Assignment 2: Statistical Machine Translation

CSC401/2511 Tutorial, Winter 2019

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Based on slides by Patricia Thaine, Jackie Cheung, Alex Fraser and Frank Rudzicz

Today's Schedule

- History of Machine Translation
- A2: the big picture
  - Task 1: BLEU Score
  - Task 2: Encoder-Decoder
  - Task 3: Training and Testing
- Marking: How each tasks are evaluated

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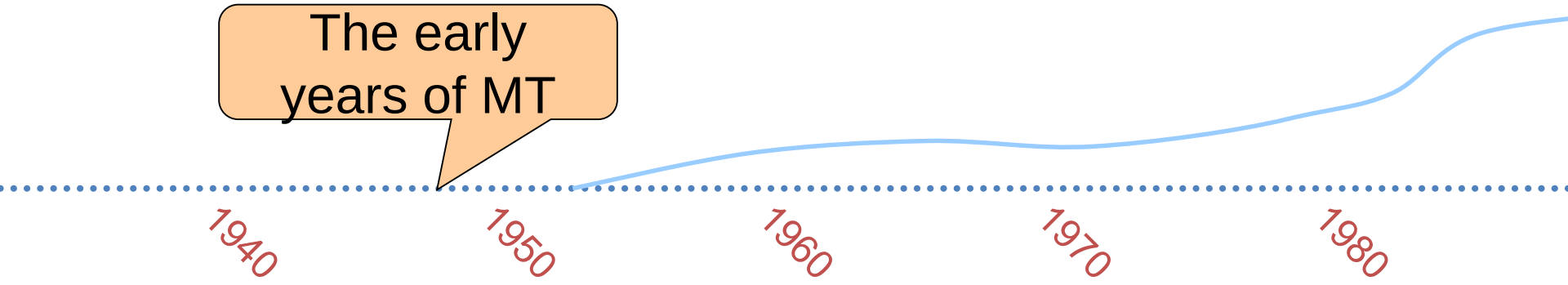
Rough History of Machine Translation Research

When I look at an article in Russian, I say: "This is really written in English, but has been coded in some strange symbols. I will now proceed to decode."

[Warren Weaver, 1947]



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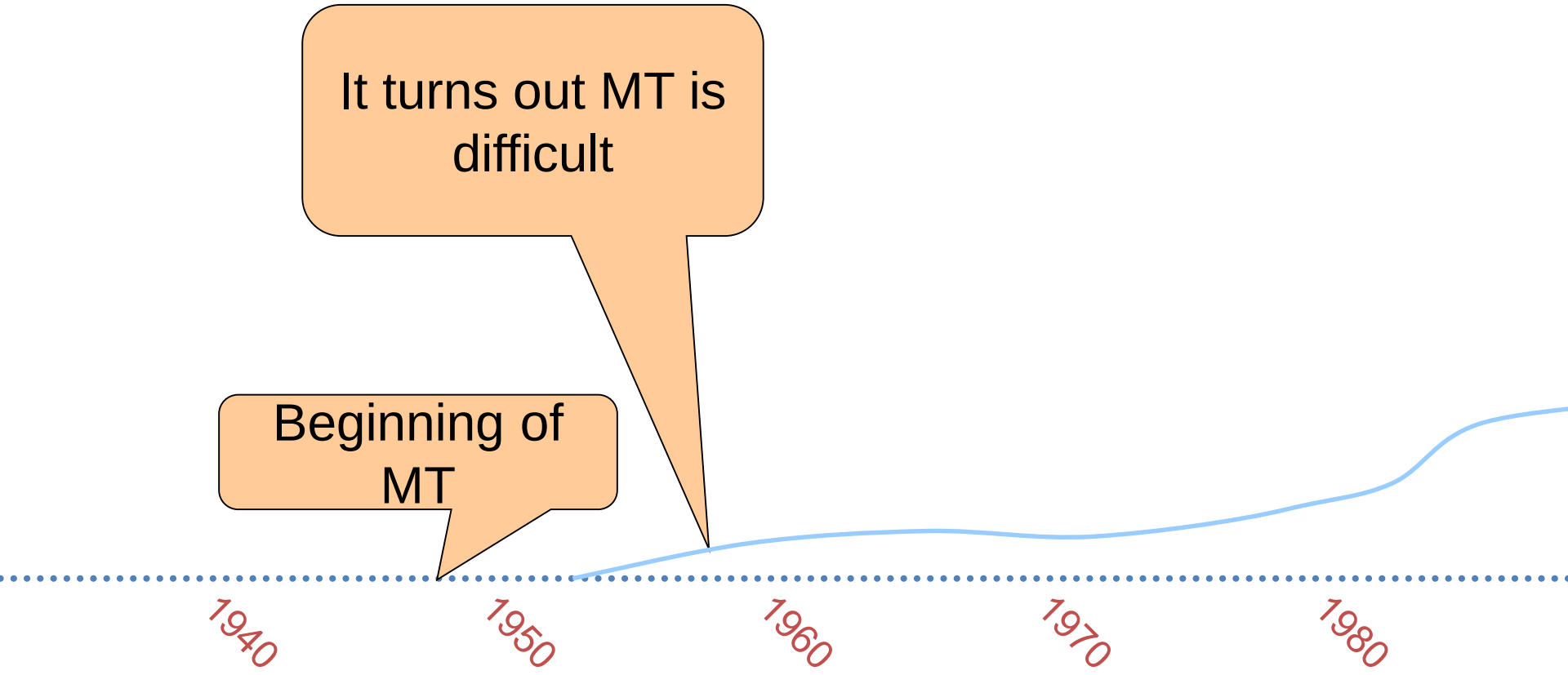

