Parsing **Tweets** into **Universal Dependencies**

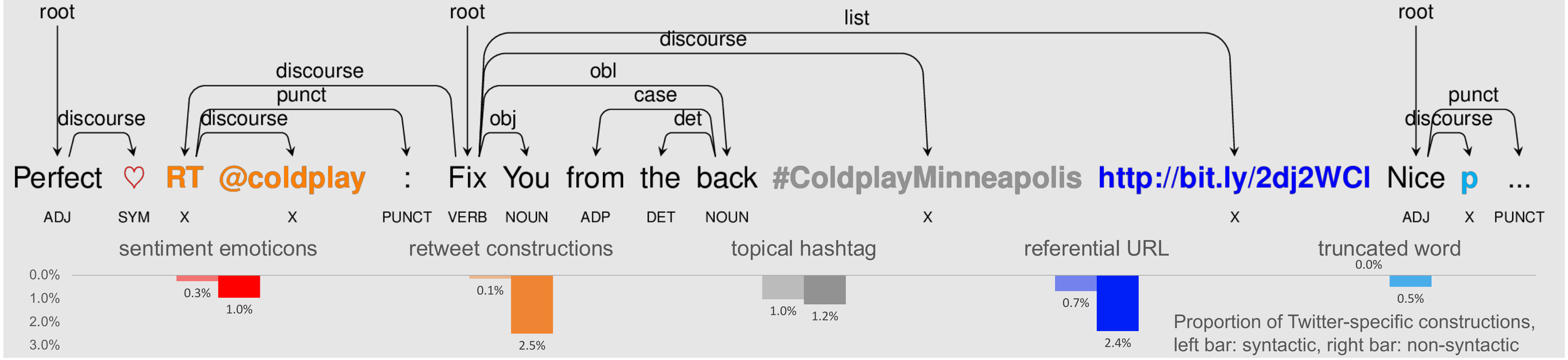
Introduction

Social Media NLP: domain adaptation and annotated datasets
Universal Dependencies (UD): adaptable to different genres and languages
Our work: UD v2 on English Social Media
- Annotation: Tweebank v2 (4x larger than v1)
- Pipeline: Distillation for fast/accurate parsing

Challenges

Annotation
- Twitter-specific constructions that are not covered by UD guidelines (cf. Sanguinetti et al. 2017 for Italian)

Pipeline
- overcome noise in the annotation
- accurate parsing without sacrificing speed



Proportion of Twitter-specific constructions, left bar: syntactic, right bar: non-syntactic

Annotation Guidelines

Tokenization
Tradeoff between preservation of original tweet content and respecting the UD guidelines.

Part-of-Speech
Conform to UD guidelines in most cases.
Use syntactic head's POS for abbreviations.

Dependencies
Identify non-syntactic tokens (see above Fig.)
- *discourse* for **sentiment emoticon**, **topical hashtag**, and **truncated word**
- *list* for **referential URL** conforming UD
- **Retweet construction** is treated as a whole

Twitter-specific Constructions

	Foster et al. (2010) Stanford Dependencies	Tweebank v1 (Kong et al., 2014) FUDG Dependencies	**Tweebank v2 (UD)**
• **URL**	Yes	Yes	Yes
• **Ellipsis**	Not mentioned	Not mentioned	Yes
• **Listing of entities**	Not mentioned	Not mentioned	Yes
• **Parataxis sentences**	Not mentioned	Not mentioned	Yes
• **Phrasal abbreviations**	Not mentioned	Not mentioned	Our contribution
• **Retweet**	Yes	Yes	Our contribution
• **@-mention (reply)**	Yes	Yes	Our contribution
• **Hashtag**	Yes	Yes	Our contribution
• **Truncated words**	Not mentioned	Not mentioned	Our contribution

Common in web-text · **Common in tweets**

Tweebank v2

Data source: Tweebank v1 + Feb to Jul 2016 Twitter Stream
Statistics:
- *18* people involved
- *3,550* annotated tweets
- *4.5* times larger than v1
- POS agreement: *96.6*
- Dep. agreement: *88.8* (U) / *84.3* (L)

Disagreements:
- POS for named entities
- Syntactically ambiguous tweets
- See our paper for more details

Tokenizer

- **Tweet tokenization**: contextual dependent and requires adaption
- *Statistical modeling* vs *rule-based model*
- We propose to use **bi-LSTM** for tokenization and it performs better

System	F1
Stanford CoreNLP	97.3
Twokenizer	94.6
Ours biLSTM	**98.3**

POS tagger

- We consider the existing POS taggers
- *Rich feature-based* (Owoputi et al., 2013) vs *neural tagger* (Ma and Hovy, 2016) and careful feature engineering still helps

System	Acc.
Stanford CoreNLP	90.6
Owoputi et al., 2013	**94.6**
Ma and Hovy, 2016	92.5

Parser

- **Annotation**: noisy, complicates the parser training
- Overcome the noise with **ensemble**
- *Ensemble is slow.* We do *distillation* and it's fast and accurate

System	LAS	Kt/s
Kong et al. (2014)	76.9	0.3
Dozat et al. (2017)	77.7	1.7
Ballesteros et al. (2015)	75.7	**2.3**
Ensemble	**79.4**	0.2
Distillation	77.9	**2.3**

Pipeline Evaluation

Tokenization: 98.3, POS tagging: 93.3, UD parsing: 74.0

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Dataset @ http://tiny.cc/0juzty · **Software @** http://tiny.cc/fluzty