THE UNIVERSITY OF TOKYO

Debugging Machine Translations

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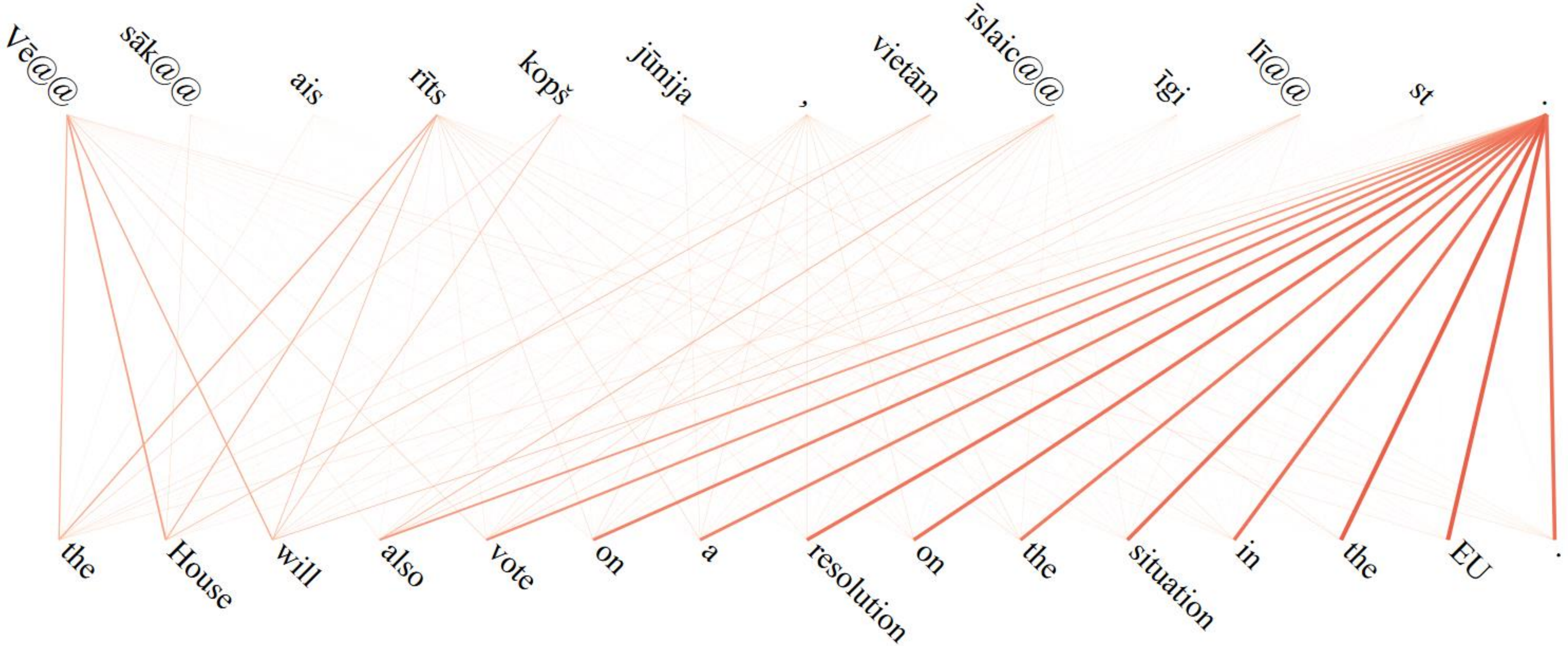
Visualizing Neural Machine Translation Attention and Confidence

- Look at specific attention alignments in the terminal
- Browse whole test sets and find *suspicious* translations
  - Sort by length or 3 other confidence metrics
- Generate screenshots of example translations for publications, presentations, etc.

