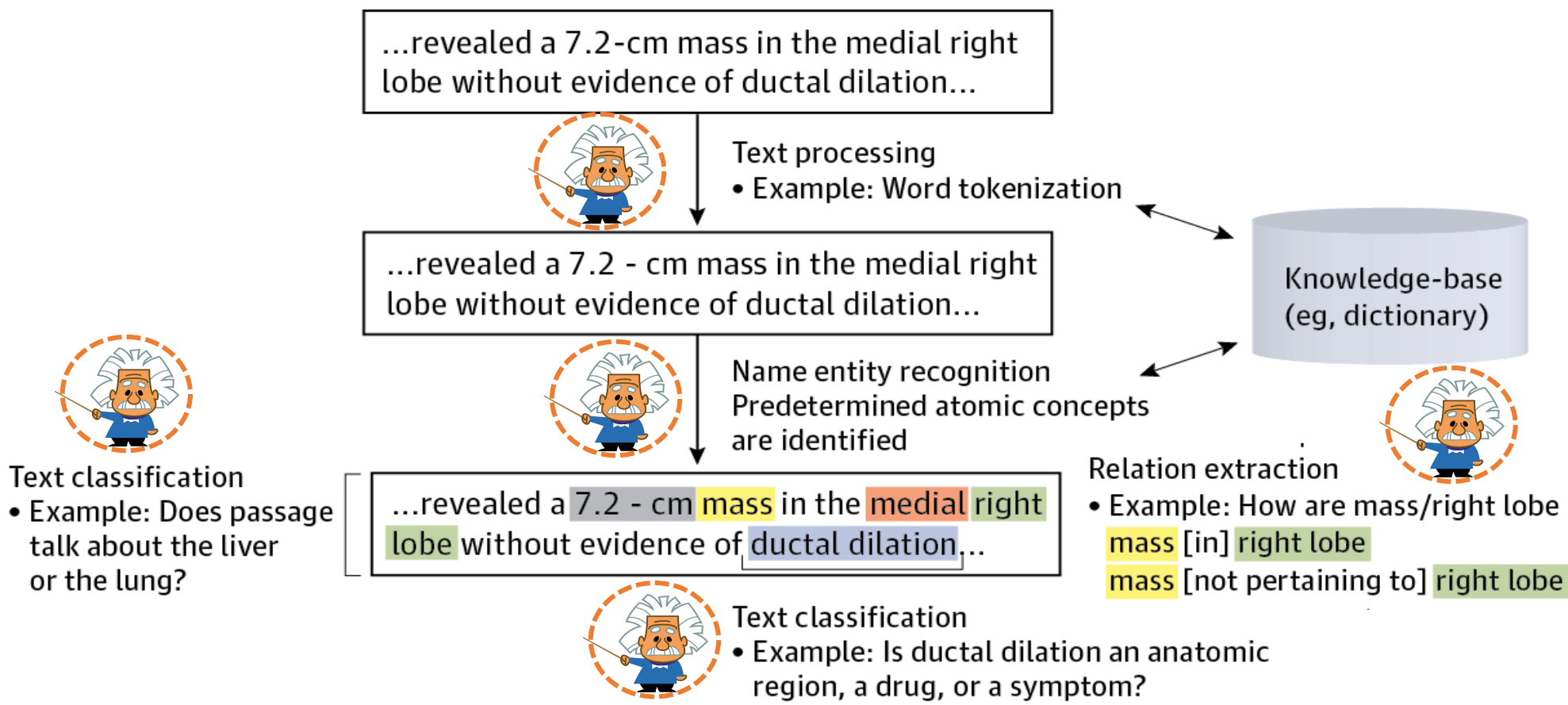


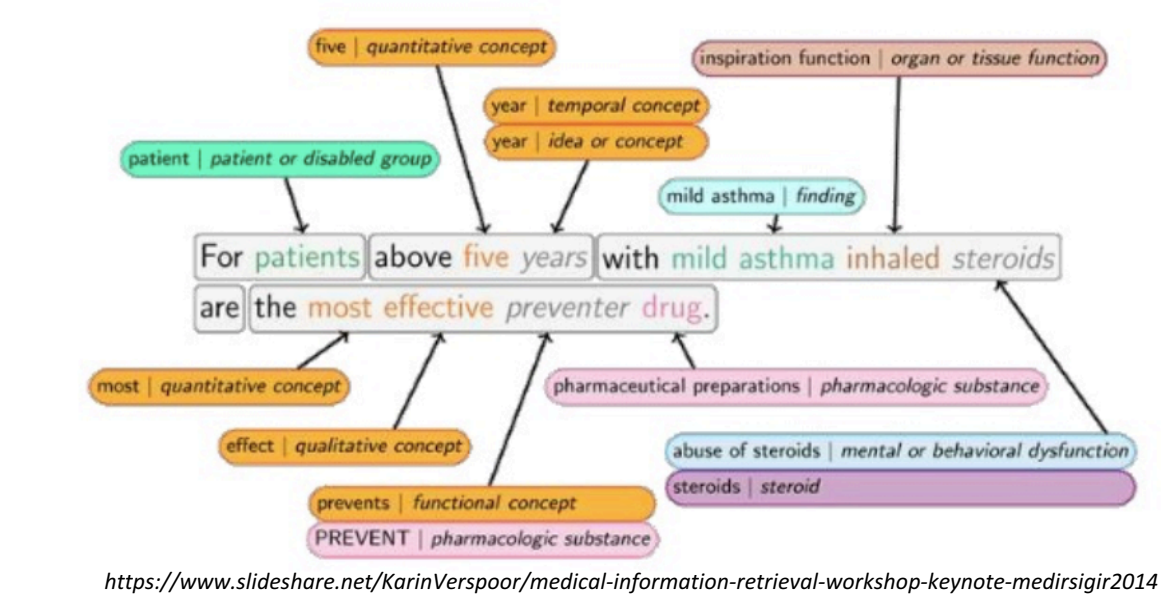
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CHALLENGE
 Knowledge creation requires **intense human effort**
 Critical Information Extraction (IE) systems require facts to be **vettted by at least one human.**

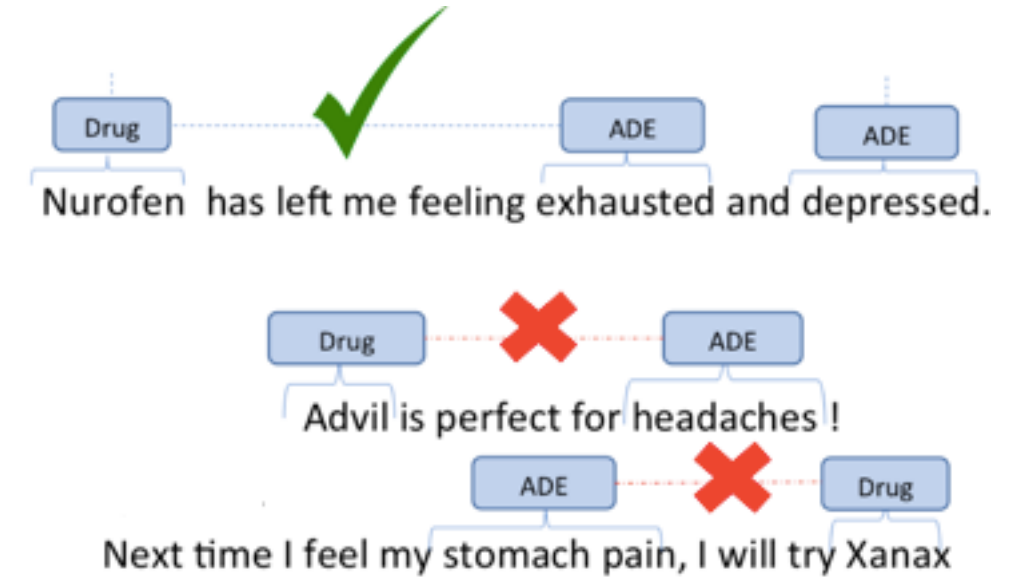
PROPOSED SOLUTION
Human-in-the-loop during **training, evaluation & execution**

- ✓ Human vets addition of new facts to the KB
- ✓ IE system effectively supports human



Related work frames NER+RE as:

- Individual tasks
- Separate tasks in a pipeline
- Joint (neural) models
 - Time-consuming
 - Complex structures
 - Large annotated data



