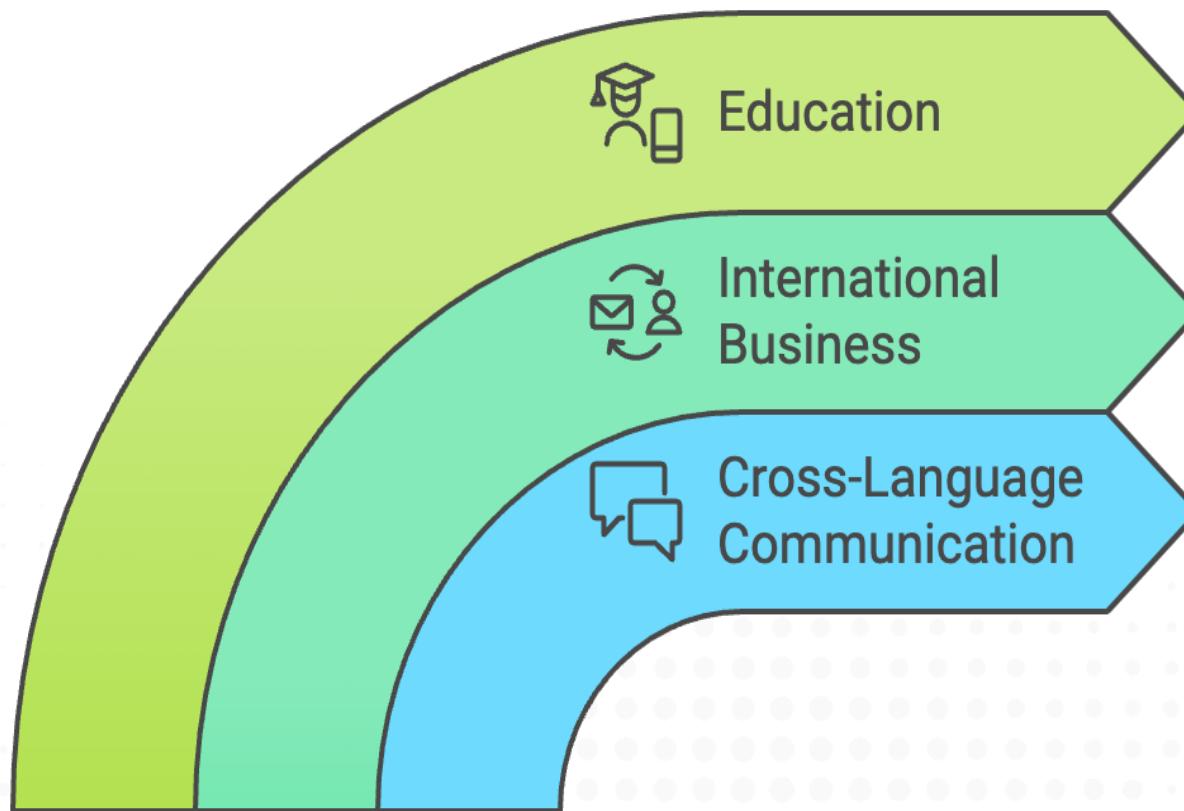
# USA Machine Translation Market Size



Source: [www.gminsights.com](http://www.gminsights.com)

# Applications of Machine Translation

## APPLICATION



Provides access to learning materials in various languages

Facilitates translation of emails, documents, and contracts

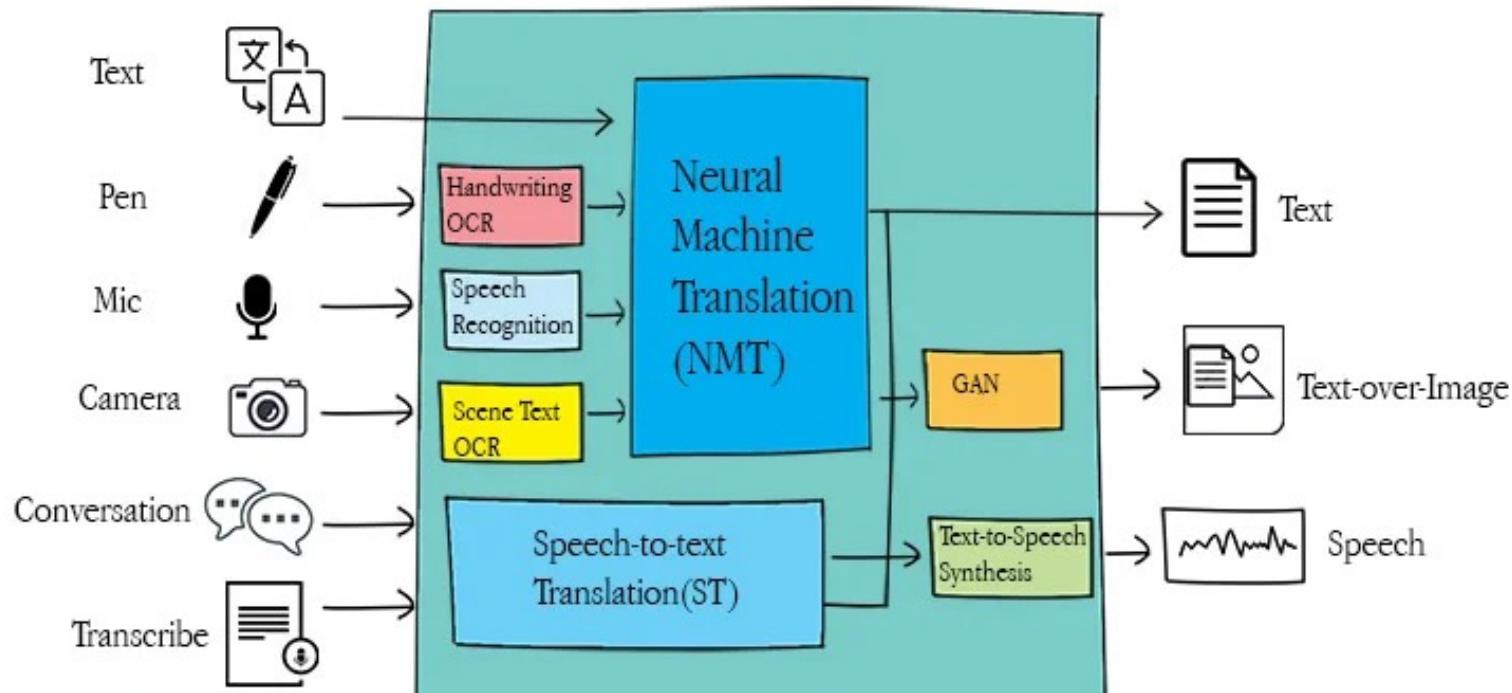
Enables social media and messaging in multiple languages

