Neural Machine Translation at Ford Motor Company

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Background

- Ford started using MT in 2000 for translation of manufacturing build instructions
  - Controlled Language input
  - Customization
  - Confidentiality
- Increased scope of MT:
  - Warranty Claims
  - Dealer Feedback
  - Customer Feedback, etc.
- Migrated to statistical/hybrid MT
- Started developing NMT in 2018
- Deployed NMT in 2019 for 4 languages
NMT Current Status

• Deployed in October of 2019
• Supports 31 language pairs
  – From English to -> German, Spanish, Chinese, Portuguese, French, Italian, Thai, Turkish, Vietnamese, Romanian, Russian
  – From German, Spanish, Chinese, Portuguese, French, Italian, Thai, Turkish, Polish, Dutch, Norwegian, Finnish, Swedish, Danish, Vietnamese, Arabic, Tagalog, Hindi, Chinese (Traditional), Romanian to -> English
• NMT is a service that is available throughout Ford
  – User Interface (www.translate.ford.com)
  – High-Speed Table-Driven Batch Translation (Warranty, Customer Feedback)
  – Legacy Batch Translation through API (Call Center Feedback, Dealers, Manufacturing/Powertrain)
• NMT is trained on a combination of Ford-specific data and general-purpose data and is deployed on Kubernetes and the HPC
Measuring Translation Accuracy

- Human Evaluation of Machine Translation
  - Bi-Lingual Speakers with Domain Knowledge
- Automated Evaluation
  - BLEU (Bilingual Evaluation Understudy)
  - Widely-used to compare MT models
  - Range between 0 to 1 (short phrases skew higher)
  - Compares similarity to human-translated text
- Issued with BLEU & other metrics
  - Shallow understanding of language
  - Does not take alternate translations into account
  - Does not always correlate to better translation quality
NMT Accuracy

• BLEU Scores – automated industry standard
• Manual human evaluation

Compared our results vs. Google Translate on Ford internal QNPS (Quality Net Promoter Score) (2020)
NMT Architecture

Neural Machine Translation w/ OpenNMT-TF Architecture

- Pre-Processing
- OpenNMT-TF Training
- Language Model

Training on GPU Cluster
- German, Spanish, Chinese, Portuguese, French, Italian, Chinese, Russian, Thai, Dutch, Vietnamese and others.

Applications
- AWS
- QNPS
- Table-Driven Batch
- OpenNMT-TF translation
- Translation API

Mach1ML Hosting
- www.translate.ford.com
Incremental training takes < 5000 steps i.e. 2-3 hrs on a single V100 GPU

Even after searching through various sampling strategies and learning rates, model is available for deployment in a day.
Q&A

Thank you!