How Large Language Models (LLM) affect Translation?

大型语言模型如何影响翻譯？

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What's a Language Model?

- A language model (LM) is a probabilistic model that predicts the order of words in a sentence
  - Probability of valid sentences, e.g., P("I love you") is high
  - Probability of random words, e.g., P("love you I") is low

  How are these probabilities computed?

  P("I love you") = P("I") P("love" | "I") P("you" | "I" "love")

  P("love you I") = P("love") P("you" | "love") P("I" | "love" "you")

Probability (next word)

Very low Probability

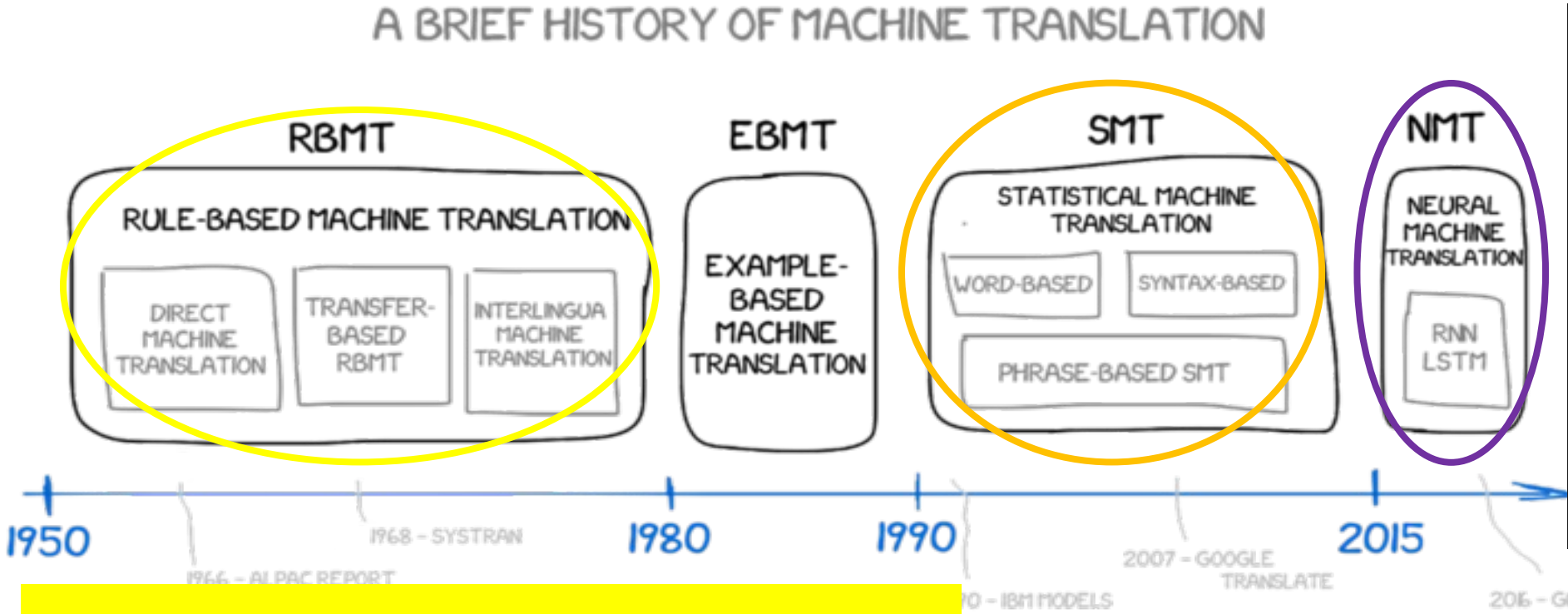
- Given a word string, S = $w_1 w_2 \ldots w_n$, LM is to compute
  - $P(S) = P(w_1 w_2 \ldots w_n) = P(w_1)\, P(w_2|w_1) \ldots P(w_n|w_1 \ldots w_{n-1})$