# Importance of Machine Translation

- 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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<https://youtu.be/z3XKMnu2pgg?si=W5WU6amw2VMsROPR>

# Technologies and Tools

## 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.

# Challenges in Machine Learning

- 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.  
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- 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 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<sup>20</sup>:** 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.

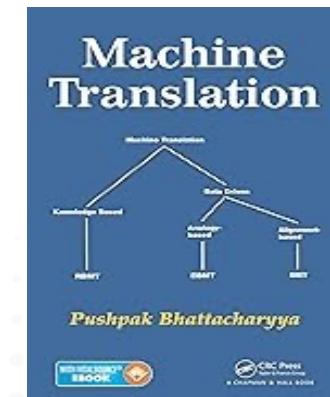
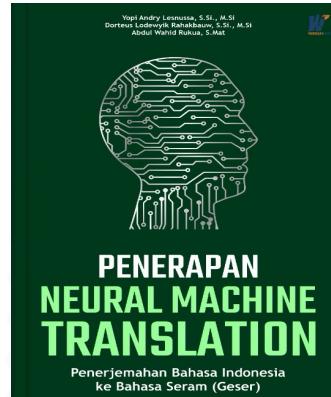
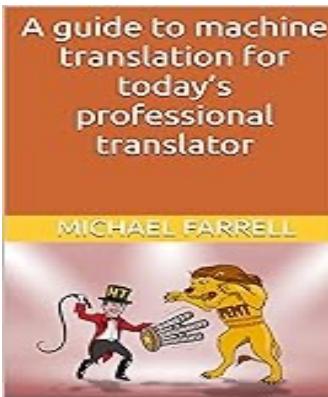
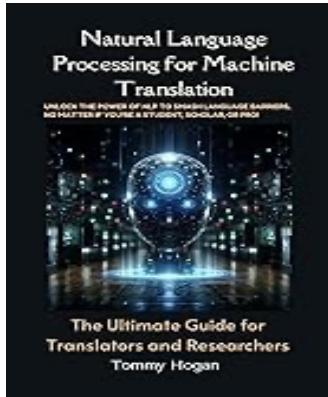
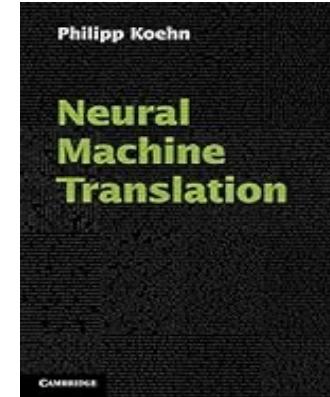
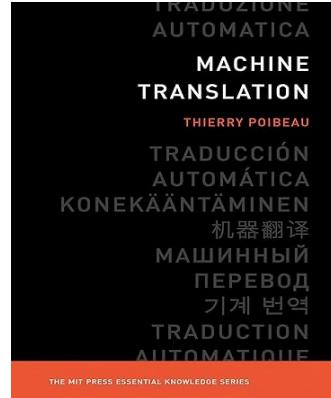
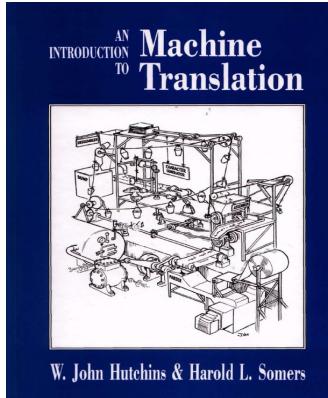
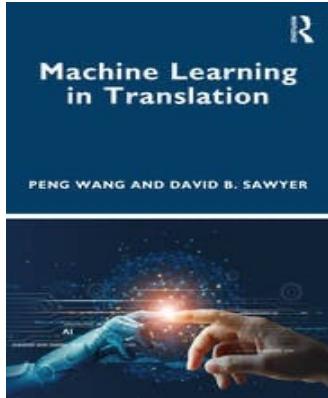
# Future of Machine Translation

