Speech recognition and synthesis

1. Speech Corpora, labeling and segmentation
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   - Language corpora
   - Use of corpora in Speech Technology
   - Annotation, Segmentation, and labeling
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Introduction

There is no data like more data

- Speech and Language are extremely complex
- Large amounts of data are necessary to model them
- "The best application is the one with the largest corpus"
- 10-1000 hours of speech recordings needed
- 10^8 - 10^9 word text corpus needed

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Language corpora

Example corpora and their sizes

- IFA Corpus: 50 thousand words ($5\frac{1}{2}$ hours) [Van Son(2003)]
- Spoken Dutch Corpus (CGN): 9 million words (800 hours) [NTU(2004)]
- British National Corpus (BNC): 100 million words [BNC(1997)]
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Contents ($\frac{2}{3}$ Dutch, $\frac{1}{3}$ Flemish)

- 500 hours (5,650,000 words) recorded in The Netherlands
- 300 hours (3,250,000 words) in Flanders
- 4250 speakers
- 15 Styles/genres
- Field recordings with Sony Minidisk
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Language corpora: CGN Styles and Genres

CGN: 9 million words from 800 hours of speech

Hour	kWords	Style
225	2,626	spontaneous conversations ('face-to-face')
51	565	interviews with teachers of Dutch (VNC)
92	1,209	spontaneous telephone dialogues
64	853	spontaneous telephone dialogues
11	136	simulated business negotiations
64	790	interviews/discussions/debates (broadcast)
36	360	discussions/debates/meetings (non-broad.)
44	405	lessons recorded in the classroom
21	208	live (eg sport) commentaries (broadcast)
17	186	newsreports/reportages (broadcast)
36	368	news (broadcast)
15	146	commentaries/columns/reviews (broadcast)
2	18	ceremonious speeches/sermons
16	141	lectures/seminars
104	903	read speech (read books)

Language corpora: CGN Annotations

Annotations and transcriptions

- Orthographic transcription (the full 8,900,000 words)
- Manually verified POS tagging and lemmatization (all)
- Lexicon and identification of multi word units (all)
- Automatic time alignment and phonetic transcription at the word level (all)
- Manually verified broad phonetic transcription (1,000,000 words)
- Manually verified time alignment at the word level (1,000,000 words)
- Syntactic annotation (1,000,000 words)
- Two independent prosodic annotations (250,000 words)

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Language corpora: CGN Annotations

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Use of corpora in Speech Technology: Research

Phonetic, prosodic and syntactic research

- Phoneme durations
- Stress and Accent placement
- Intonation and expressive speech (emotions)
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Text to Speech synthesis

- Produce accentuation and boundaries from text
- Produce phoneme durations from text
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Automatic Speech Recognition

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- Language model (smoothed N-grams)
- Pronunciation variation
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- Phonemic transcription ⇒ Phone alignment
- POS tags

All annotations and segmentation can be manually verified (at great cost)

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Phonetic symbols

Speech corpora needed an unambiguous digital encoding of IPA symbols (now there is UNICODE)

- Language specific encodings
  - 1 character ASCII encodings + diacritics (SAMPA)
  - 2 character ASCII encodings (SWITCHBOARD)
- Complete IPA encodings
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Phonetic symbols: CGN's SAMPA encoding

SAMPA vs. Worldbet, eg, Vowels

IPA	CGN	Wbet	Example	Word
ɪ	I	'I '	lIp	lip
ɛ	E	'E '	lEx	leg
ɑ	A	'A '	lAt	lat
ɔ	O	'> '	bOm	bom
ʏ	Y	'ux'	pYt	put
i	i	'i '	lip	liep
y	y	'y '	byr	buur
e	e	'e '	lex	leeg
ø	2	'7 '	d2k	deuk
a	a	'a '	lat	laat
o	o	'o '	bom	boom
u	u	'u '	buk	boek
ə	@	'& '	x@-lE+k	gelijk
ɛi	E+	'Ei'	wE+s	wijs
øy	9+	'8y'	h9+s	huis
ɔu	O+	'Ou'	kO+t	koud

Assignment: 4 Segmentation and labeling

Label and segment your utterance on the word and segment (phoneme) level

- Open sound in praat
- Create a Word tiers
- Add the (aligned) words to the tier
- Copy to a Phoneme tier
- Then add (split into) the phonemes

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Appendix A

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Version 2, June 1991

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Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

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The hypothetical commands `show w` and `show c` should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w` and `show c`; they could even be mouse-clicks or menu items—whatever suits your program.
You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

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> *signature of Ty Coon, 1 April 1989*
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