Learning to understand

Dad - What is "gin"?
Learning to understand

From explanations

• “It’s something to drink”
• “… for adults, you know …”

Dad - What is “gin”?
Learning to understand

From explanations

• “It’s something to drink”
• “… for adults, you know …”

Grounding

• this is a bottle of gin …
• this is someone who drank gin …

Dad - What is “gin”?
Learning to understand

From explanations
• “It’s something to drink”
• “… for adults, you know …”

Grounding
• this is a bottle of gin …
• this is someone who drank gin …

Reinforcement
• “Give me that bottle!”
• “This is alcohol! … nothing for you, man!

Dad - What is “gin”?
Learning from multilingual data

Translations as explanations
- each translation gives a different view
- translations are like naturally occurring reformulations

Grounding through multimodality
- add visual features
- add sound

Reinforce semantics
- supervised training objectives that require understanding
- machine translation and other tasks
Machine translation and meaning

meaning

source language

observable training data

level of understanding

understanding

speaking

target language
Machine translation and meaning

- Latent semantic representation
- Machine translation
- Analysis
- Generation
- Translation
- Level of understanding
- Source language
- Target language
- Observable training data

Use translations as semantic supervision!
Table 1: The performance of the LSTM on WMT'14 English to French test set (ntst14). Note that an ensemble of 5 LSTMs with a beam of size 2 is cheaper than a single LSTM with a beam of size 12.

<table>
<thead>
<tr>
<th>Method</th>
<th>test BLEU score (ntst14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline System [29]</td>
<td>33.30</td>
</tr>
<tr>
<td>Cho et al. [5]</td>
<td>34.54</td>
</tr>
<tr>
<td>Best WMT'14 result [9]</td>
<td>37.0</td>
</tr>
<tr>
<td>Rescoring the baseline 1000-best with a single forward LSTM</td>
<td>35.61</td>
</tr>
<tr>
<td>Rescoring the baseline 1000-best with a single reversed LSTM</td>
<td>35.85</td>
</tr>
<tr>
<td>Rescoring the baseline 1000-best with an ensemble of 5 reversed LSTMs</td>
<td>36.50</td>
</tr>
</tbody>
</table>

Table 2: Methods that use neural networks together with an SM system on the WMT'14 English to French test set (ntst14).

Task by a sizeable margin, despite its inability to handle out-of-vocabulary words. The LSTM is within 0.5 BLEU points of the best WMT'14 result if it is used to rescore the 1000-best lists to the baseline system.

3.7 Performance on long sentences

We were surprised to discover that the LSTM did well on long sentences, which is shown quantitatively in figure 3. Table 3 presents several examples of long sentences and their translations.

3.8 Model Analysis

(From Sutskever et. al: “Sequence to Sequence Learning with Neural Networks”)
Multilingual Machine Translation (MT)
Multilingual Machine Translation (MT)

many
languages

many
languages

train
Multilingual Machine Translation (MT)

Many languages

Train

Many languages
Multilingual Machine Translation (MT)
Multilingual Machine Translation (MT)

Many languages train multilingual MT model.

Many languages zero-shot translation learning paraphrase model.
Multilingual MT & Zero-Shot Translation

BLEU scores = comparison with human reference translations (higher = better)
Multilingual MT & Zero-Shot Translation

Model with all languages

BLEU scores = comparison with human reference translations (higher = better)
Multilingual MT & Zero-Shot Translation

![Graph showing BLEU scores for various language pairs]

- **BLEU scores** = comparison with human reference translations (higher = better)

- **Model with all languages**

- **Language pair not seen in training data (zero shot)**

---

**Language Pairs with BLEU Scores:**
- En→De: 38
- De→En: 41
- En→Cs: 39
- Cs→En: 36
- Fr→En: 57
- En→Fr: 43
- De→Fr: 50
- Fr→De: 48
- De→Cs: 32
- Cs→De: 31
- Cs→Fr: 40
- Fr→Cs: 28

---

**Legend:**
- m2m + monolingual
- bilingual + attBridge
- zero-shot
Multilingual MT & Paraphrasing

Fix your language!

- detect language
- Afrikaans
- Danish
- Dutch
- Catalan
- Estonian
- Finnish
- Faroese
- French
- Frisian
- Galician
- German
- Hungarian
- Icelandic
- Italian
- Norwegian
- Occitan
- Portuguese
- Spanish
- Swedish

Valsch geschreibt is nich gut!
Das Pferd hat gelaufen.
Ich haben fertig.
Wir sein kommen.
wat morkelst du denn da rum?
Icke geb dir dann och noch wat zu trinken.
Dat is nix für meinereiner!
Mein Fuß ist brechen! Ich muss nach die dokter.

Falsch geschrieben ist nicht gut! Das Pferd ist gelaufen.

https://translate.ling.helsinki.fi/fix_language
The Haus is musty.
Success is possible

https://translate.ling.helsinki.fi/fix_language
What does the system attend to?

(a) $k = 1$

(b) $k = 10$
Translation-related projects

Data collection for MT
> 200 languages
http://opus.nlpl.eu

Data collection & MT
in 2 languages
https://blogs.helsinki.fi/fiskmo-project/

http://blogs.helsinki.fi/language-technology/

audiovisual data & MT
in 6 languages

semantics & MT > 1,000 languages

MeMAD
Methods for Managing Audiovisual Data
https://memad.eu