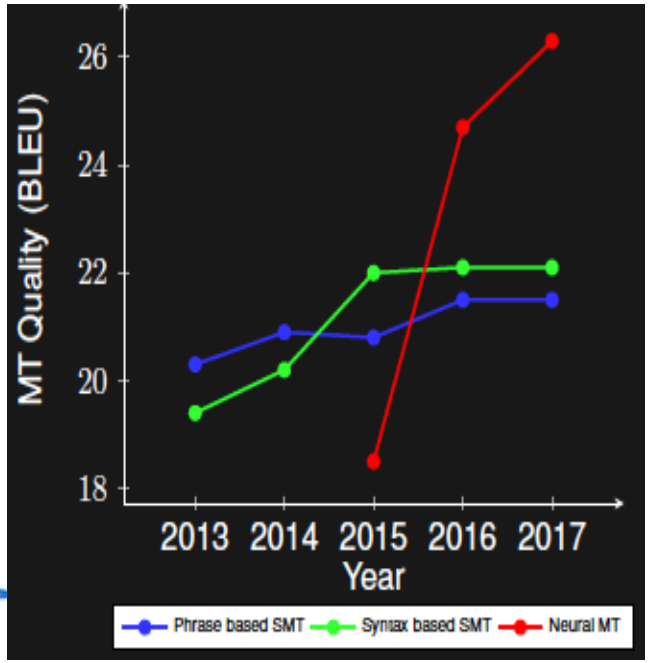
Statistical LM instead of Rule-based LM

Used for many language tasks, e.g., P(w) =0

- Spelling Correction – "breakfast", "chulling", "audio", …
- Grammar checking – "I go", "he goes", "one book", "two books", "two sheep", "a piece of paper", "three waters"

P(w) =0





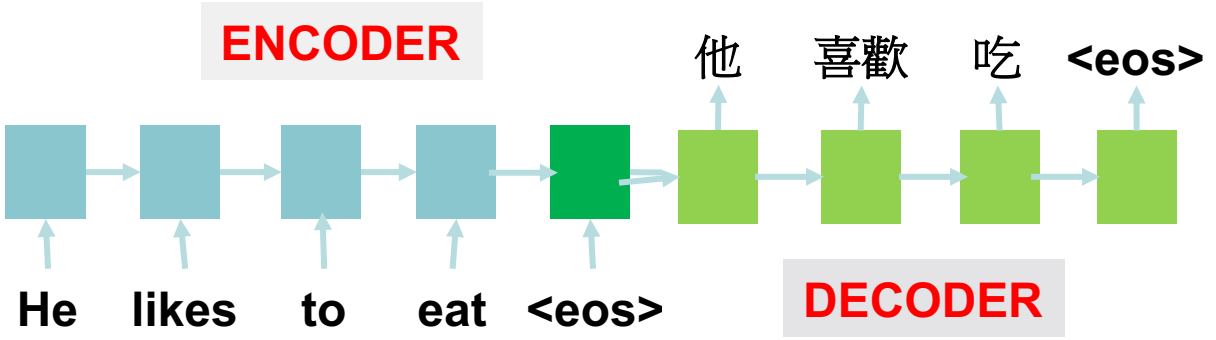
Rule-based Model

I | want | to go | to the market | today.

我 | 想 | 去 | 市場 | 今天

Statistical Machine Translation (SMT)
Use LM to fix the order of the words

Sequence to Sequence Translation Encoder-Decoder Model (2014)