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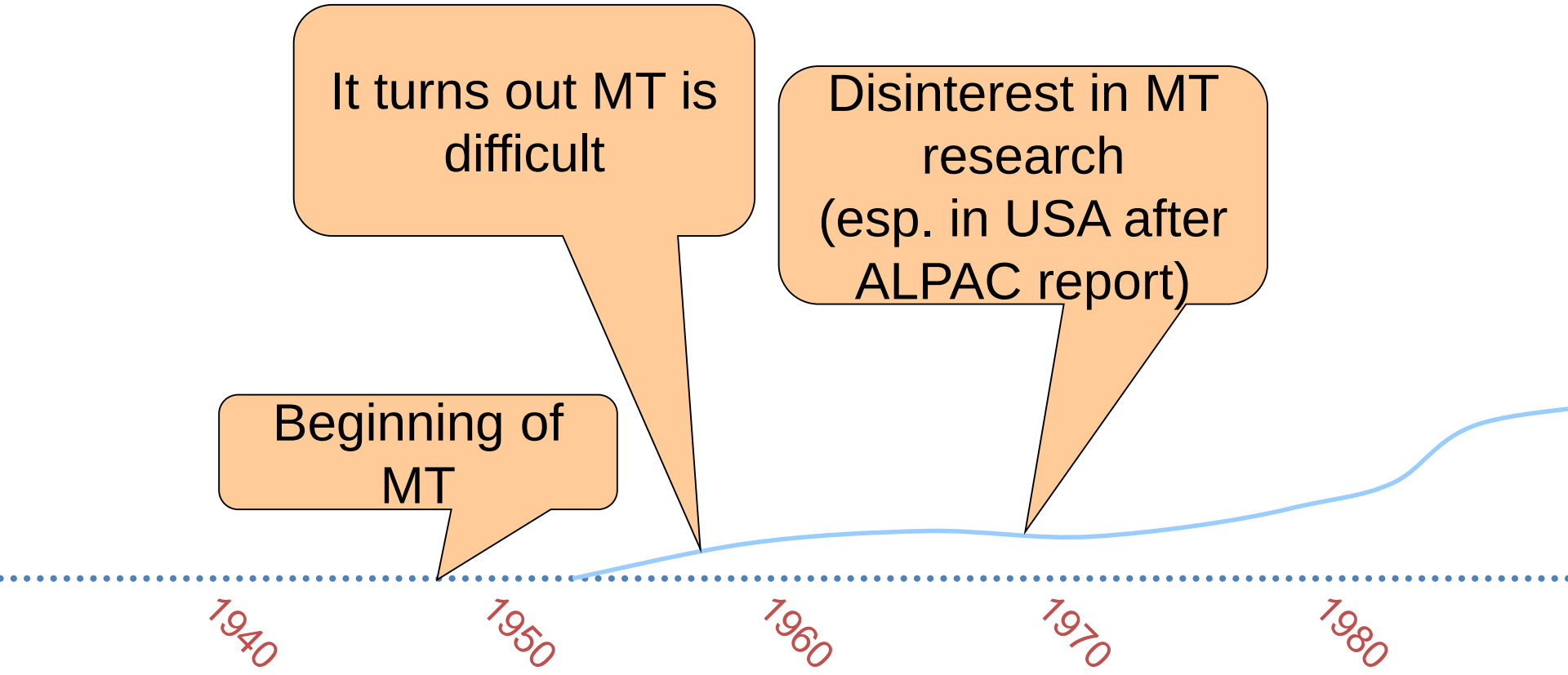

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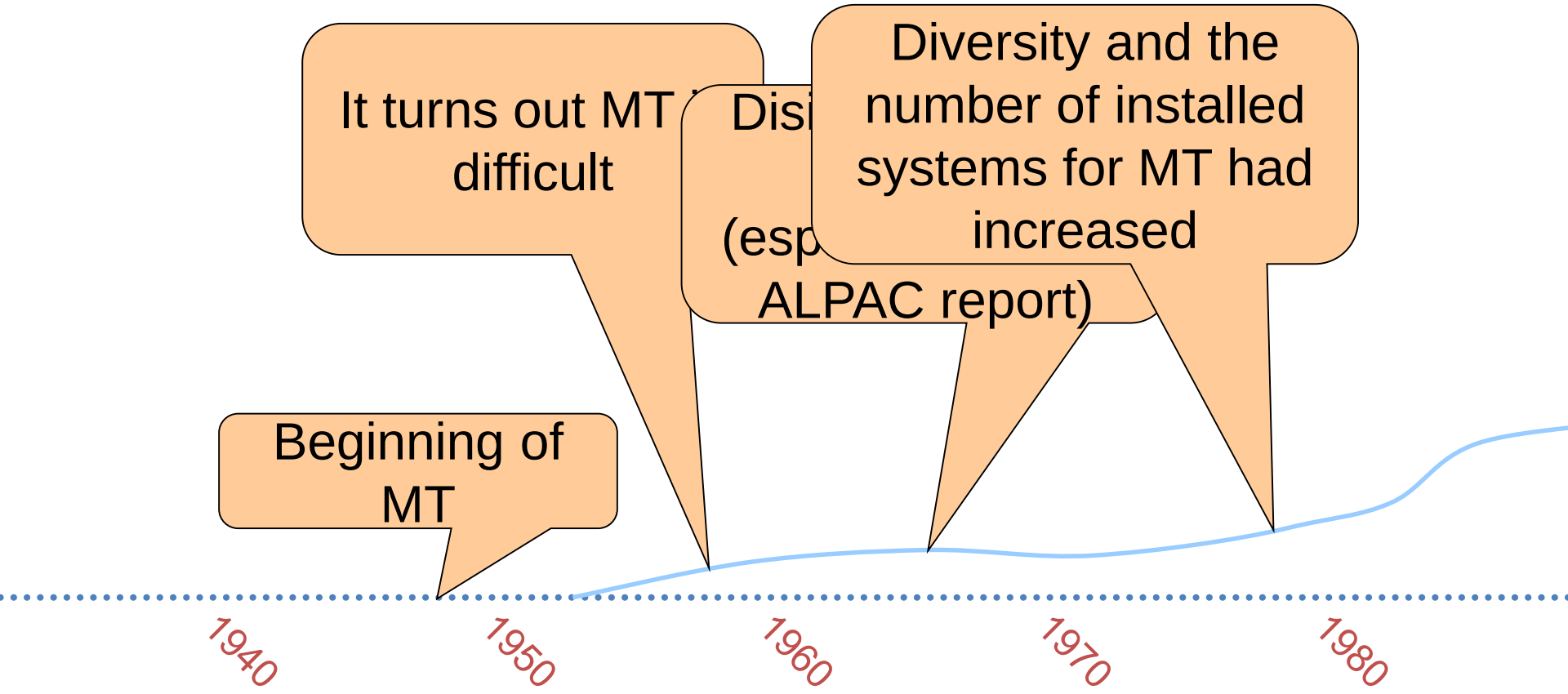

