Spoken Arabic Dialect ID

Speech & Audio Processing & Recognition

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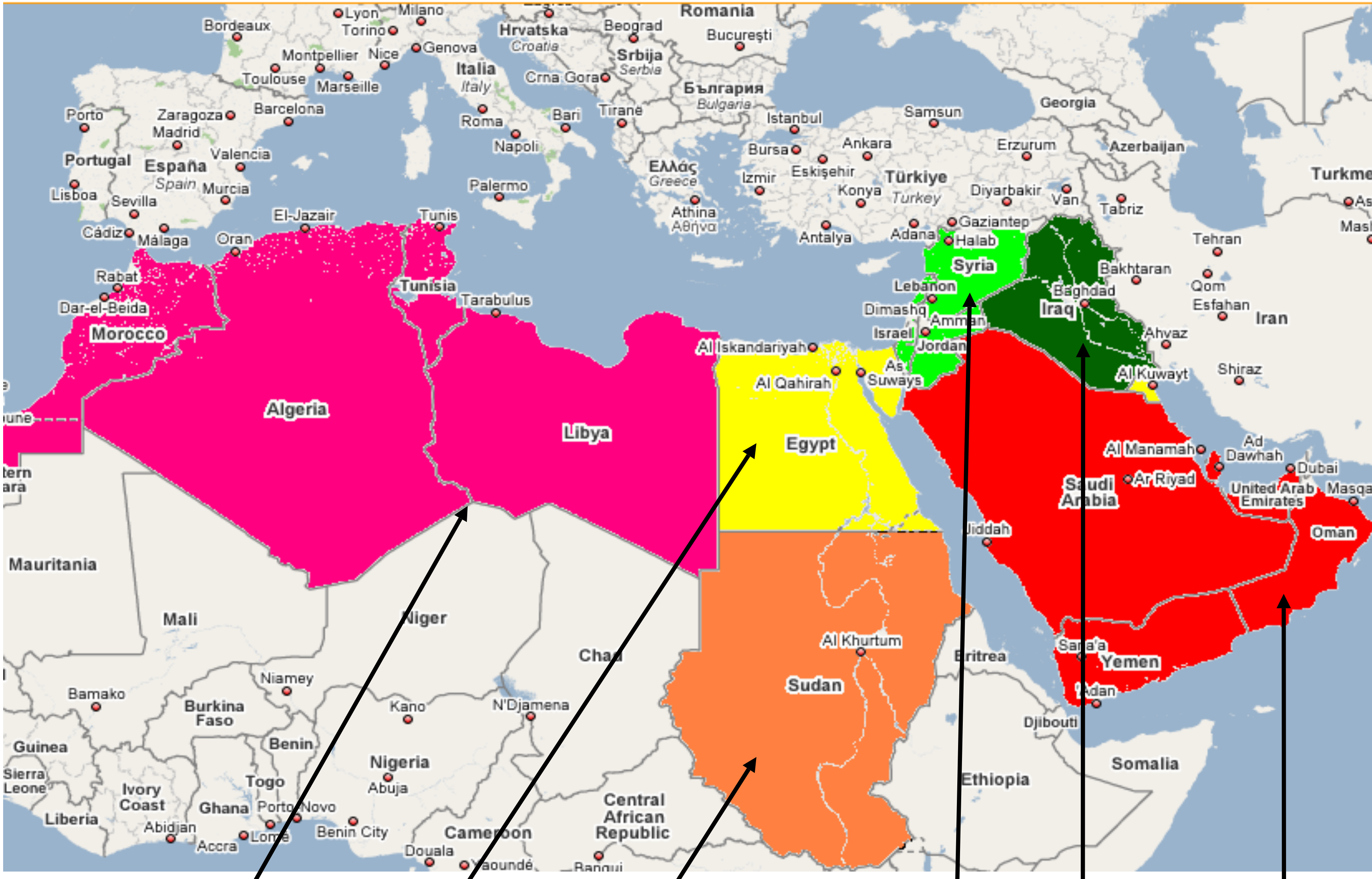
March 13, 2008

Background

- Modern Standard Arabic (MSA): standard language throughout the Arab world (Literary Arabic)
  - A native Language of Nobody
- Colloquial Arabic: collective term for all dialects of Arabic



Maghrebi, Egyptian, Sudanese, Levantine, Iraqi, Arabian

Dialect ID

- Given a speech segment as short as possible ➔ Dialect ID

Why Study Dialect ID

- Interesting problem
  - Phonetic cues?
  - Prosodic cues? (e.g., intonational contours, phrase accents, durational features…)
  - *Lexical and syntactic features?

