

①

Welcome!

Intro:

- name
- research / industry interest — why?
- 1 NLP problem

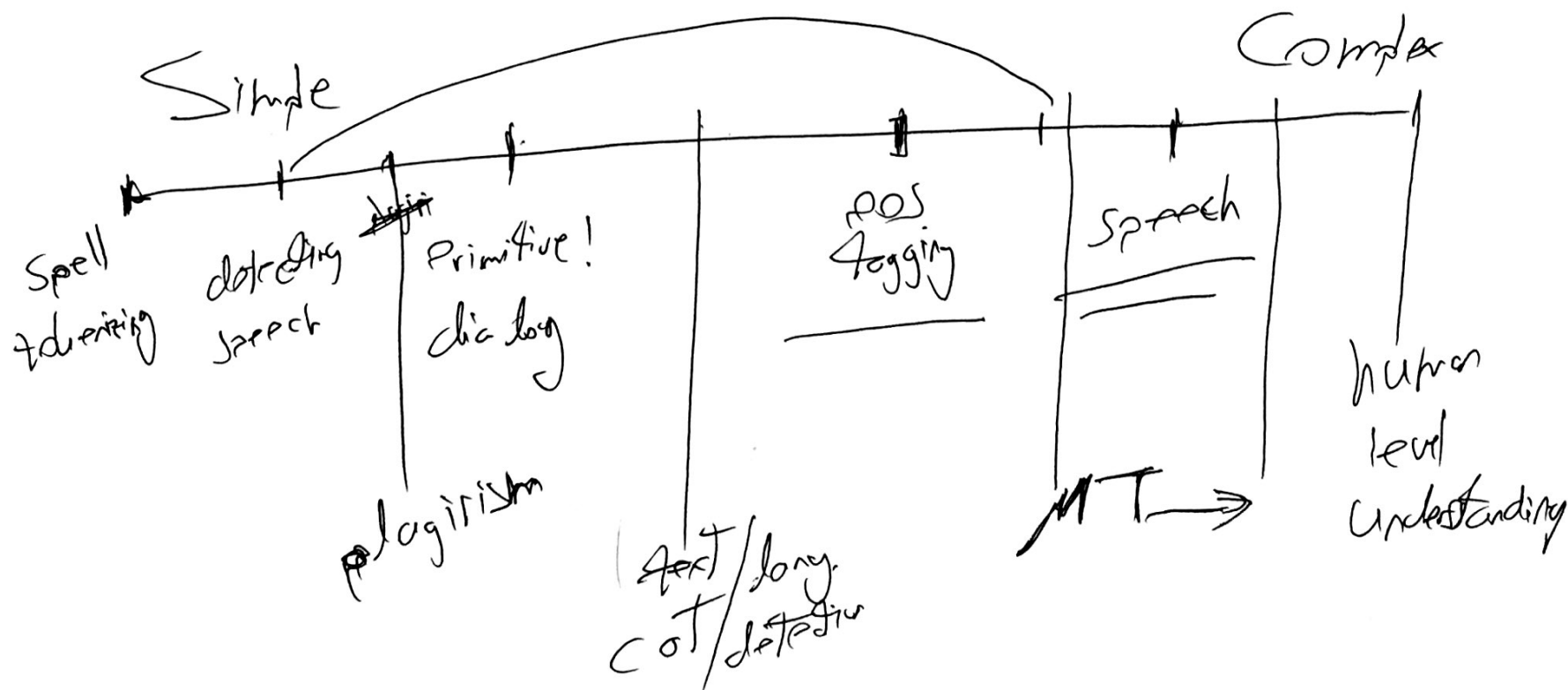
TODO: PDF  
for FNL

2

NLP:

Goal: Understanding

~~Not just string proc.~~



②

Topic I:

$\frac{\text{PER}}{\text{Arzo}}$  is sitting at the

end of the  $\frac{\text{red}}{\text{ADJ}}$  table.

in  $\frac{\text{LOC}}{\text{Gates}}$ .