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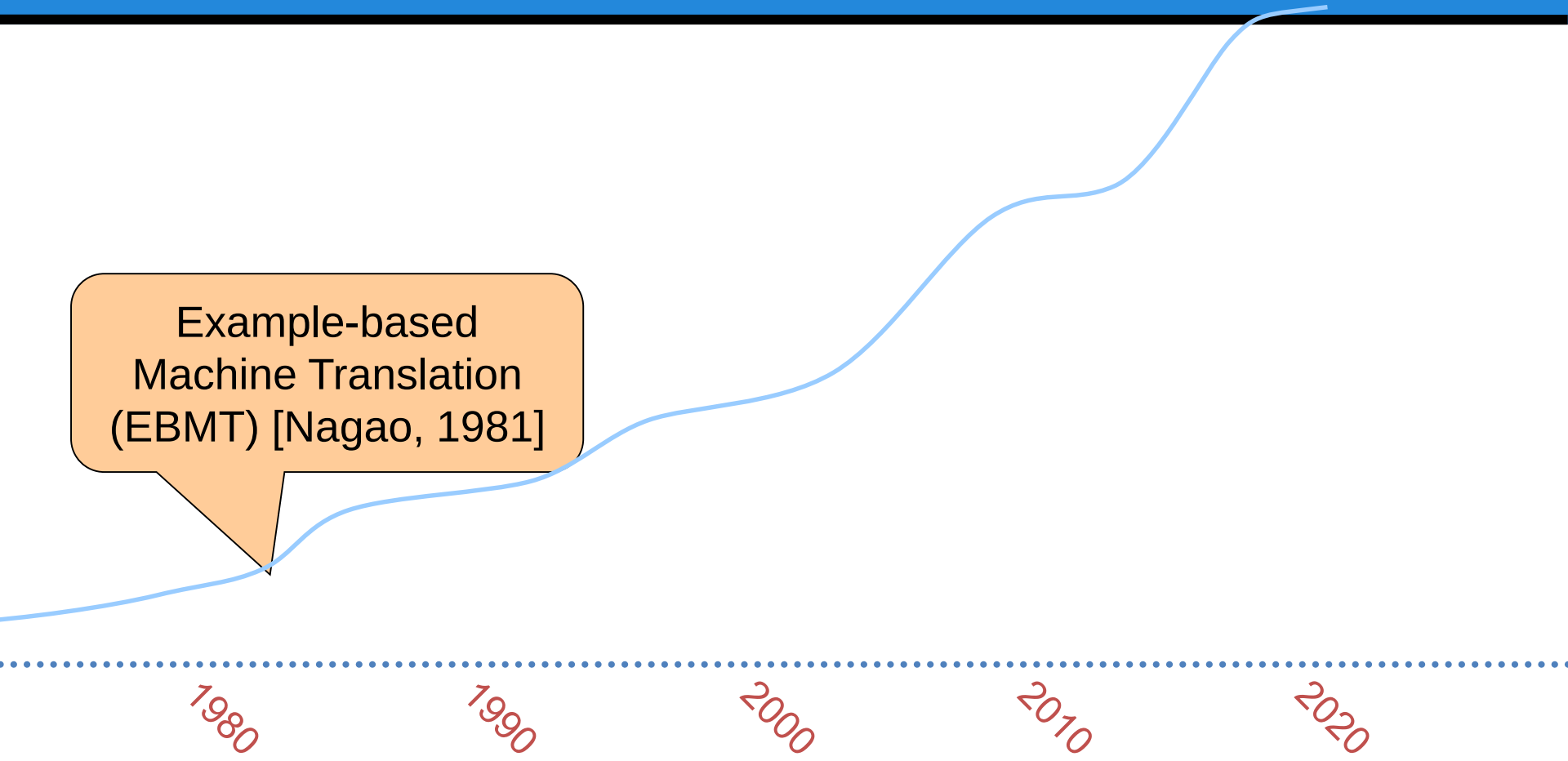