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    - Pronunciation Model
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    - Morphological Model
    - Language Model

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    - Pronunciation Model
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    - Morphological Model
    - Language Model
- Speaker Annotation

Dialect ID – Our Approach

- Phonotactic Modeling
  - Hypothesis: Every Arabic dialect has its own phonetic distribution
  - This approach was successfully used in Language ID

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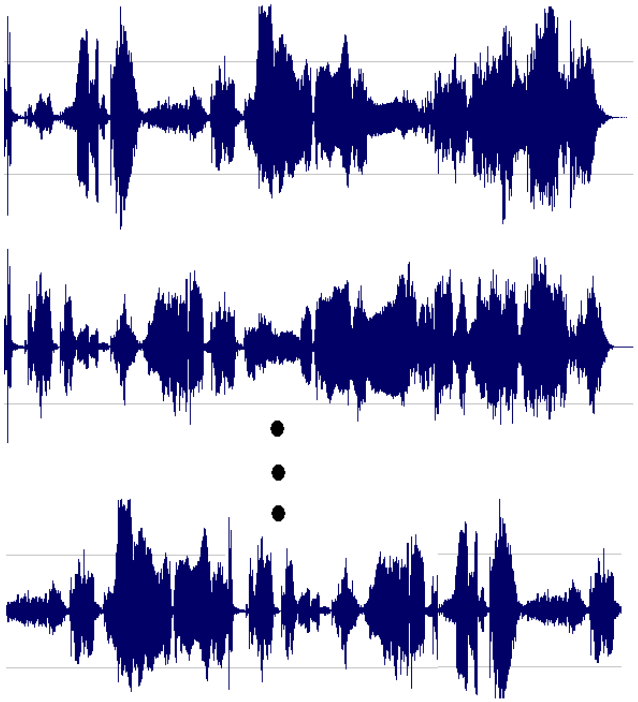
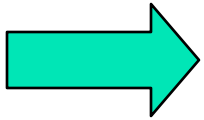
  - For Dialect *i*





dh uw z hh ih n d uw
w ay ey d y aw ao uh
jh y eh k oh aa k v hh
aw ao n

f uw v ow z l iy g s m
p l k dh n eh g f ey m
p l ay ae

dh iy jh sh p eh ae ey
d p sh ua r m ey f ay
n z

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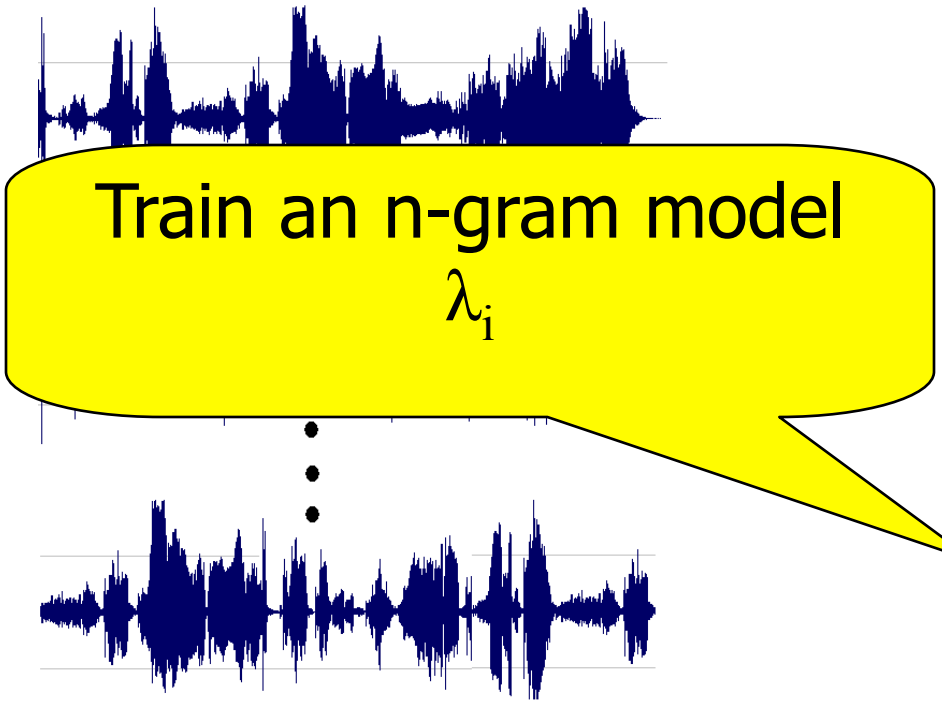

