GUIR: Temporal Information Processing for Clinical Narratives

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Abstract

- We participated in all the subtasks:
  - TIMEX3 and EVENT spans (TS, ES)
  - TIMEX3 and EVENT attributes (TA, EA)
  - Document-time Relations (DR)
  - Containment Relations (CR)

Example: "***April 23, 2014****: The patient did not have any* ***postoperative bleeding*** *so we will* ***resume chemotherapy*** *with a larger* ***bolus*** *on* ***Friday*** *even if there is slight* ***nausea****.*"
- *TS: Red, ES: Green*
- *TA: April 23, 2014 [DATE]; postoperative [PREPOSTEXP]*
- *EA: chemotherapy [polarity=POS, modality=ACTUAL]*
- *DR: bleeding BEFORE docTime*
- *CR [postoperative CONTAINS bleeding]; [Friday CONTAINS resume]*

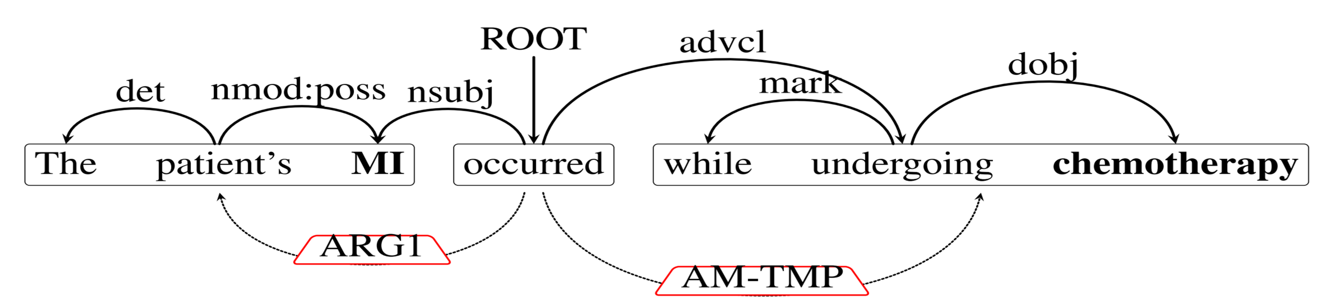
- Our approach is based on **supervised learning**, utilizing various sets **of syntactic, lexical, and semantic features** with the addition of **manually crafted rules**
- Our system demonstrated substantial improvements over the baselines in all the tasks and consistent above-median results in virtually all sub-tasks.