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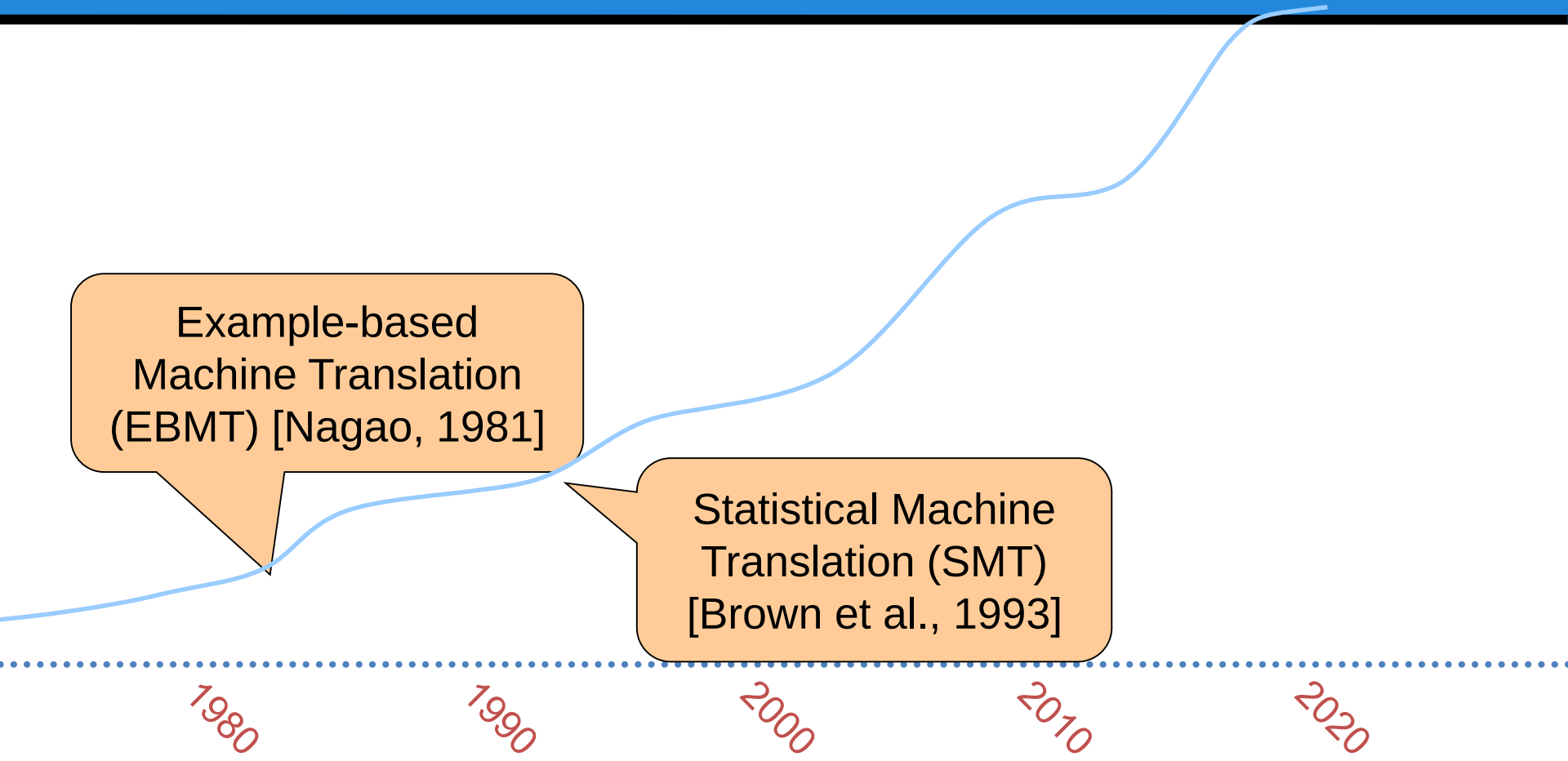