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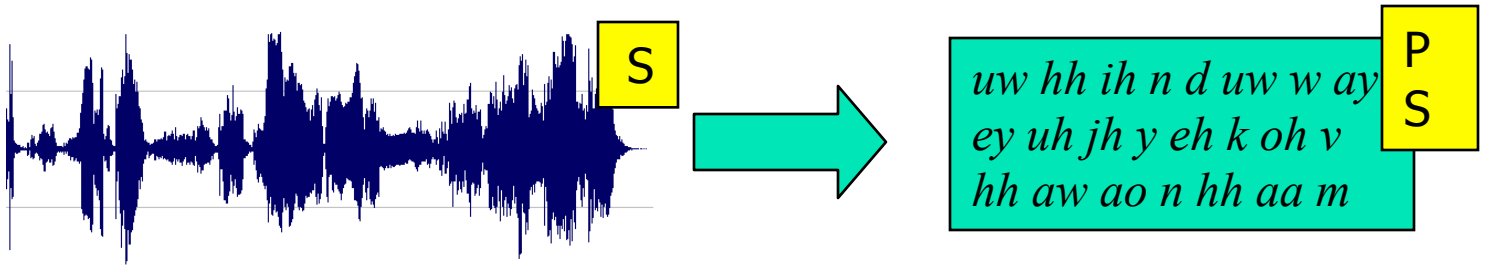

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$$= \arg\max_i (P(PS \mid \lambda_i) P(Di))$$

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$$P(PS \mid \lambda_i) = \prod_{k=0}^{n-1} P(p_k \mid p_{k-1}, p_{k-2})$$

uw hh ih n d uw w ay
ey uh jh y eh k oh v
hh aw ao n hh aa m

PS

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Experiment

- Train an MSA “phone” recognizer on ~37 hours of speech from TDT4 Broadcast News

Corpora – Levantine

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- Arabic CTS Levantine Fisher Training Data Set 1,2,3 Speech
  - 762 Dialogues ➔ 1524 speaker
  - Each dialogue is 10 minutes ➔ 127 hours of speech
  - Annotated: LEB=547, JOR=393, PAL=187, SYR=72

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- Egyptian corpus: held-out 20/240 speakers
  - Run the Arabic phone recognizer on 220 files:

    ➔ ~18.3 million phones

- Levantine corpus, held out 757/1524
  - Run the Arabic phone recognizer on 220 files:
    - ➔ ~19.4 million phones

Results on the held out Data

- Levantine: 98.3% 744/757 were correctly classified as Levantine
- Egyptian: 95% 19/20 were correctly classified as Egyptian

Results on a different corpus

- Babylon Levantine corpus
  - Microphone Recordings
  - 164 speakers
  - ~60 hours of speech
  - Accuracy: 96.3% speakers

TODO

- Test on a different corpus for Egyptian
- Try to identify "sub" dialects (from the same corpus)
- Identify Gulf and Iraqi Arabic
- Incorporate English phone recognizer

Important issue (TODO)

- We use all the speech of a speaker
  - avg: ~5 minutes for Lev.
  - avg: ~15 minutes for Egy.

- Will this approach work if we use less than 30s of speech?

Thank you!