deeplearning.ai

Sequence to sequence models
_____

Bleu score (optional)

Evaluating machine translation

French: Le chat est sur le tapis.

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
bilingual evaluation understudy

[Papineni et. al., 2002. Bleu: A method for automatic evaluation of machine translation]

Andrew Ng

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
cat on	1 ←	1 ←
on the	1 ←	1 ←
the mat	1 ←	1 ←

$$\frac{4}{6}$$

[Papineni et. al., 2002. Bleu: A method for automatic evaluation of machine translation]   Andrew Ng

Bleu score on unigrams

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

Reference 2: There is a cat on the mat.

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

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

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

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

n-gram

Unigram $\in \hat{y}$

Count (unigram)

unigram

count$_{clip}$ (n-gram)

n-grams $\in \hat{y}$

Count (n-gram)

n-grams $\in \hat{y}$

[Papineni et. al., 2002. Bleu: A method for automatic evaluation of machine translation]   Andrew Ng

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 = brevy penalty

$$BP = \begin{cases} 1 & \text{if MT\_output\_length} > \text{reference\_output\_length} \\ \exp(1 - \text{MT\_output\_length/reference\_output\_length}) & \text{otherwise} \end{cases}$$

[Papineni et. al., 2002. Bleu: A method for automatic evaluation of machine translation]

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