Method

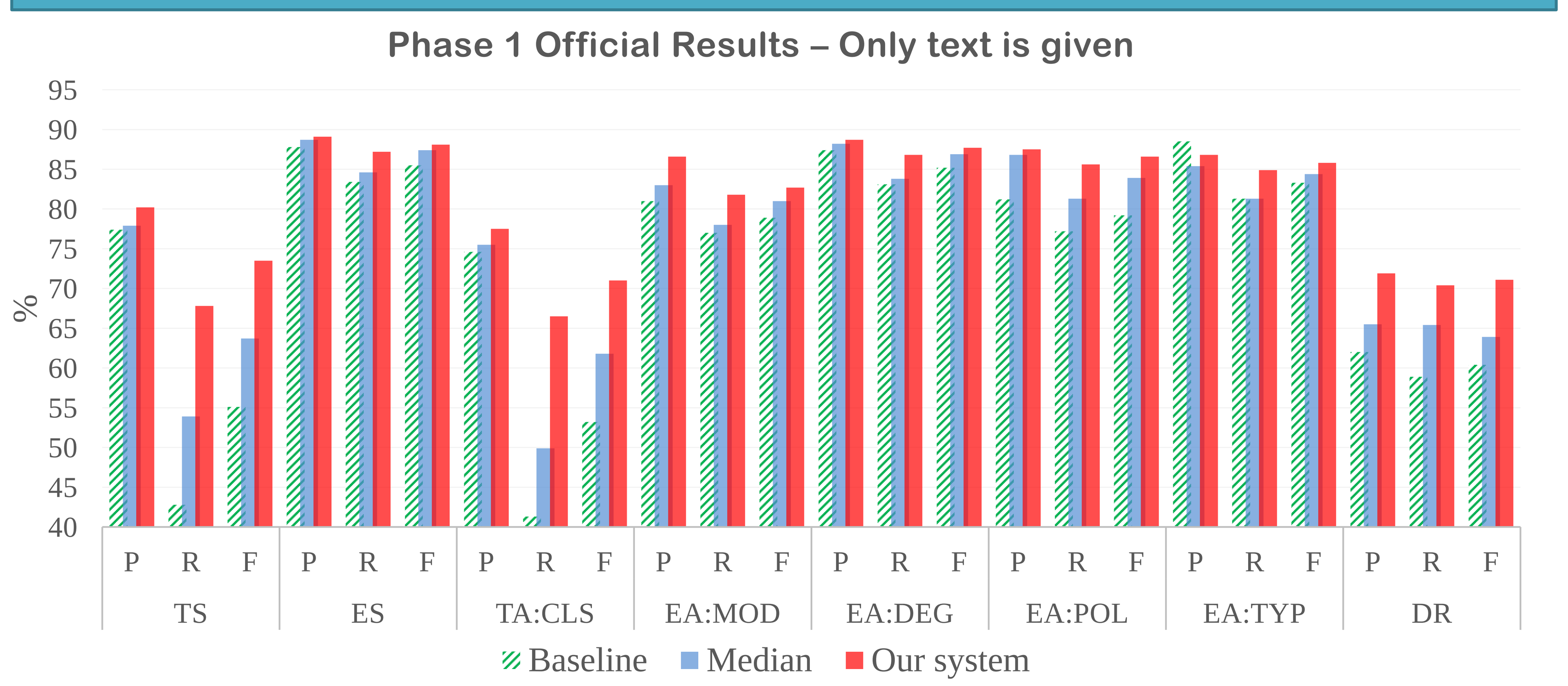
- **General approach**
  - Supervised structured learning (CRF) + supervised classification (Logistic Regression)
  - Features: Syntactic, lexical, morphological, distributional, domain specific, dependency and semantic roles
  - Basic features:
    - lowercase; token letter case; if token is title; if token is numeric; if token is stopword; POS tag; brown cluster; prefix; suffix; noun chunk shape of the token; lemma
  - CRF + Logistic Regression
  - Data
    - 293 Train, 147 Dev, 151 Test clinical narratives
- **TS + ES**
  - Base features + Domain specific
  - UMLS Semantic Types
  - Manual rules: For time and also event. E.g. standard patient readings. "Diastolic=55 mm[Hg]"

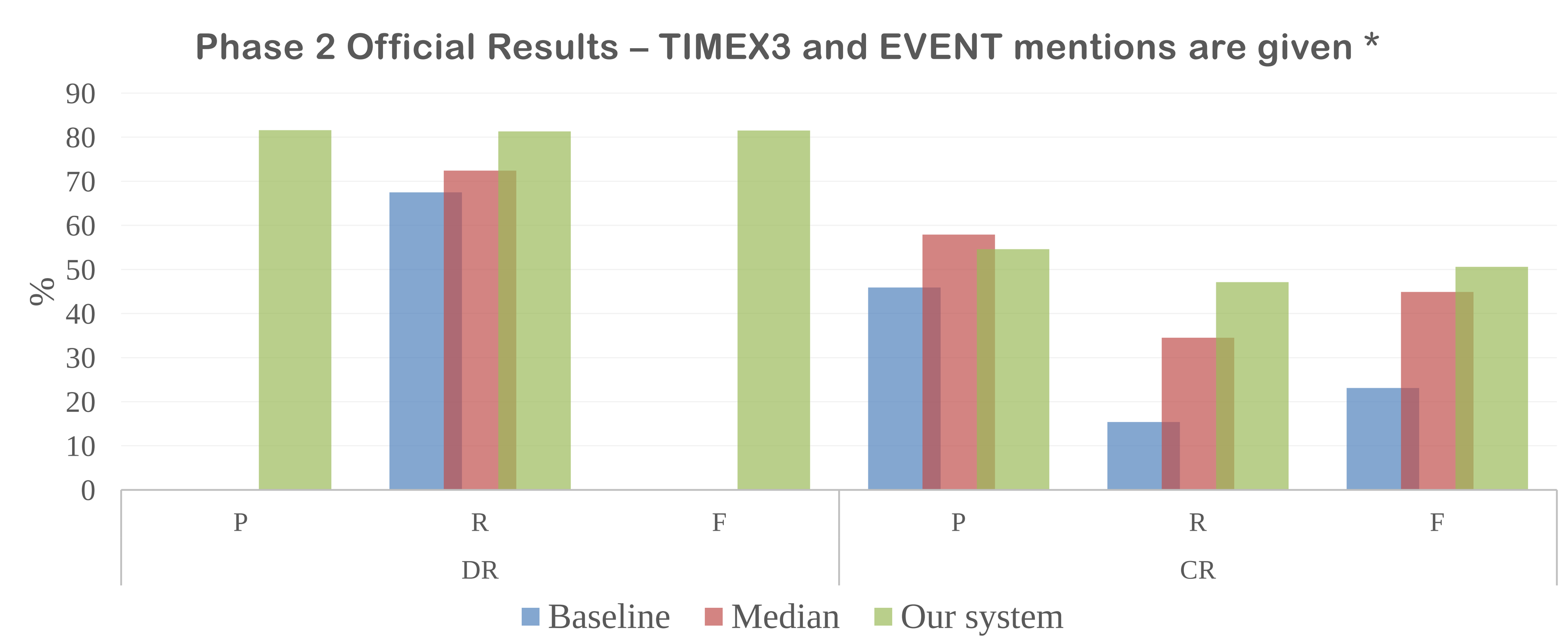
Method (Cont'd)