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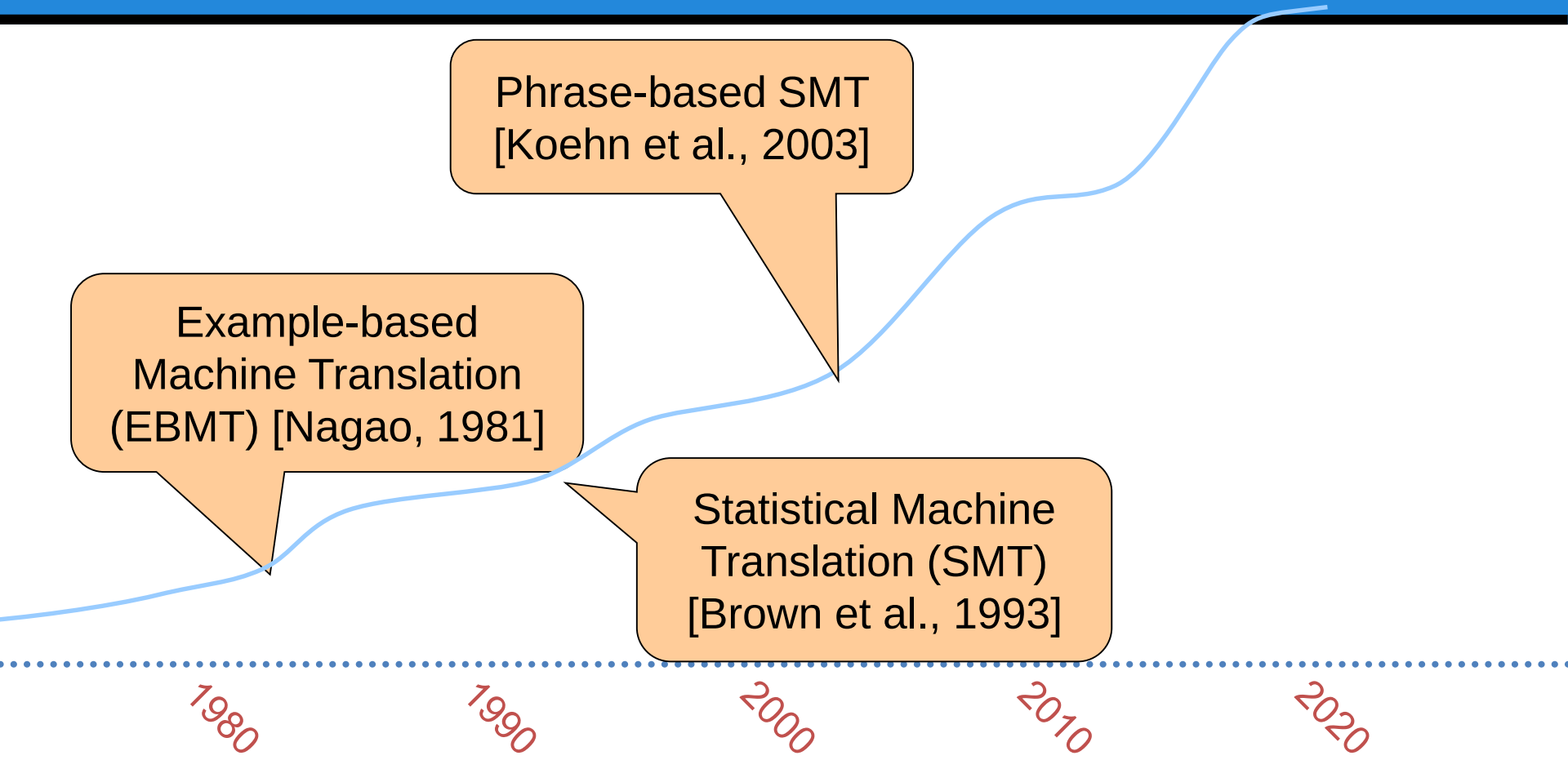

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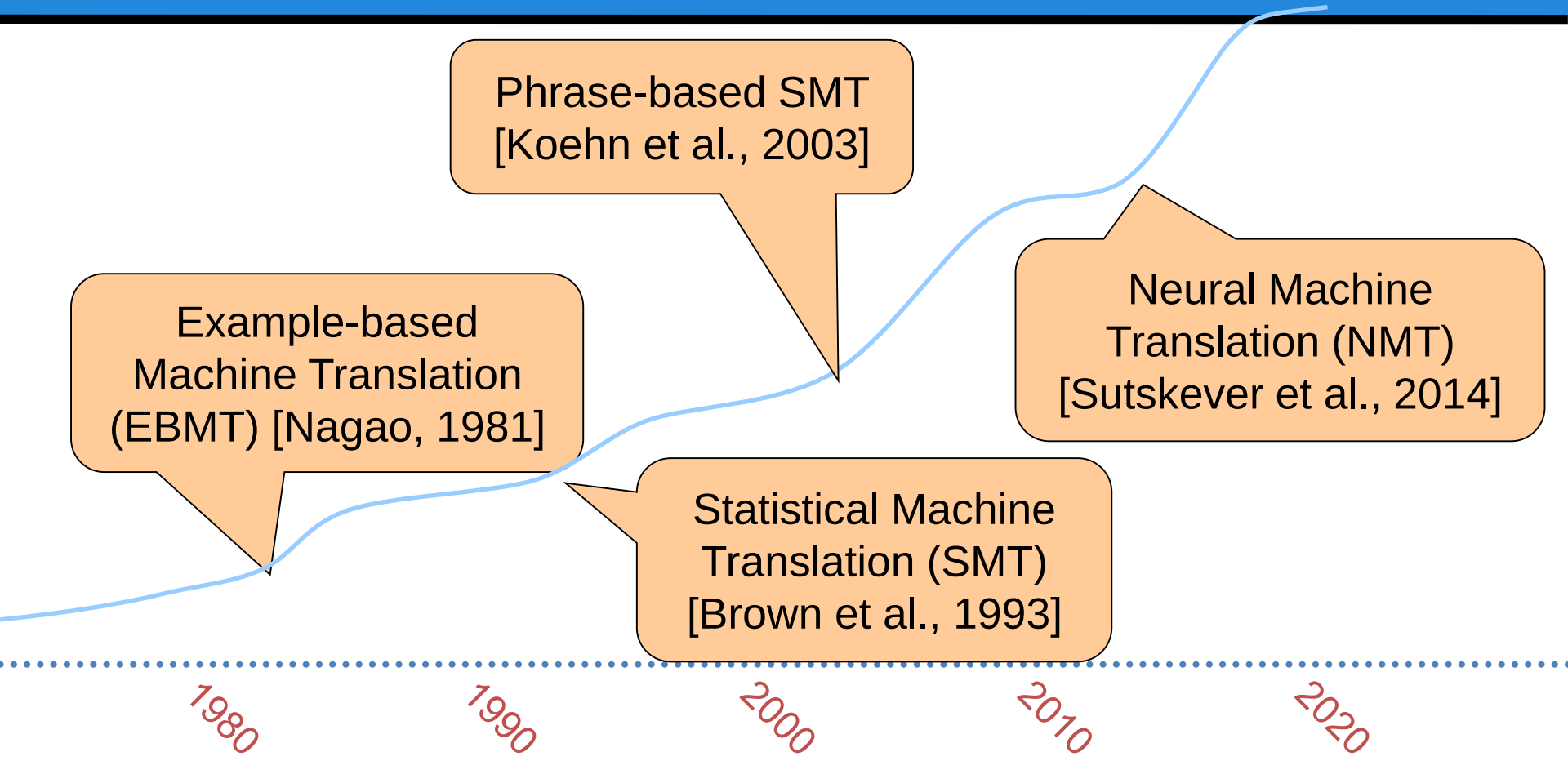

