11-830 Computational Ethics for NLP

NLP for Good: Lorelei
Government Investment in Languages

- Language Technologies mostly developed for High Resource Languages
  - English, Spanish, German, Arabic, Mandarin
- What about the other 6995 languages?
  - Maybe 30 have good resources (ASR, Treebanks, Parsers)
- What about those around 300-1000?
  - > 1 Millions speakers, Have media (writing systems)
- If no immediate commercial value no support happens
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- But
  - Wars and Religions!
  - People will spend money to develop non-commercial support if
  - They want to spread the word, (or stop the word)
US Government LT Investment

• DARPA
  • Invested in MT from 1940s
  • Invested in ASR from 1970s
  • Invested in Dialog systems from 1990s
  • Invested in Speech Translation from 1990s
• Case study Lorelei (2016-2021)
The Scenario

- Disaster happens! (e.g. earthquake)
- Area effected doesn’t use major language
- Communication is in local language
  - News, TV/Radio, Social Media
- What is going on?
  - Where should you provide support
  - Who is affected
  - How many people need help
  - What is the urgency
Lorelei Incident

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- Communication is in local language
  - News, TV/Radio, Social Media
- Provide
  - Machine Translation
  - NER
  - Situation Frames (11 types) plus location, status, urgency, “gravity”
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- Do this in
  - 24 hours
  - 7 days
  - 30 days
- You are told the language at hour 0
Lorelei Evaluation Exercises

- May 2016: Dry Run (Mandarin)
- July 2016: Uighur (Turkic Language spoken in Western China)
- July 2017: Tigrinya and Oromo (spoken in Eritrea and Ethiopia)
- July 2018: ??? and ???
Lorelei Performers

- Providing complete systems (with components from elsewhere)
- USC/ISI (with UIUC, Notre Dame)
- CMU (with UW, Melbourne and Leidos)
- BBN (with JHU, UPenn)
- Other components
  - Columbia (urgency, sentiment)
  - UTEP (SF from prosody)
Techniques

• Perform in pronunciation space
  • Not words, morphemes or character space
• Cross Lingual Transfer
  • If $w_3_{l_1}$ co-occurs with $w_1_{l_1}$, $w_2_{l_1}$
  • Maybe $w_3_{l_2}$ means $\text{trans}(w_3_{l_1})$ if $\text{trans}(w_1_{l_1}),\text{trans}(w_2_{l_2})$
  • e.g. China, Japan and Korea vs 中国，日本，韓國
• Very Low Resources
  • Religious Texts (Bible, Quran and Unix Manuals)
  • Wikipedia
  • Native Informant (“taxi” driver bilingual for limited time)
Techniques

• Global Linguistic Knowledge
  • High morphology language more likely to be free word order
  • Close language borrowing
    • linguistic/geographic/colonial
    • Uighur numbers are Turkish-like
    • Merci is casual Arabic for “thank you”
    • Pashto (Indic) has many Dari/Farsi lexemes
    • “Petrol” might be called “gas”
• Nothing is spelled consistently
  • The dialects aren’t well defined
  • The registers aren’t well defined
  • People code-mix all the time
Lorelei Advances

- Techniques for low resource languages
  - Translation, interpretation, sentiment
  - Both particular languages, and general techniques
- Machine Learning
  - Better use of limited data
  - Not naive just end-to-end
    - Using large mono-lingual dataset to improve models
    - Using structure to make learning easier
- Helping people get immediate help in earthquakes