- **TA + EA**
  - Base features + Rules
    - E.g. "Complete" indicates DEGREE:MOST, "Possibly" indicates MODALITY:HEDGED, and "never" shows POLARITY:NEG
- **DR**
  - Base features + two sets of features
    - Set 1: UMLS semantic type; tense of the related verb in dependency tree; dependency root of the sentence
    - Set 2: class, text and brown cluster of closest TIMEX3 mention; comparison with section time; comparison with document time; sentence tense and modals
- **CR**
  - Base features + Semantic frames, dependency features, UMLS semantic types, verb tense and sentence root



Results

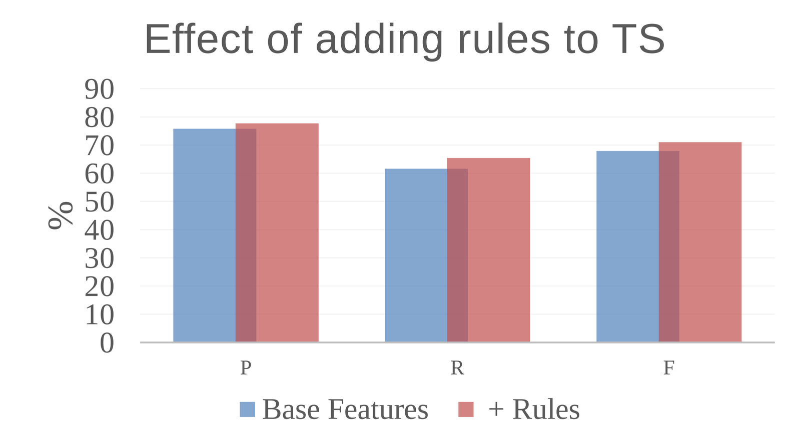


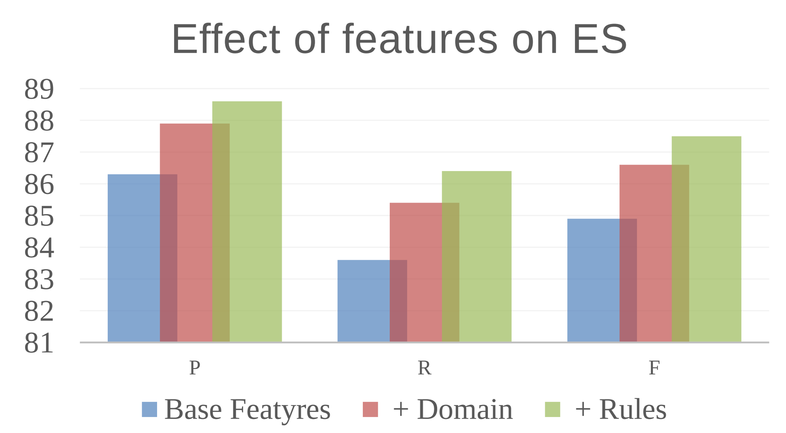


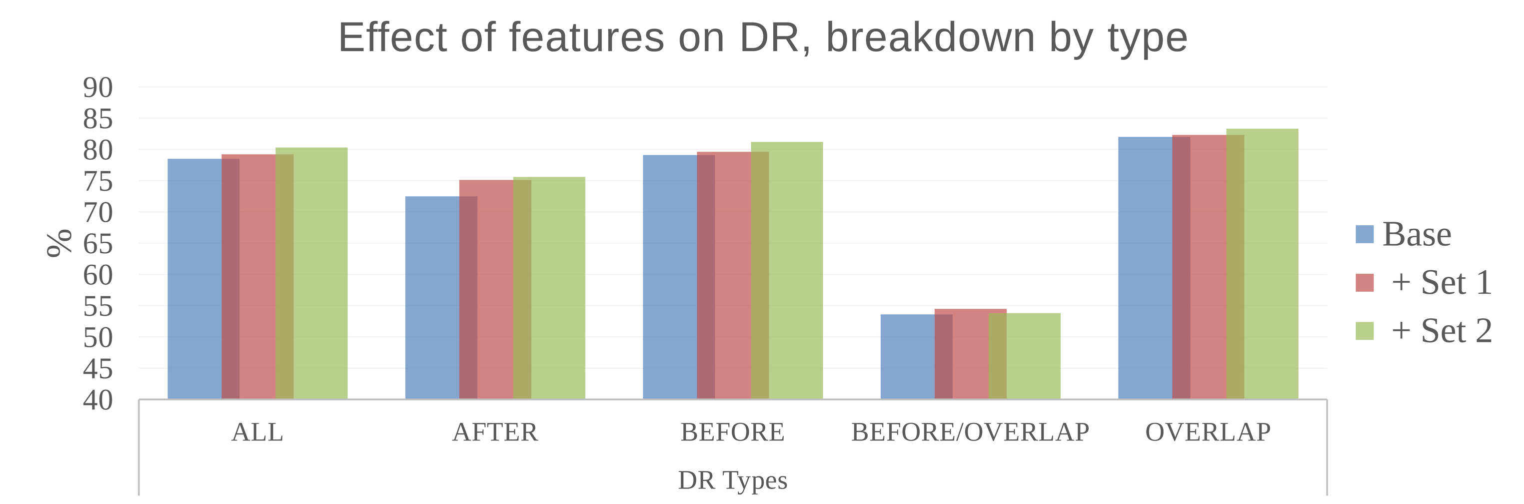
* Baseline and median for Precision and F1 of DR were not reported

