



deeplearning.ai

Sequence to sequence models

Bleu score (optional)

Evaluating machine translation

French: Le chat est sur le tapis.

Bleu
bilingual evaluation understudy

Reference 1: The cat is on the mat. ←

Reference 2: There is a cat on the mat. ←

MT output: the the the the the the the.

Precision:

Modified precision:

Bleu score on bigrams

Example: Reference 1: The cat is on the mat. ←

Reference 2: There is a cat on the mat. ←

MT output: The cat the cat on the mat. ←

	Count	Count _{clip}	
the cat	2 ←	1 ←	
cat the	1 ←	0	4
cat on	1 ←	1 ←	—
on the	1 ←	1 ←	6
the mat	1 ←	1 ←	
	↑		

Bleu score on unigrams

Example: Reference 1: The cat is on the mat.

Reference 2: There is a cat on the mat.

→ MT output: The cat the cat on the mat. (\hat{y})

$$p_1, p_2 = \underline{1.0}$$

$$p_1 = \frac{\sum_{unigram \in \hat{y}} count_{clip}(unigram)}{\sum_{unigram \in \hat{y}} count(unigram)}$$

Handwritten notes: $unigram \in \hat{y}$ (under the first sum), $count_{clip}(unigram)$ (circled), $count(unigram)$ (circled), $unigram$ (under the second sum).

$$p_n = \frac{\sum_{ngram \in \hat{y}} count_{clip}(ngram)}{\sum_{ngram \in \hat{y}} count(ngram)}$$

Handwritten notes: $ngram$ (above the first sum), $count_{clip}(ngram)$ (circled), $count(ngram)$ (circled), $ngram \in \hat{y}$ (under the second sum).

Bleu details

p_n = Bleu score on n-grams only

p_1, p_2, p_3, p_4

Combined Bleu score: $BP \exp\left(\frac{1}{4} \sum_{n=1}^4 p_n\right)$

BP = brevity penalty

$$BP = \begin{cases} 1 & \text{if } \underline{MT_output_length} > \underline{reference_output_length} \\ \exp(1 - MT_output_length/reference_output_length) & \text{otherwise} \end{cases}$$