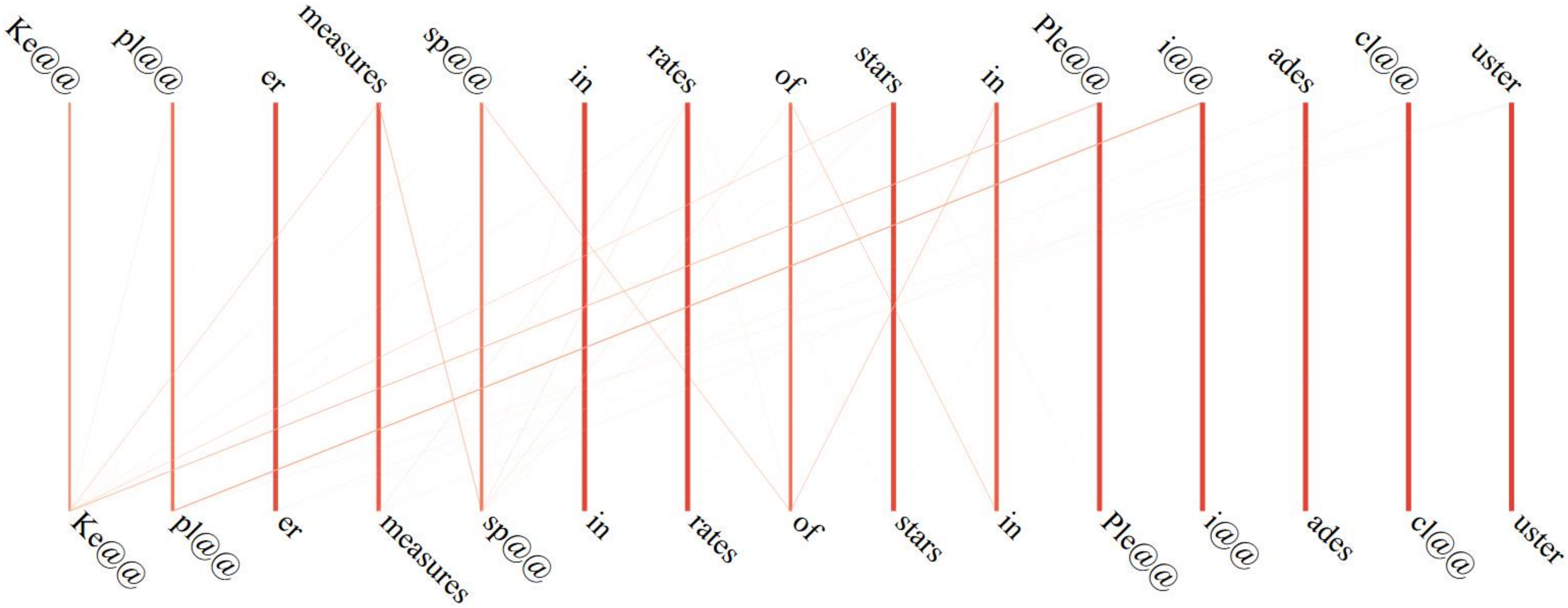
Later additions

- Directly compare two translations of the same source
- Sort by BLEU or similarity to source
- Tweaked confidence score

Unrelated Translations



Untranslated Sentences



Check out the paper for more details

$$AP_{out} = -\frac{1}{L_{src}} \sum_i \sum_j \propto_{ij} \cdot \, log \propto_{ij}$$

$$CDP = \frac{1}{L_{src}} \sum_j \log\left(1 + \left(\sum_i \propto_{ji}\right)^2\right)$$

$$AP_{in} = -\frac{1}{L_{trg}} \sum_i \sum_j \propto_{ij} \cdot \, log \propto_{ij}$$

$$confidence = CDP + AP_{out} + AP_{in}$$

Requirements

- **https://github.com/M4t1ss/SoftAlignments**
  - **This presentation, links to models and data, scripts used in this tutorial are all in assets/MT-Marathon-2019**
- Python 2 or 3
  - NLTK (for BLEU calculation)
- PHP 5.4 or newer (for web visualization)
- Translations and NMT attention alignments
  - + source text
  - + reference (for BLEU calculation)

Model Specific Details

- RNNs mostly work
- Does anyone actually use CNNs for MT?
- Transformers have too many attention matrices
  - Use guided alignment in Marian
  - Use averaged attention in Sockeye (https://github.com/awslabs/sockeye/pull/504/files)

Guided Alignment in Marian

- Prepare data up to the part of splitting in subword units
- Run *fast_align* on the subword training data
  - An example is in assets/MT-Marathon-2019/scripts/fast_align.sh
- Pass the resulting *grow-diag-final-and* file to Marian for training via the *--guided-alignment* parameter
  - An example is in assets/MT-Marathon-2019/scripts/train.sh
- Translate as usual
  - To get translations with attention alignments, pass the *--alignment soft* parameter to marian-decoder
  - An example is in assets/MT-Marathon-2019/scripts/translate.sh – use this to translate the prepared data
  - Marian outputs a slightly different alignment format than Nematus, Amun, OpenNMT. Use the included format-output.py to convert it

NMT Attention Alignment Visualizations

https://github.com/M4t1ss/SoftAlignments

- Run examples from the readme using the tiny data sets that are in the repository
- Load the data you just translated using one of the models
  - Find some whacky translation examples
  - Are there any sentences completely untranslated?
- Translate the same data with both models and compare both outputs

Find Some Buggy Translations

https://github.com/M4t1ss/SoftAlignments

- High BLEU, low other scores
- Low BLEU, high other scores
- Not so long sentences with some or all low scores

You can use the online version

- **http://attention.lielakeda.lv**
- Examples from this lab have names starting with MTM-
- Check out other datasets that are there