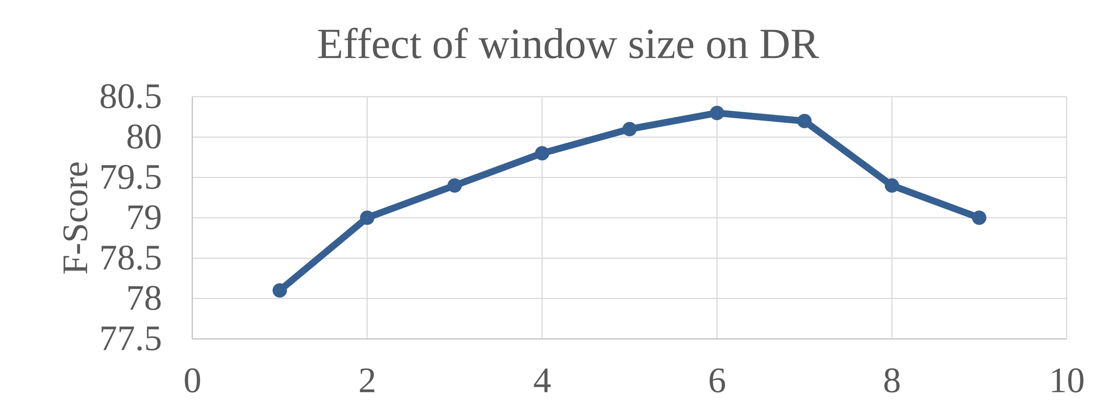
Results (cont'd)

- **Analysis**









Discussion and Conclusions

- Our approach was based on a feature-rich supervised classification for all the tasks
- We showed consistent improvement over the median results in virtually all the tasks
- Features like brown clusters, dependency based features, domain specific features and SRL features are helpful in most of the tasks
- We observed improvements by adding manual features. Excessive addition of rules, results in increased recall but much lower precision and should be avoided.
- Our approach for narrative containers was limited to intra-sentence relations and many of the missed cases, were due to cross-sentence relations

This work was partially supported by NSF, Grant: CNS-1204347 and REU award: IIP-1362046.