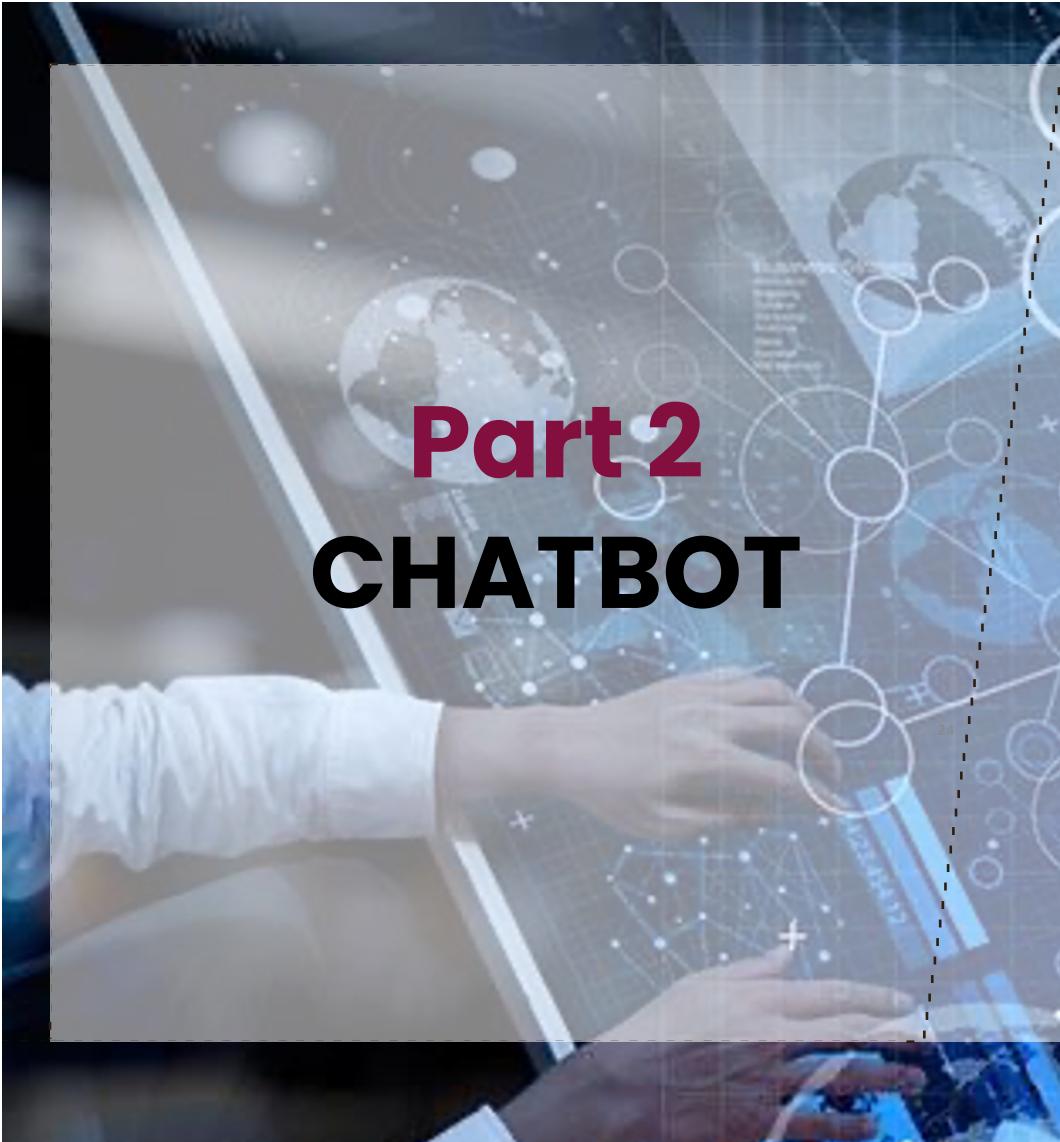
- 1. Advances in AI:** Enhanced contextual understanding and accuracy in translations.
- 2. Real-Time Translation:** Integration with AR/VR for seamless, instant translations.
- 3. Customized MT Systems:** Industry-specific translations for improved relevance and precision.