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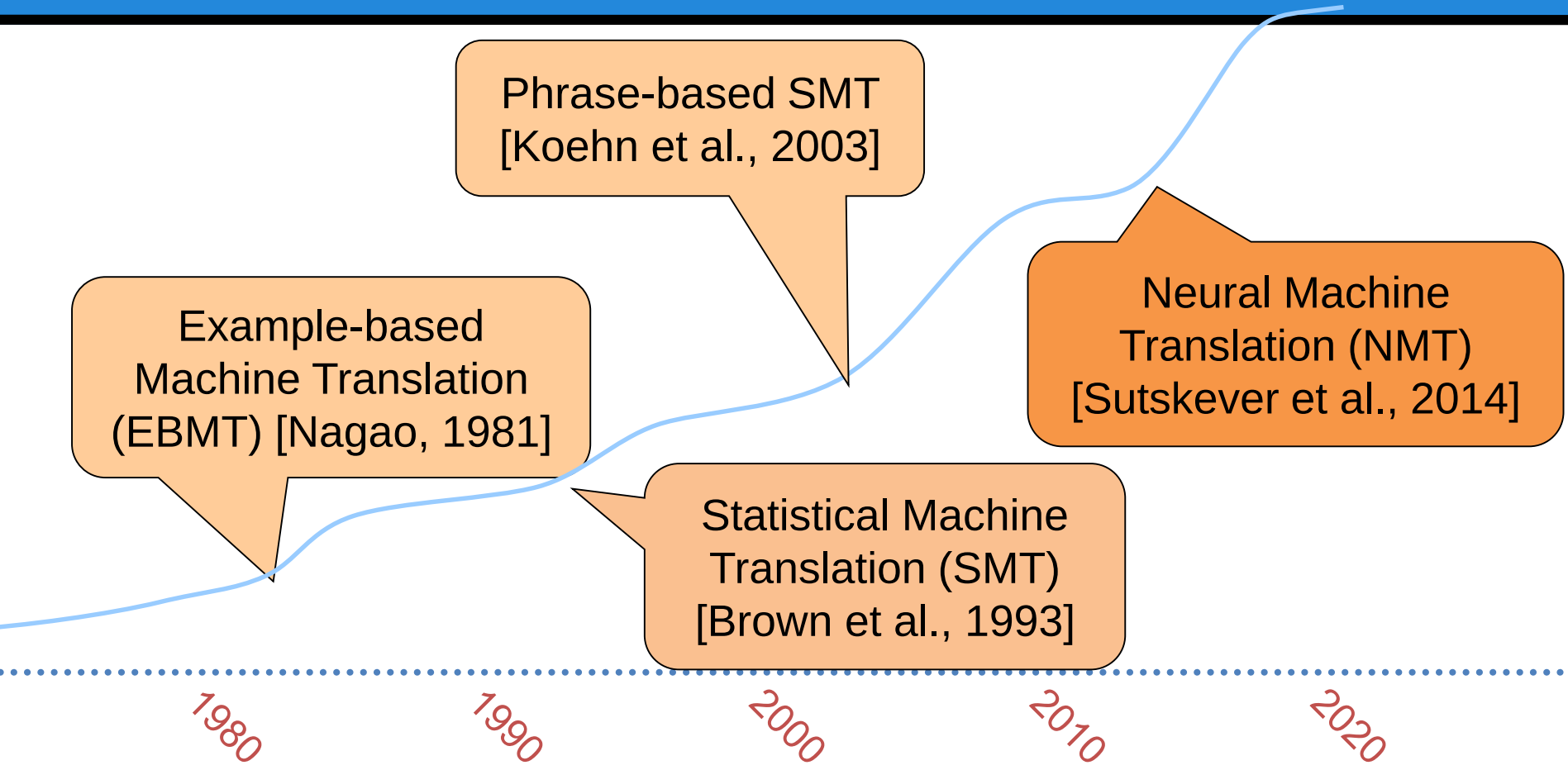