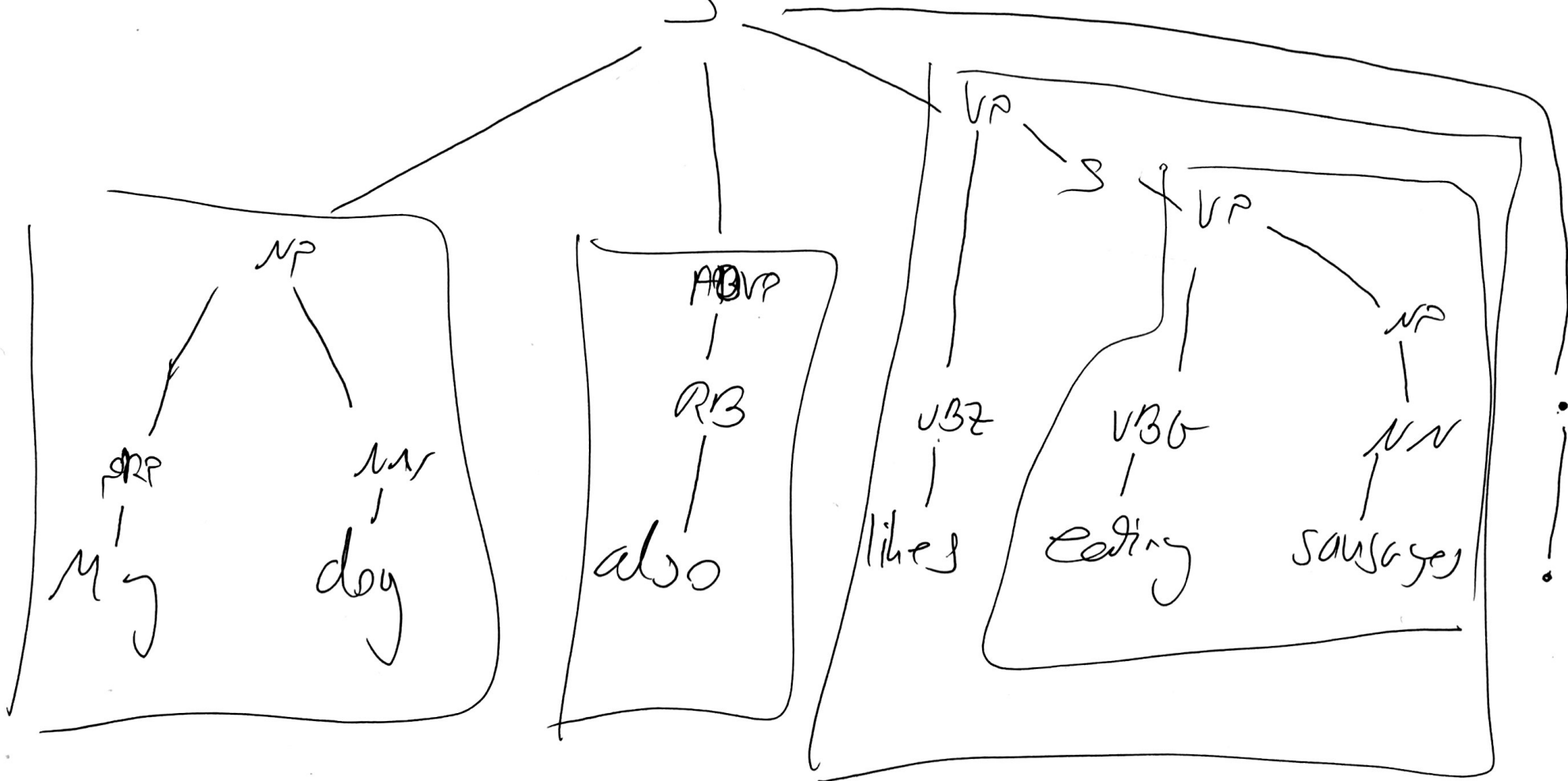
— Calendar

$\frac{\text{VB}}{\text{"Schedule a meeting with } \frac{\text{PER}}{\text{Alane}} \text{ tomorrow at Dom"}}$

④

Root

S



# ① Semantic Parsing

$f: X \longrightarrow \lambda$

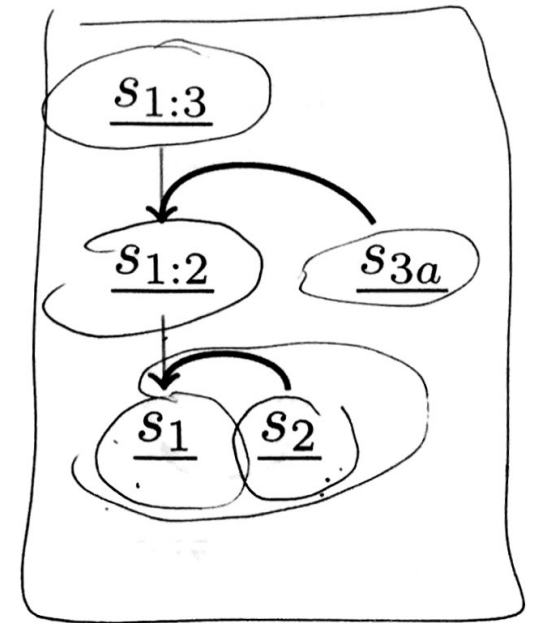
show me flights from nyc

$\lambda x. \text{flight}(x) \wedge \text{tr}(x, \text{nyc})$

# / Rhetorical structure theory

In RST, discourse relations compose elementary units into a tree [MT88].