Large Language Models and Machine Learning

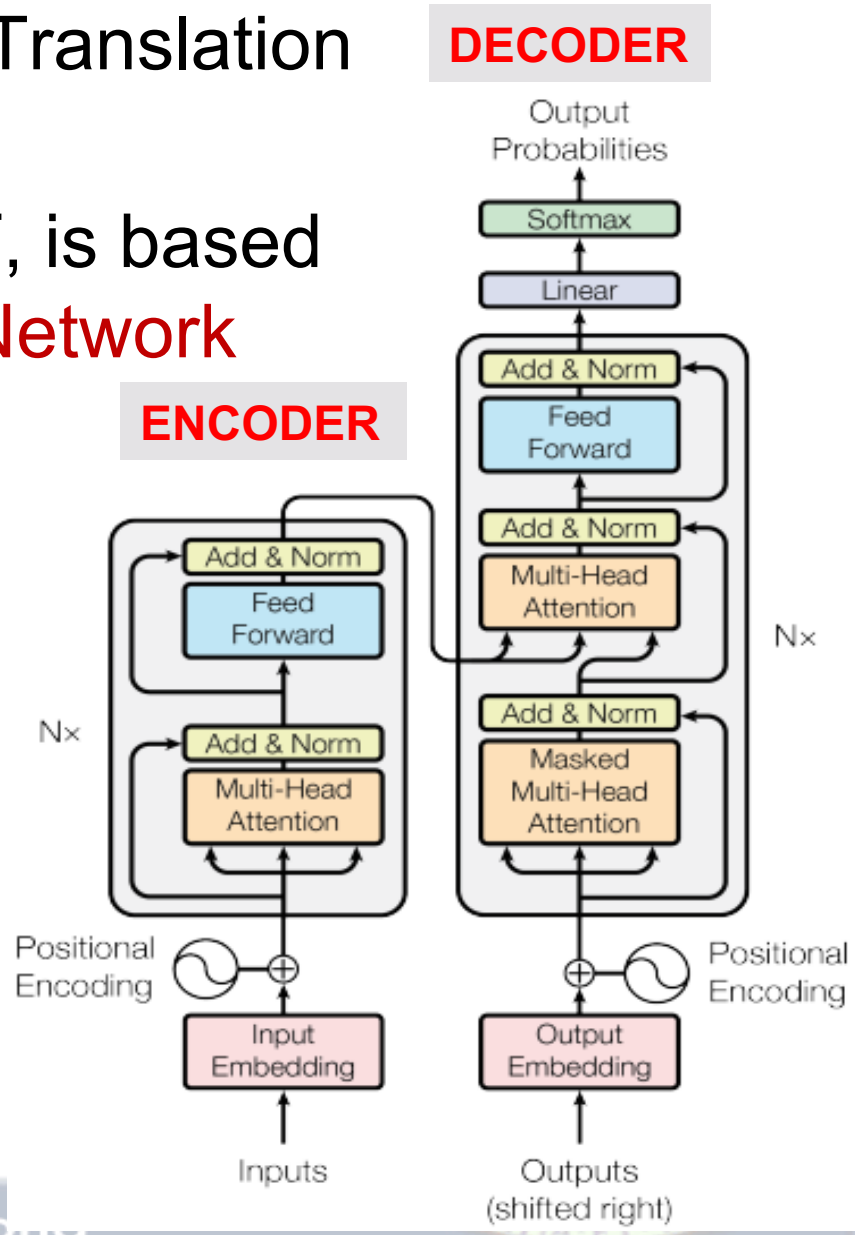
- Google's Transformer 2017 – Neural Machine Translation encoder-decoder model
- **Large** Language Models (LLMs), like ChatGPT, is based on Transformer architecture and large Neural Network
- Neural Machine Translation (NMT) has led to significant improvements in quality, accuracy, and efficiency.

Example:

source sentence： 他們喜歡讀書

Previous translation - "**They like to read books**"

NMT with LLM can capture the intent from context "**They enjoy reading**"



- New Era – more and fast communications
  demand for translated content reaches an all-time high

How LLM affects Translation Tasks?

- Machine translation helps translators deliver work faster and easier and therefore, more efficient.
- MT provides the first draft fast and accurate, while human translators perform post-editing jobs on the complex and interesting content.
- For some non-critical contents, any person, good at the target language, can post-edit (by smoothing the language) the draft from MT which has captured the main meaning of the source content.

DeepTranslate 譯谷

- Platform based with LLM and Transformer architecture
- Translation Features (besides fast and quality)
  - specialized on Chinese ⇔ English
  - Domain specific (with fine-tuning)
    e.g., health, transport & logistics, education, housing, …
  - Consistent style (rule-based)
    with terminology, format, names, places,...
- Intact Format – output document same as source
- Security – cloud-based or on premise
- Constant updates and customer supports