# Machine Translation Article

- 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>

## BOOKS





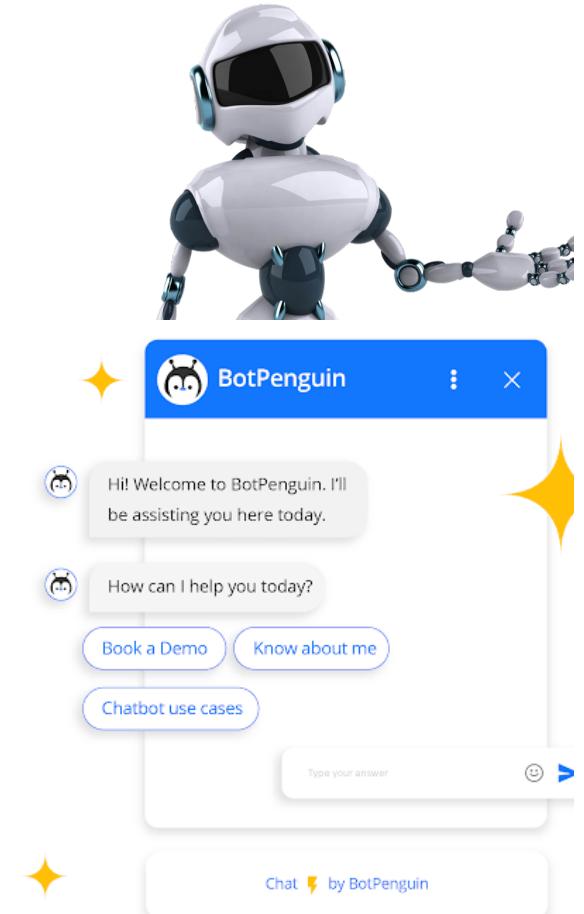
## **Part 2**

# **CHATBOT**

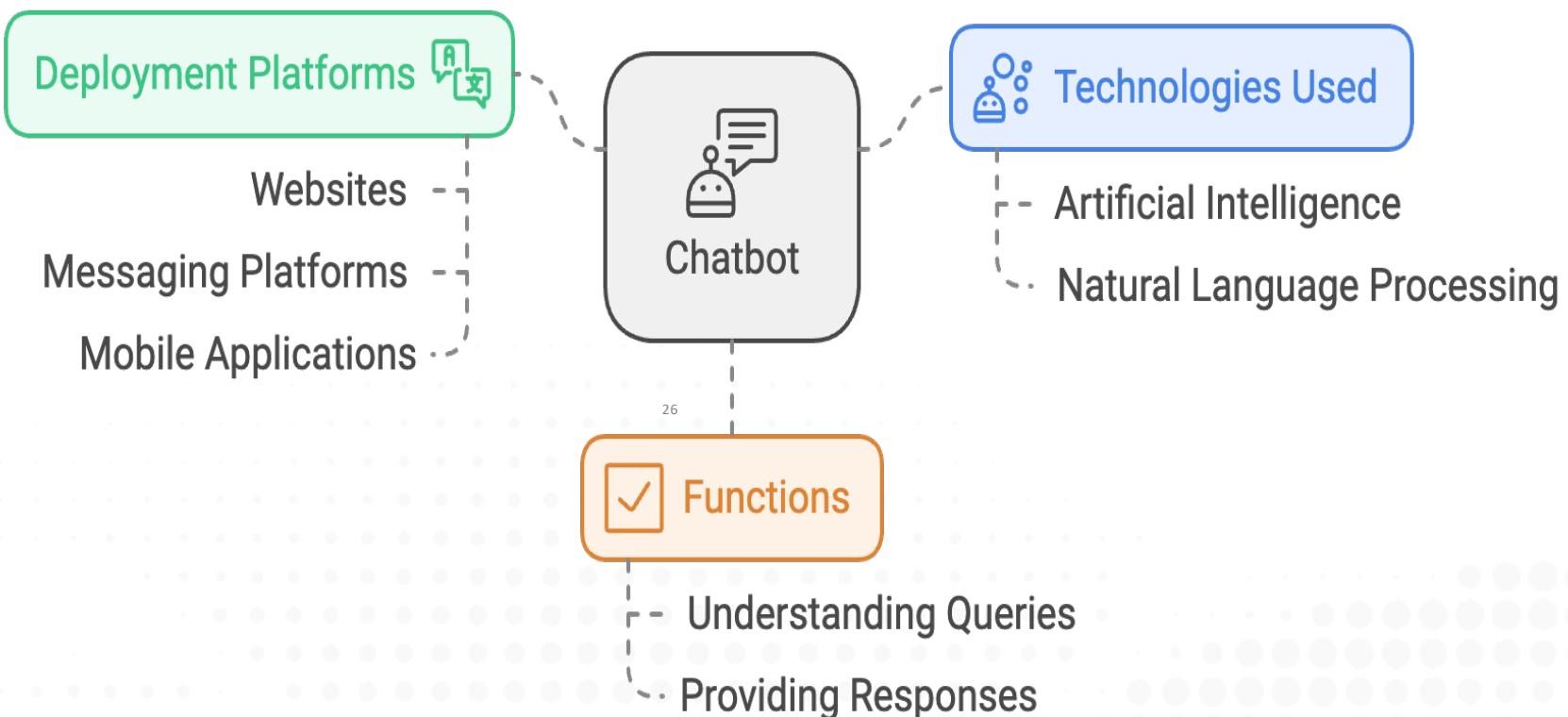


# Chatbot

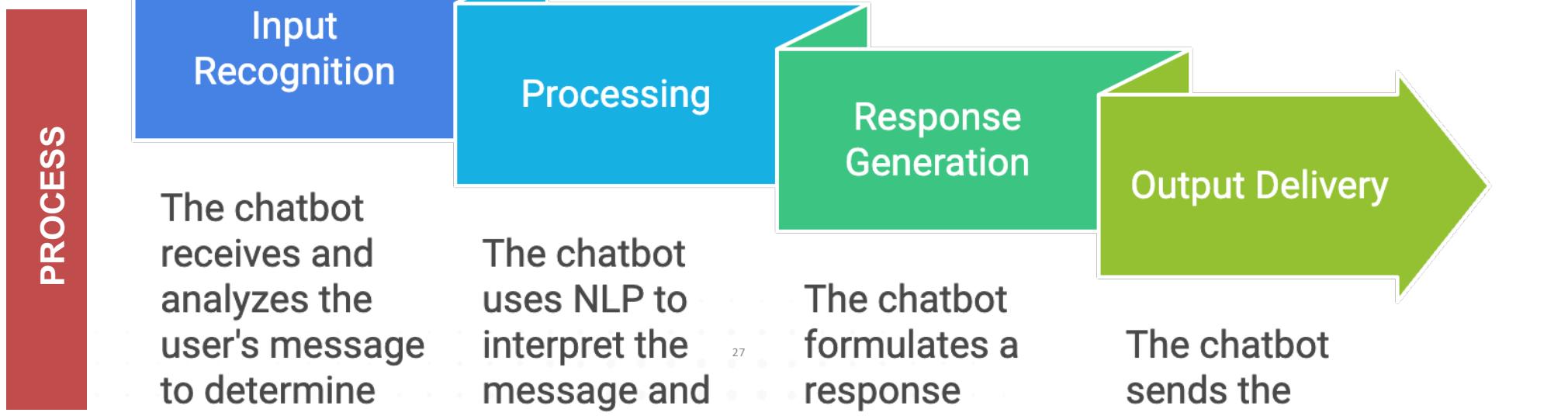
A chatbot is a **computer** program designed to simulate conversation with human users through text or voice interactions. These AI-driven systems use **natural language processing** to understand and respond to user queries, providing information, assistance, or performing specific tasks. Chatbots are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