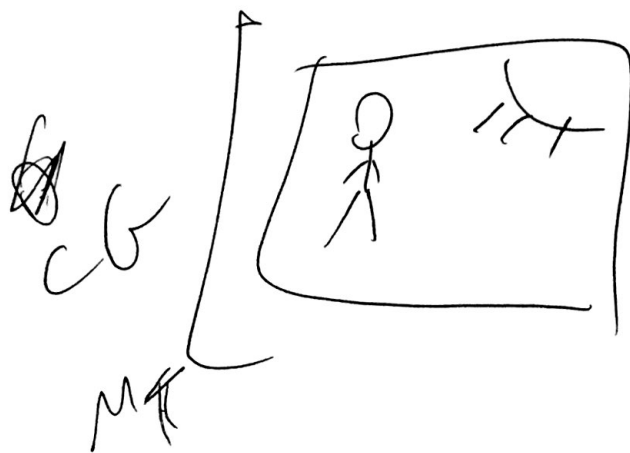
- ▶ s1: Montreal is a bilingual city.
- ▶ s2: They speak French and English.
- ▶ s3a: This makes it an interesting place to visit.



② LM  $\longrightarrow$  Generation

Goal! give a prob.  
to every sentence

$\rho$  (Colorless ideas sleep furiously) = ?



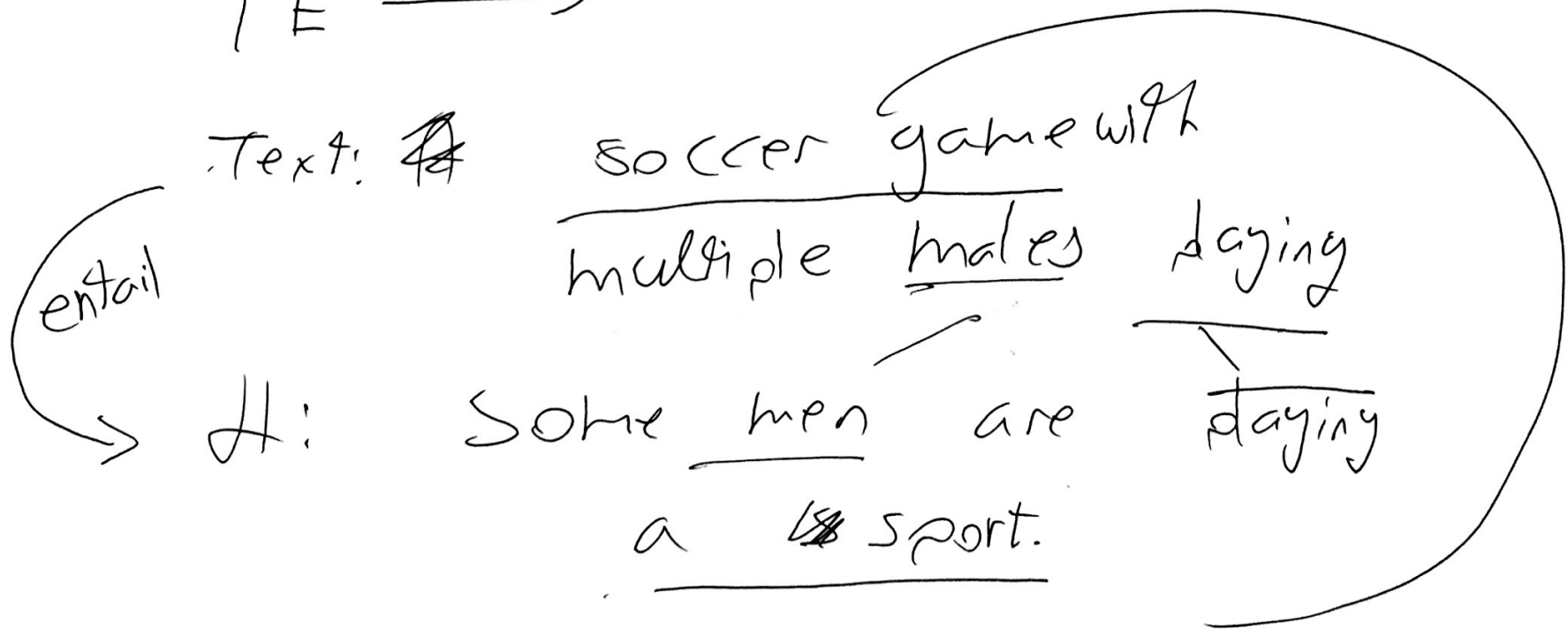
$\longrightarrow$  the boy is  
standing in the sun