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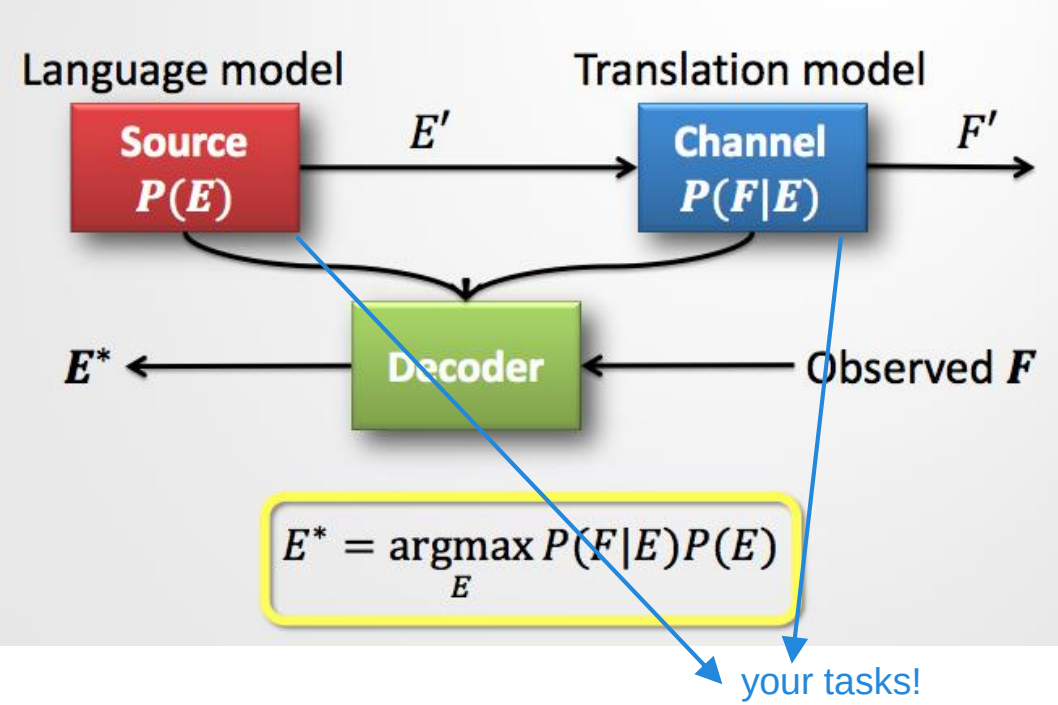
Today's Schedule

- History of Machine Translation
- A2: the big picture
- Task 1: Preprocess Inputs
- Task 2: Compute n-gram counts
- Marking: How each tasks are evaluated

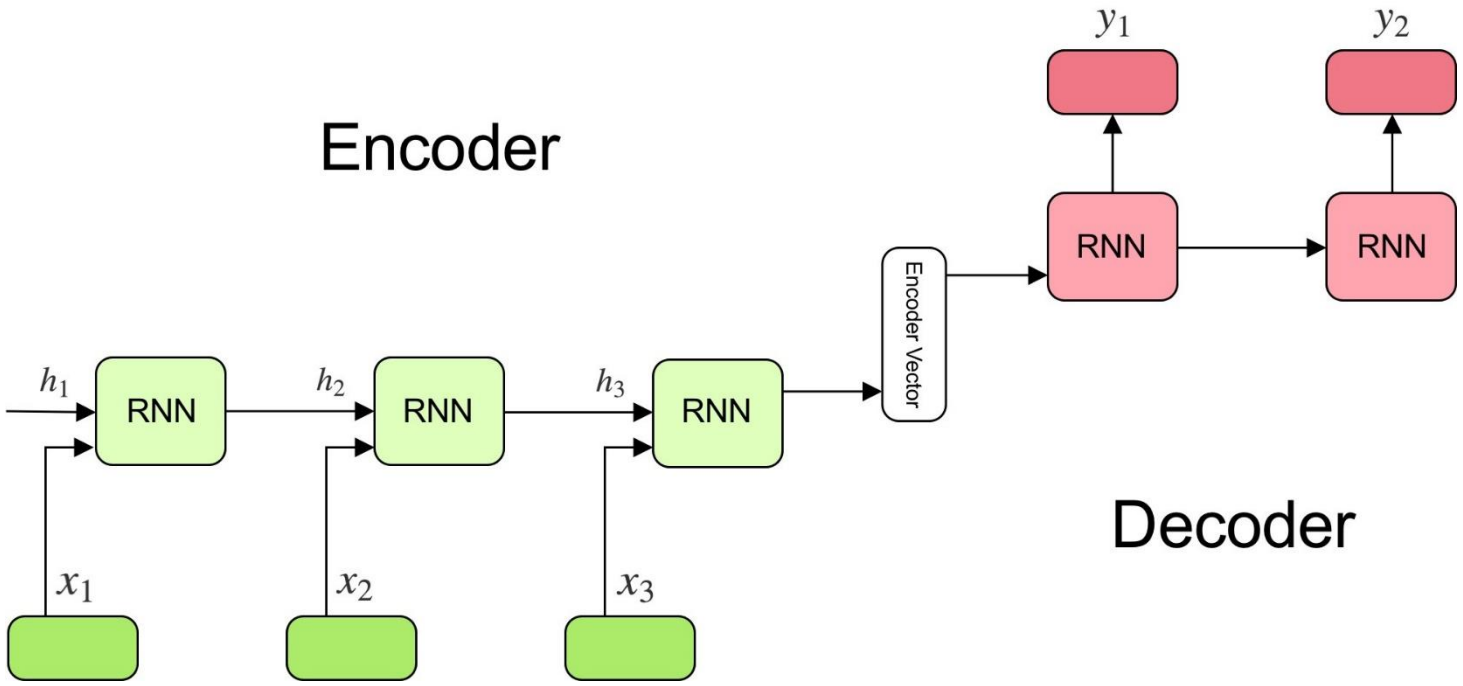
A2 – Historically: Noisy Channel Model

We need a language model, a translation model, and a decoder.