# Chatbot

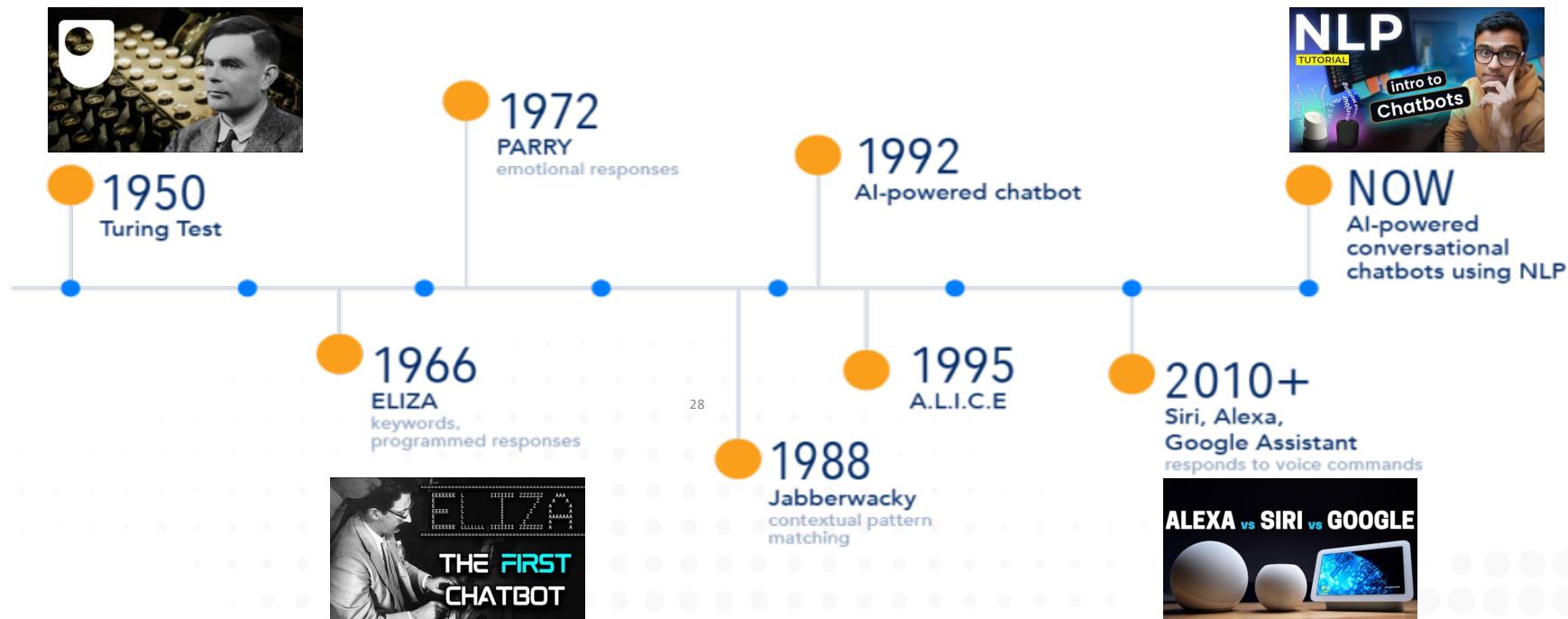


# Chatbot Interaction Process

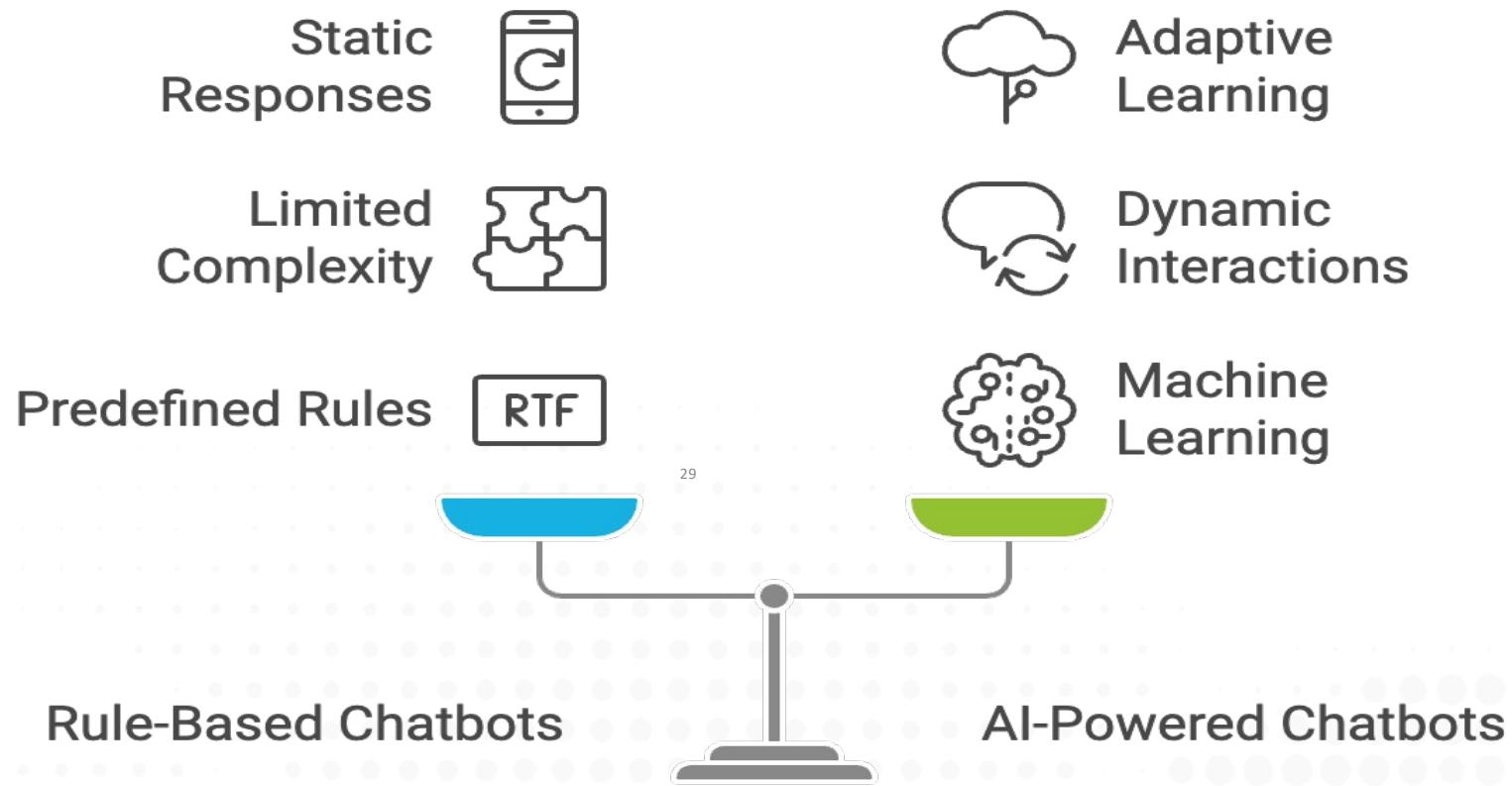