③

MT →

SKL →

TE →





$$QA: g \longrightarrow A$$

Embedding  
+  
Dist.  
Semantics

$$w \longrightarrow () \in \mathbb{R}^n$$

lexical  
Semantics

$$w \begin{matrix} \nearrow s_1 \\ \longrightarrow s_2 \\ \searrow s_3 \end{matrix}$$

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# Topics

- Tagging
  - Label segments of sentence
  - NER, linguistic structure, cooking ingredients
  - POS: [http://cogcomp.cs.illinois.edu/page/demo\\_view/pos](http://cogcomp.cs.illinois.edu/page/demo_view/pos)
  - NER: [http://cogcomp.cs.illinois.edu/page/demo\\_view/NERextended](http://cogcomp.cs.illinois.edu/page/demo_view/NERextended)
  - Recipes: <http://open.blogs.nytimes.com/2015/04/09/extracting-structured-data-from-recipes-using-conditional-random-fields/>
- Dependency parsing
  - Hierarchical structure of single words
  - <http://nlp.stanford.edu:8080/corenlp/>
  - EXAMPLE: Summer is ending soon
  - EXAMPLE: The F.B.I. disclosed that it had collected nearly 15,000 new emails in its investigation of Hillary Clinton.
- Constituency parsing
  - Hierarchical structure of constituencies
  - <http://nlp.stanford.edu:8080/parser/>
  - Tree structured over a sentence
- Semantic parsing (i.e., compositional semantics)
  - EXAMPLE: show me flights
  - EXAMPLE: show me flights from new york city
  - EXAMPLE: show me flights from new york city to ithaca
  - <https://lil.cs.washington.edu/uwtime/>
- Discourse parsing
- Language modeling
  - Give every sentence a probability
  - When is it useful? Generation
- Machine translation
  - <https://translate.google.com/>
- Semantic role labeling
  - Pre-defined lexicon of frames or propositions
  - Goal: identify and fill values
  - [http://cogcomp.cs.illinois.edu/page/demo\\_view/SRL](http://cogcomp.cs.illinois.edu/page/demo_view/SRL)

- Textual entailment
  - EXAMPLE: A soccer game with multiple males playing. --> entail --> Some men are playing a sport.
  - EXAMPLE: An older and younger man smiling. --> neutral --> Two men are smiling and laughing at the cats playing on the floor.
- Question answering
  - When was Obama born? 1961
- Reading comprehension
  - <http://research.microsoft.com/en-us/um/redmond/projects/mctest/>
- Sentiment analysis
  - <http://nlp.stanford.edu:8080/sentiment/rntnDemo.html>
- Co-reference resolution (including [Winograd Schemas](#))
  - [http://cogcomp.cs.illinois.edu/page/demo\\_view/Coref](http://cogcomp.cs.illinois.edu/page/demo_view/Coref)
- Word embeddings and distributional semantics
  - Represent word meaning as a point in a multi dimensional continuous space
  - <http://www.ghostweather.com/files/word2vecpride/>
- Lexical semantics
  - Word senses, representing meaning in discrete space
  - <http://demo.patrickpantel.com/demos/lexsem/cbc.htm>
- Vision+language (e.g., VQA, caption generation)
  - <https://www.captionbot.ai/>
  - <http://www.visualqa.org/>
- Information extraction
  - Identify pre-specified relations between entities
  - OpenIE: <http://openie.allenai.org/>
- Time and event extraction
  - <https://lil.cs.washington.edu/uwtime/>
- Math word problems
- Chat bots
  - Historically: bots that can have freeform conversation
    - <http://www.manifestation.com/neurotoys/eliza.php3>
  - Today: focused on micro tasks, e.g., buying flowers
    - <https://www.messenger.com/t/48386889767>