Neural Machine Translation

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Outline

NMT History

Sequence to Sequence Translation

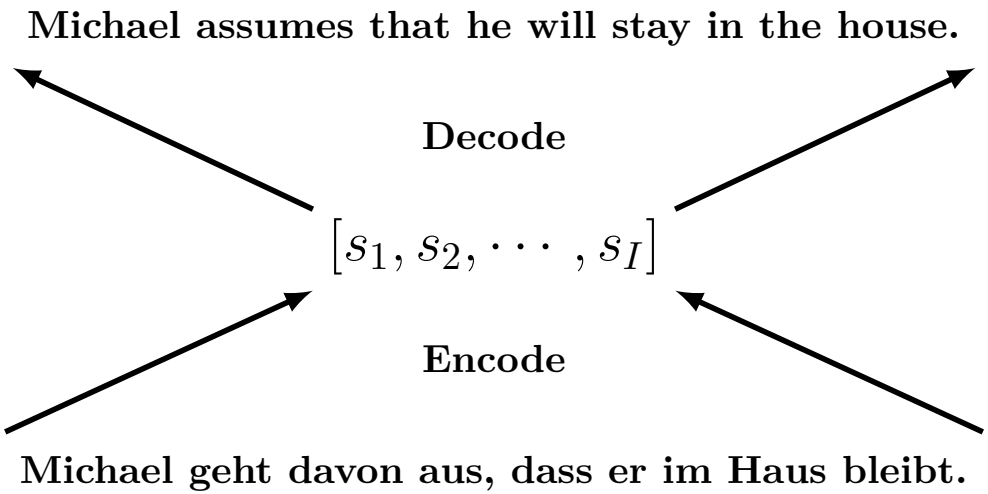
Comparison

NMT History

- **2014** Sequence to sequence translation [Sutskever & Vinyals+ 14, Cho & van Merrienboer+ 14b]
- **2015** Attention-based neural machine translation [Bahdanau & Cho+ 15, Luong & Pham+ 15a]
- **2016** Subword-NMT [Sennrich & Haddow+ 16b]
- Multi-lingual NMT [Firat & Cho+ 16]
- WMT 2016
- Google NMT [Wu & Schuster+ 16]
- Fully char-level NMT [Lee & Cho+ 16]
- **2017** ...

Sequence to Sequence Translation

- Basic principle behind neural machine translation
- Translation from one language to another can be done by a single neural network
- The input and output are both variable-length sequences
- An encoder reads the source sentence, encodes it into a vector
- Decoder uses this vector to predict the target words



Comparison to Best Systems

	WMT2015 De→En newstest2014		WMT2016 En→Ro newstest2016		BOLT Zh→En test1	
	BLEU %	TER %	BLEU %	TER %	BLEU %	TER %
Model A	28.1	53.2	24.5	59.3	17.9	67.7
Model B	24.0	57.2	26.7	56.6	17.9	67.2
Model C	28.2	53.0	25.3	58.4	17.6	68.9
Model D	29.2	52.9	27.1	55.4	21.7	63.7

- De→En and Zh→En:
  - Subwords and LSTM

Thank you for your attention

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Results: Cool Method with Overlay (IWSLT2013)

IWSLT De-En	dev		test		eval11		alignment-test	
Model	BLEU %	TER %	BLEU %	TER %	BLEU %	TER %	AER%	SAER%
Attention-Based	30.5	48.7	29.3	50.6	33.9	46.6	41.8	66.3
+ method	31.5	47.2	30.3	49.0	34.3	44.3	35.4	44.2

- Improves translation by an average of 0.8 BLEU on IWSLT2013
- Great improvement in AER and SAER

Results: Cool Method with Overlay (WMT2016)

WMT En-Ro	newsdev2016/1		newsdev2016/2		newstest2016	
Model	BLEU %	TER %	BLEU %	TER %	BLEU %	TER %
Attention-Based	19.8	62.0	21.3	58.1	20.3	60.4
+GA	21.0	61.1	23.6	56.4	21.8	59.4
+method + conv ($D = 10, M = 1$)	21.4	60.1	24.7	55.4	22.3	58.7

- Improves translation by an average of 0.8 BLEU on IWSLT2013
- Great improvement in AER and SAER
- Improves translation by an average of 1.7 BLEU on WMT2016
  - Adding convolutional feedback gives an additional 0.6 BLEU on average

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