## EVOLUTION

# Evolution of Chatbot

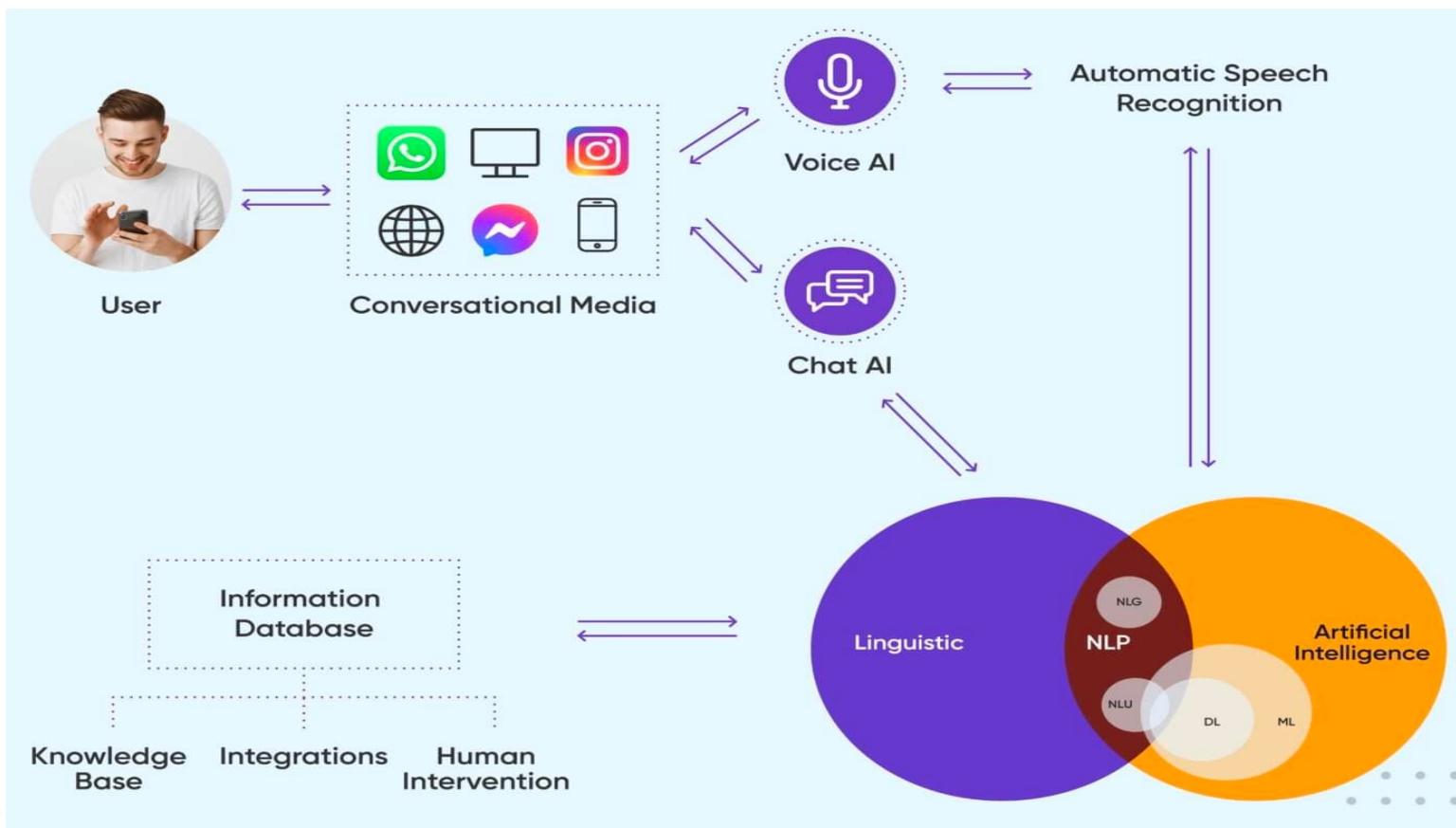


## TYPES

