Advanced Language Processing Winter School 2021

17–22 January 2021, Grenoble, France

Schedule

- Seven Zoom Q&A sessions with pre-recorded lectures by the speakers.
- Three student poster sessions.
- Two Slack lab sessions.
- A Zoom social session, playing Codenames by Vladimír Chvátil (FI alumnus).

Outline

1. **Kyunghyun Cho: Language Modeling** (Lecture [1, 2, 3], Lab, Q&A)
2. **Claire Gardent: Natural Language Generation** (Lecture, Q&A)
3. **Laurent Besacier: Self-Supervised Learning from Speech** (Lecture, Q&A)
4. **Yejin Choi: Neuro-Symbolic Common-Sense Knowledge** (Lec.[1, 2], Q&A)
5. **Grzegorz Chrupała: Visually-Grounded Models of Speech** (Lecture, Q&A)
6. **Tim Baldwin: NLP for User-Generated Content** (Lecture, Q&A)
7. **Isabelle Augenstein: Explainability for NLP** (Lecture, Lab, Q&A)
8. Poster sessions

Cho: Language Modeling and Machine Translation

- Cho is one of the authors of the Attention mechanism. (Bahdanau et al, 2016)
- Lecture introduces N-gram language models and motivates neural models:
  - N-gram language models suffer from data sparsity (traditional solutions: smoothing, backoff).
  - N-gram language models can't capture long-term dependencies (no traditional solutions).
- For language modeling, lecture develops CBOW and RNNs (LSTM, GRU).
- For machine translation, lecture develops LSTM+Attention and Transformers.
- Lab shows how CBOW, recurrent models, LSTM+Attention, and Transformers can be implemented and used for language modeling & machine translation.

Choi: Neuro-Symbolic Common-Sense Reasoning

- In the lecture, Choi frames common-sense reasoning as language generation:
  - Kahnemann (2003) argues intuitive reasoning is part of System 1, evoked by language.
  - Hofstadter and Sander (2013): “categories [..] outnumber words, require [..] text descriptions.”
- Several works by Choi et al. are introduced:
  - Unsupervised inference-time algorithms:
    i. Reasoning through neural backpropagation (Qin et al., 2020)
    ii. Reasoning through search with logical constraints (Lu et al., 2020)
    iii. Reasoning through distributional neural imagination (West et al., 2020)
  - Supervised knowledge modeling algorithms:
    i. Neural and symbolic common-sense knowledge (Hwang et al., 2020)
    ii. Visually grounded common-sense knowledge (Park et al., 2020)
    iii. Social, ethical, and moral norms (Forbes et al., 2020)
- Common-sense challenges by Choi et al. are introduced:
  - Physical/Social IQA, Visual/Abductive Cms. Reasoning, HellaSwag, WinoGrande, CosmosQA

Chrupała: Visually-Grounded Models of Speech

- In the lecture, Chrupała motivates visually-grounded modeling of speech:
  - Additional modality helps solve the lack of annotated data for most spoken languages.
- Existing datasets for visually-grounded modeling of speech are introduced:
  - MIT Flickr Audio Caption Corpus – 8K Flickr images with ~48 hours of spoken captions
  - Places Audio Captions – 100K images w/ spoken descriptions in English/Hindi (w/o captions)
  - Synthetically Spoken COCO, SPEECH COCO – 300K images w/ synthesized spoken captions
- Existing works on visually-grounded modeling of speech are introduced:
  - Cross-Channel Early Linguistic Learning (Roy and Pentland, 2002)
  - Deep Multimodal Semantic Embeddings for Speech and Images (Harwath and Glass, 2015)
  - Unsupervised Learning of Spoken Language with Visual Context (Harwath et al., 2016)
  - Representations of Language in a Model of Visually Grounded Speech (Chrupała et al., 2017)
  - Language Learning Using Speech to Image Retrieval (Merkx et al., 2019)
- Analyses of visually grounded model representations are discussed:
  - Bottom layers encode phonemes (form), top layers encode meaning. (Chrupała et al., 2020)

Augenstein: Explainability for Natural Lang. Proc.

- In the lecture, Augenstein motivates and defines explainability:
  - **Decision Understanding** – How does the model arrive at predictions for specific instances?
  - **Model Understanding** – What features and parameters has a model learnt?
- Several works of Augenstein et al. about explainability are introduced:
  - Decision Understanding:
    1. Generating Fact Checking Explanations (Atanasova et al., 2020)
    2. A Diagnostic Study of Expl. Techniques for Text Classification (Atanasova et al., 2020)
  - Model Understanding:
    1. Generating Label-Cohesive and Well-Formed Advers. Claims (Atanasova et al., 2020)
    2. TX-Ray: Quantifying & Explaining Model-Knowledge Transfer in (Un-)Supervised Natural Language Processing (Rethmeier et al., 2020)
- Post-hoc **explainability methods** and **evaluation measures** are introduced:
  - Gradient-based, Perturbation-based, Simplification-based (see also the interpretability book)
  - Agreement with Human, Confidence Indication, Faithfulness, Rationale/Dataset Consistency