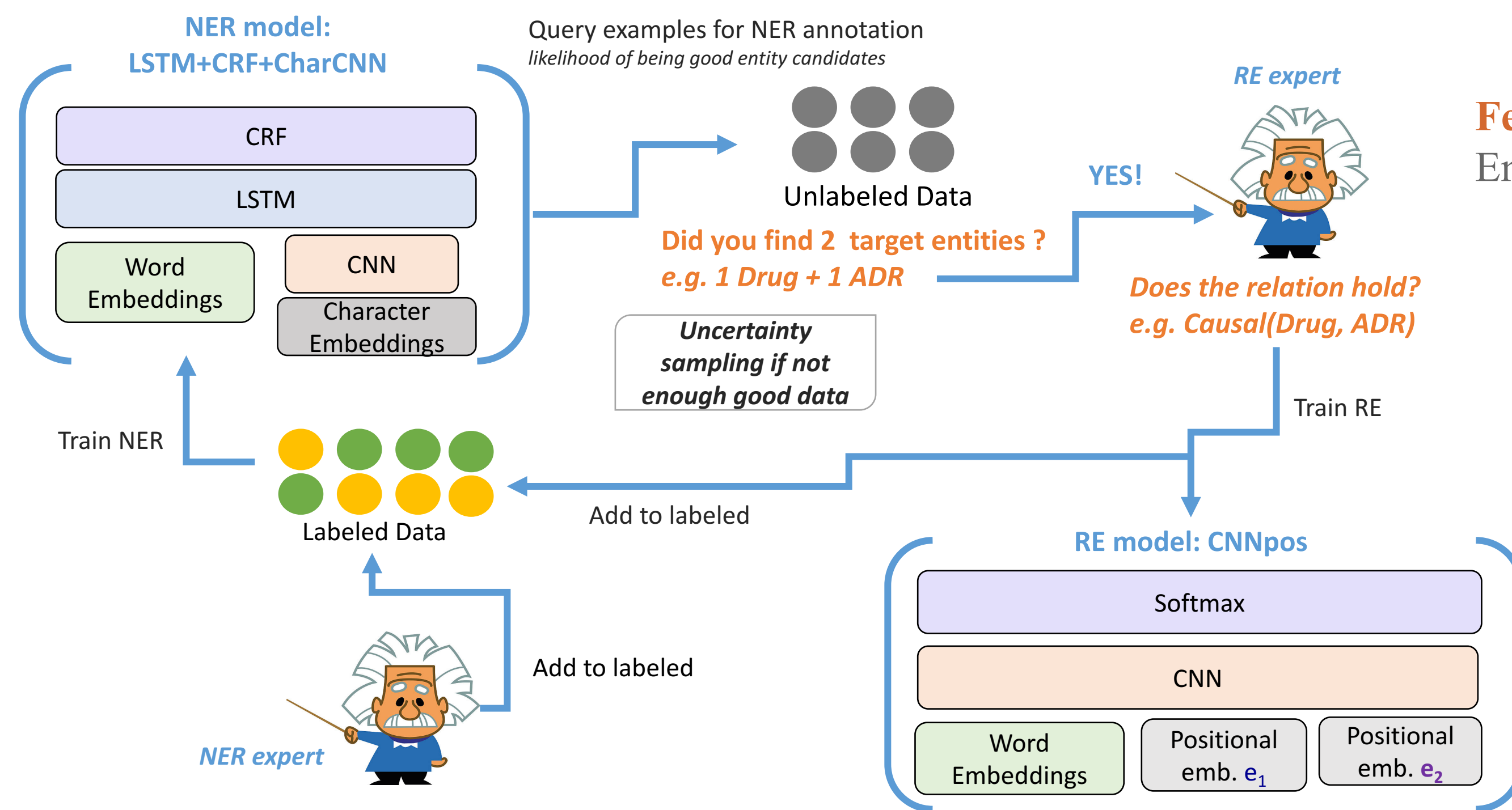
Name Entity Recognition

What about “difficult” (long tail) entities and relations?

Relation Extraction

Interleaved training + Active Learning

Proposed Pipeline for joint NER+RE



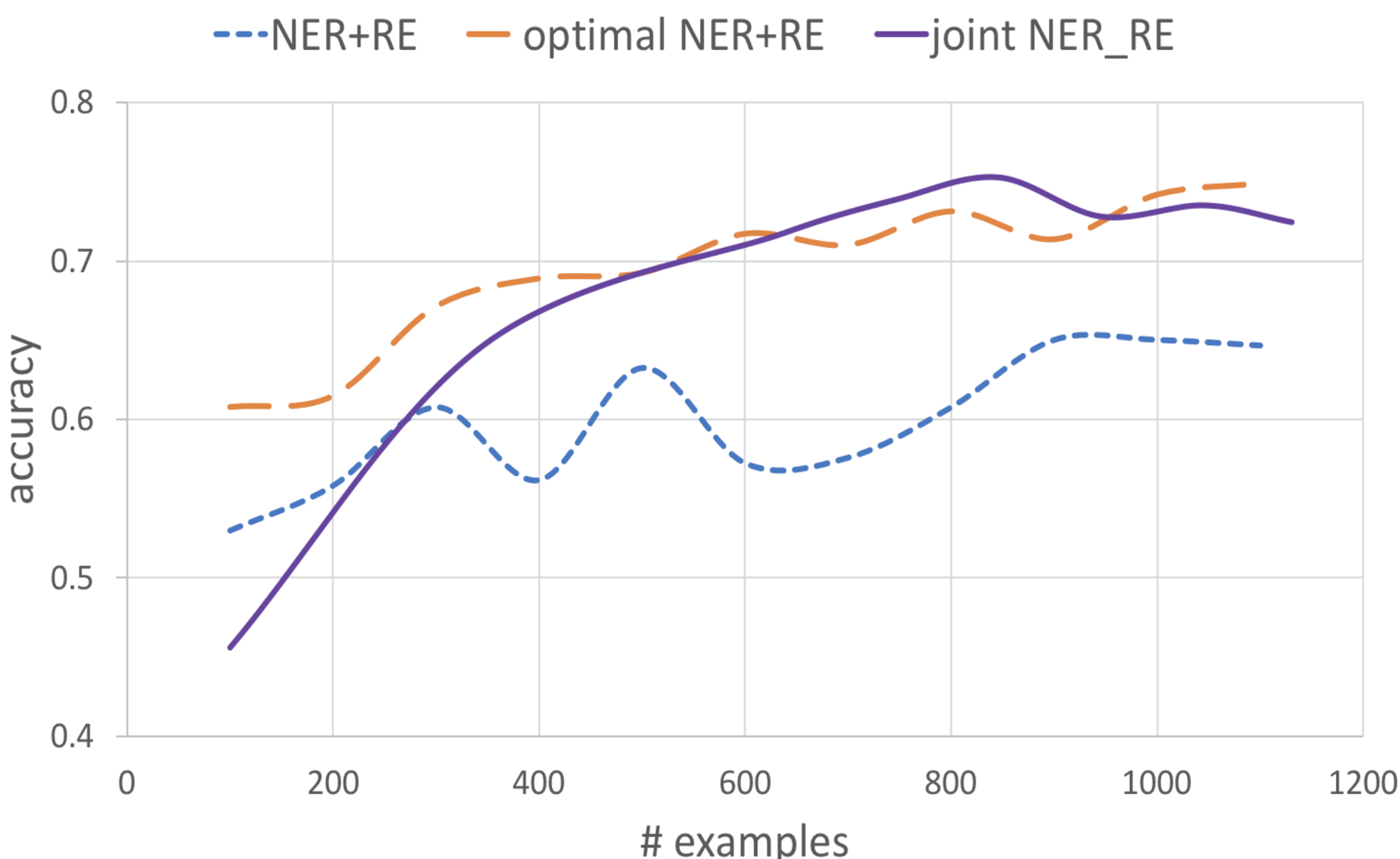
Feedback loop between NER and RE
 Enforces agreement between the two modules

- NER**
- discards non-trivial negatives
 - generates entity candidates likely to express the relation
- RE**
- provides feedback to NER
 - actually express the relation

CausalADEs Dataset
 Medical forum posts on patient reported Adverse Drug Events

Causal relationships between Drugs & Adverse Drug Events

	Positive	Negative	# Entities
Train	616	515	2262
Test	154	129	566



Comparison of pipelines:
 Our proposed method (**joint NER+RE**)
 Performing NER before RE (**NER+RE**)
 Oracle NER module (**optimal NER+RE**)

Exp.	A	F1	P	R
optimal NER+RE	74.91	72.16	73.02	71.32
joint NER+RE	72.44	68.03	72.17	64.34
NER+RE	64.66	43.18	80.85	29.46

Comparable with optimal NER