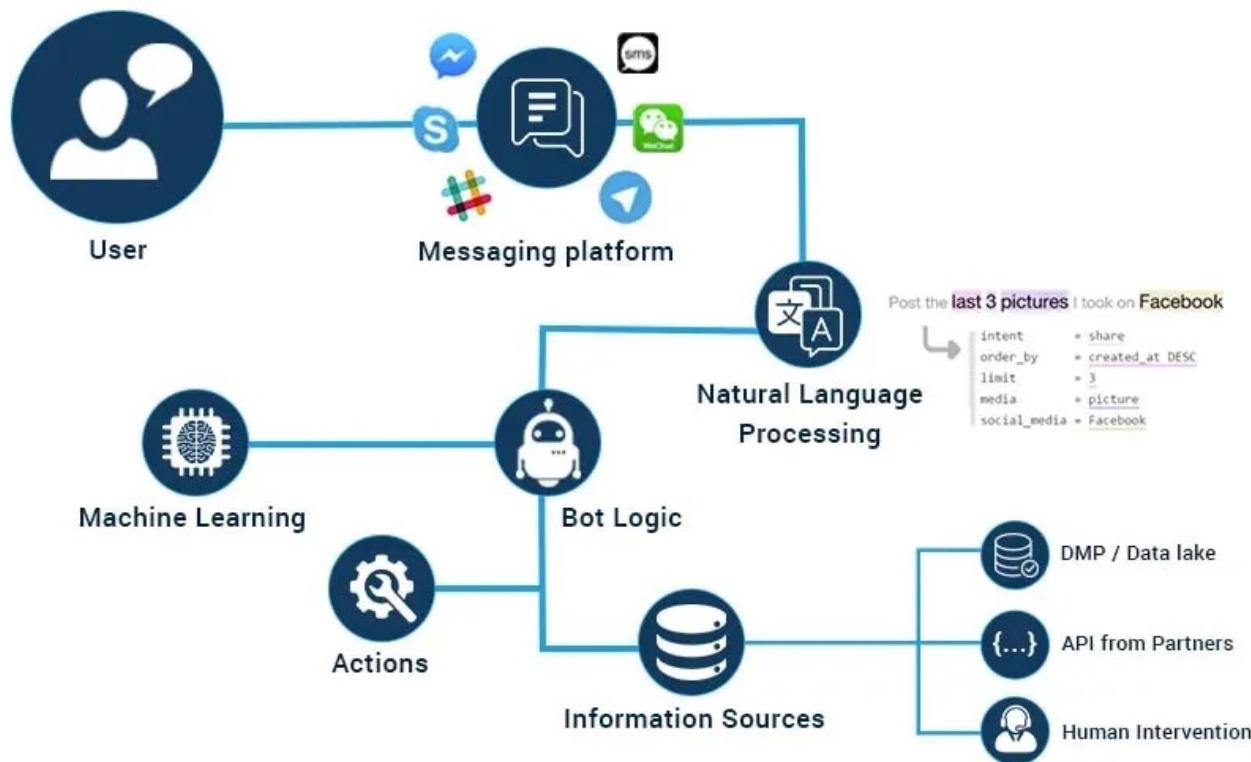


## NLP CHATBOT

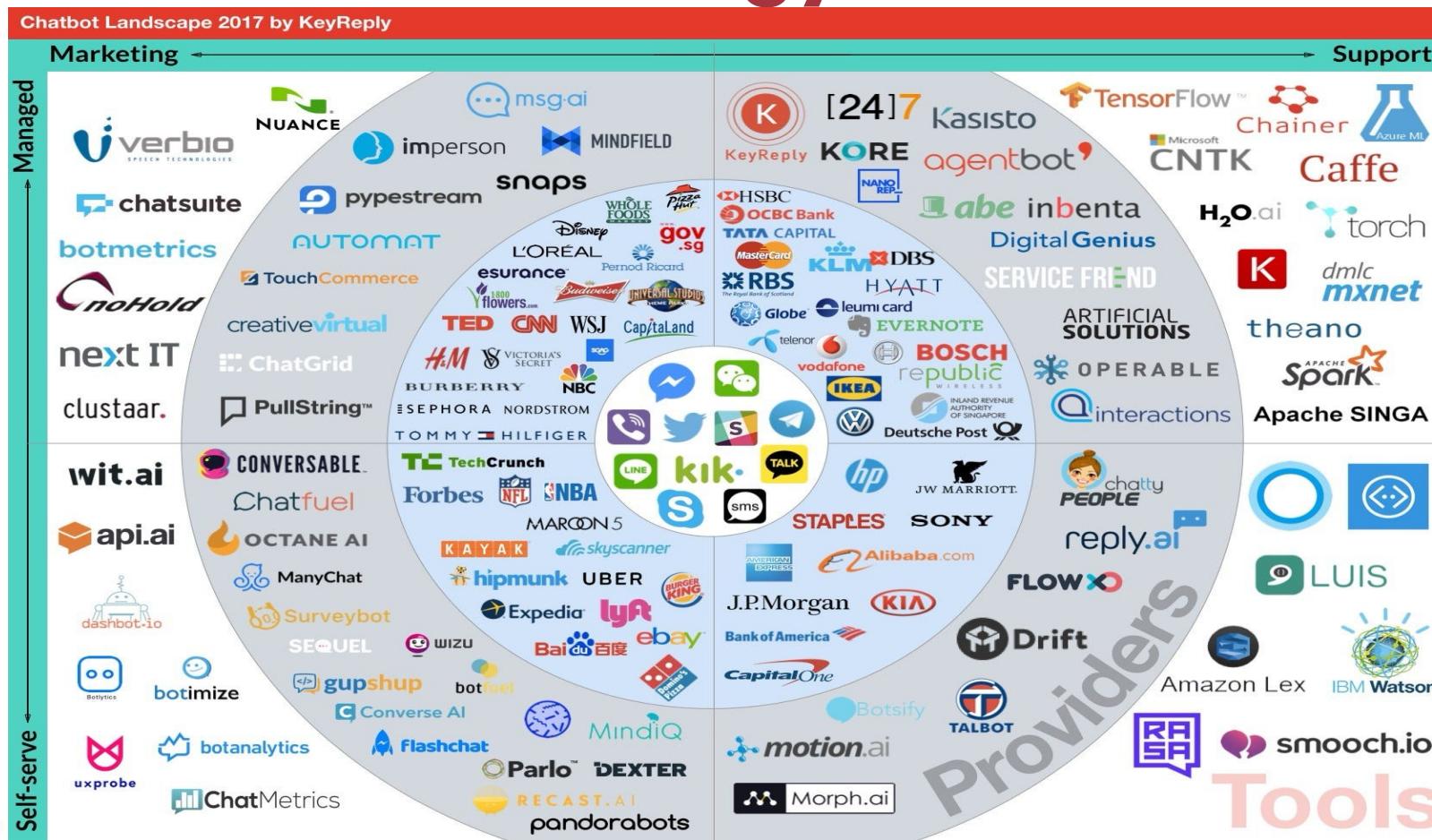
# How Does an NLP Chatbot Work?



# How Does an NLP Chatbot Work?



# Technology Stack

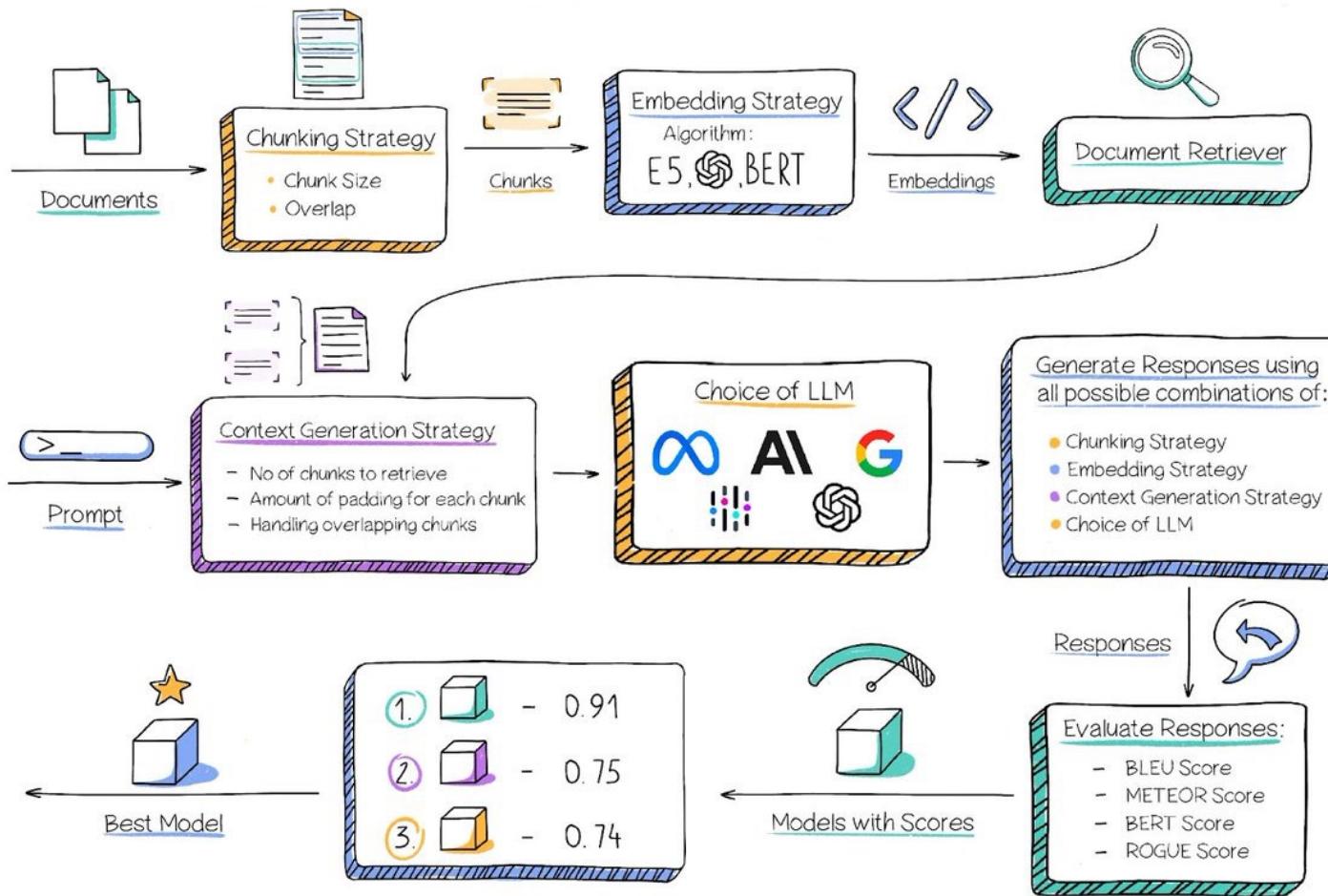


# Chatbot Use Case

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



# Create Your Own Custom LLM Chatbot



# AI Chatbot Healthcare

## 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

Customer Support

Personalized  
Recommendations

Lead Generation and  
Qualification

Social Listening and Sentiment  
Analysis

Interactive Content Delivery

Automated Posting and  
Scheduling

Influencer Marketing

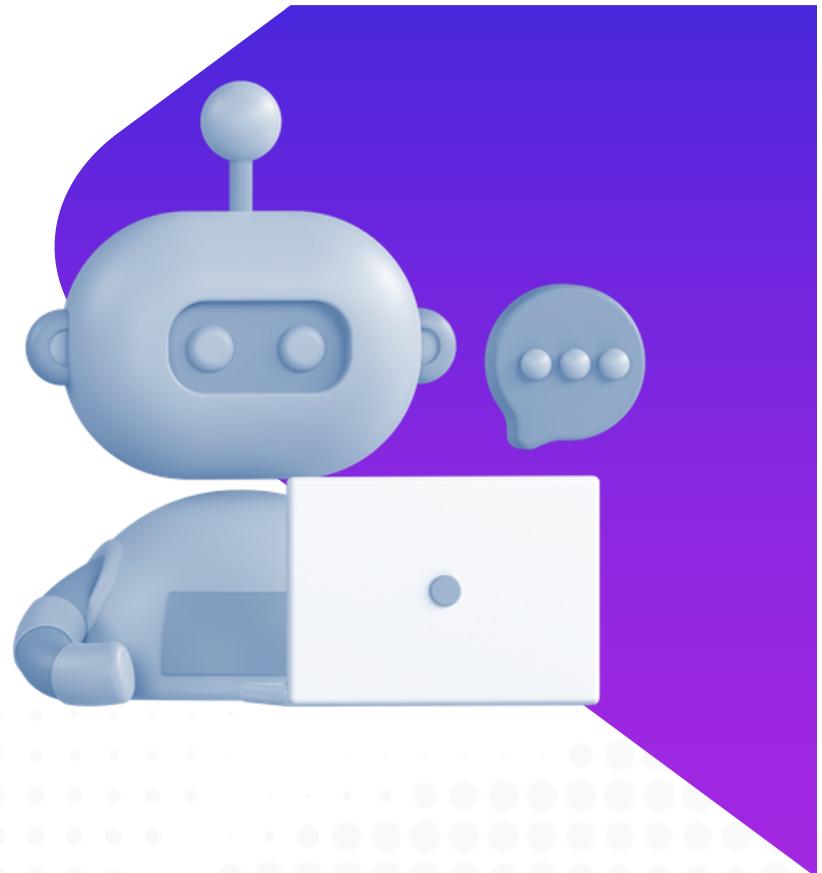
Social Media Advertising

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

# Future Trends in Technology

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

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

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innovative • entrepreneurial • global

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Thank  
You