A2 – Currently: Noisy Channel Model

We need an encoder, a decoder, and a search algorithm.



Task 1. BLEU Score

File: “a2_bleu_score.py”

4 functions:

1. grouper(seq, n):
2. n_gram_precision(reference, candidate, n):
3. brevity_penalty(reference, candidate):
4. BLEU_score(reference, hypothesis, n):

Task 1. BLEU Score

BLEU Score is calculated like in the lecture slides.

Notes:

- No capping.
- Only 1 reference and 1 candidate at a time.
- Don’t include SOS and EOS tokens in the calculations.

Task 2. Encoder and Decoder

File: “a2_encoder_decoder.py”

4 Classes:

1. Encoder(EncoderBase):
2. DecoderWithoutAttention(DecoderBase):
3. DecoderWithAttention(DecoderWithoutAttention):
4. EncoderDecoder(EncoderDecoderBase):

Task 2. Encoder and Decoder

Notes:

- Does not follow 100% from the slides. Look at the handouts!
- To correctly implement the code you'll need to look and understand other files (a2_abcs.py).

DO NOT CHANGE ANYTHING IN THE FILE.

Task 3. Train and Test

File: “a2_training_and_testing.py”

3 Functions:

1. def train_for_epoch
2. def compute_batch_total_bleu
3. def compute_average_bleu_over_dataset

General Development

- You will not need any imports that are not already specified.
- Do not change any files that come implemented.
- Check Piazza for updates to the code.
- When dealing with matrices (i.e., tensors) in the neural network, use vectorized/matrix operations.

Marking

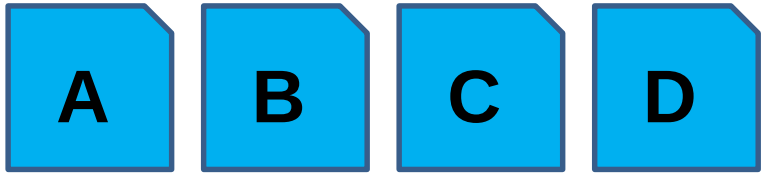
(A large) Portion of it will be auto-marked.

- Your code will be tested individually (by file).
- Your code must adhere to the specifications for function calls to work.
- Do **NOT** hardcode any paths.
- It must work on CDF (test your code).
- There is a GPU component which will be tough to finish on time if you leave it to the last second.

Marking (Cont)

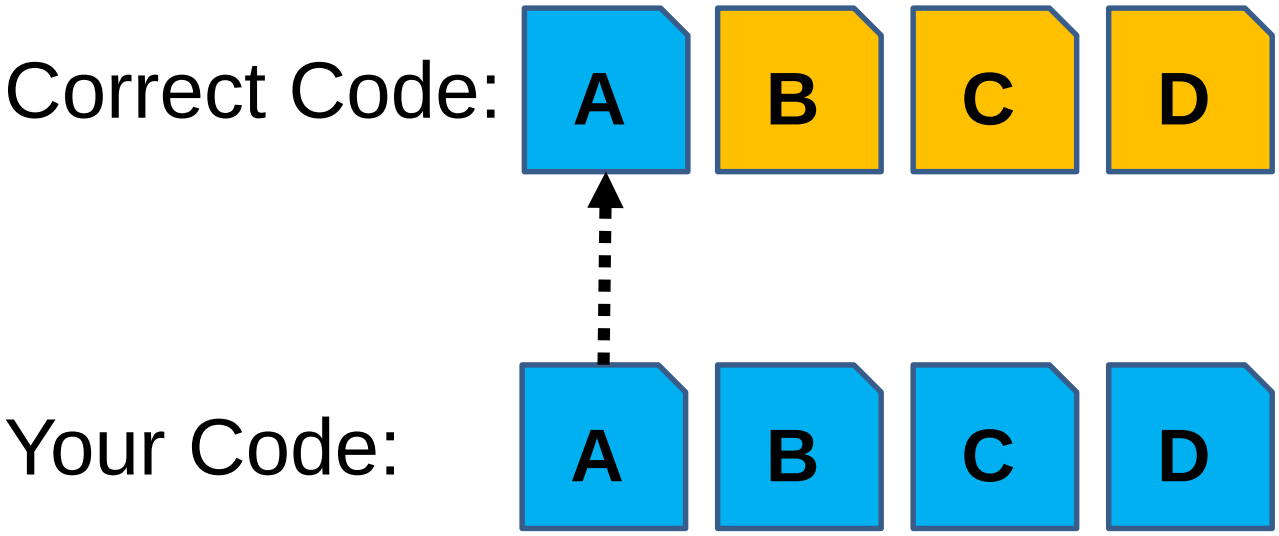
Initially:

Correct Code: 

Your Code: 

Marking (Cont)

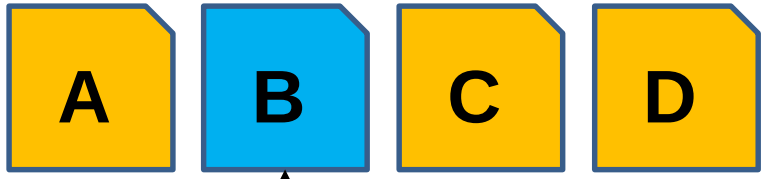
If we are testing “A”:



Marking (Cont)

If we are testing “B”:

Correct Code:



Your Code: