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Temporal Information Extraction

S&T Campaign: Information Sciences
System Intelligence and Intelligent Systems

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Research Objective

- **Enable intelligent systems to perform temporal reasoning by extracting structured temporal information from unstructured text.**
- **Improve temporal relation extraction precision & recall.**

ARL Facilities and Capabilities Available to Support Collaborative Research

Technical Expertise

- **Temporal information extraction from text**
- **Arabic language**

DCT: 1998-02-27

Presidents Leonid Kuchma of Ukraine and Boris Yeltsin of Russia **signed** an economic cooperation plan **Friday**, and Yeltsin **claimed** they **resolved** even more nagging problems.

Russia and Ukraine share similar cultures and languages, and Ukraine was **ruled** from Moscow for **centuries**.

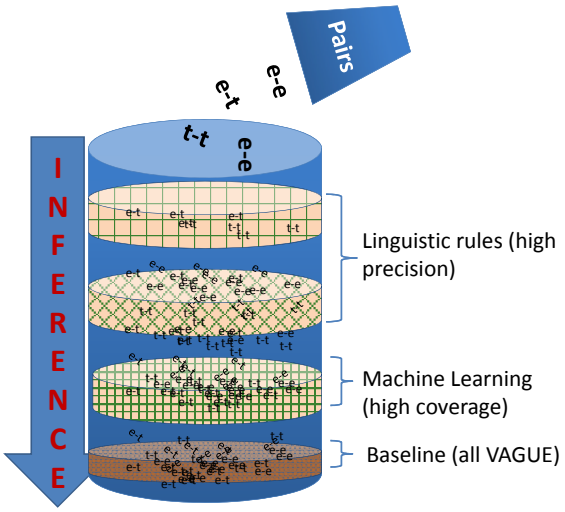
System	P	R	F
Baseline: All VAGUE	.41	.41	.41
ClearTK	.46	.43	.44
NavyTime	.49	.42	.45
CAEVO (ML+linguistic rules)	**.51**	**.51**	**.51**

Corpus: Temporal Relations by Type			
BEFORE	2,590	INCLUDES	836
AFTER	2,104	INCLUDED IN	1,060
SIMULTAN.	215	VAGUE	5,910
Total: **12,715**			

Corpus: VAGUE Relation Breakdown	
Mutual VAGUE	1,657 (28%)
Partial VAGUE	3,234 (55%)
No VAGUE	1,019 (17%)

Challenges

- **Obtain ground truth annotation maximizing consistency and completeness.**
- **Translate linguistic theory into temporal relation extraction rules & machine learning features.**



Cascading Time & Event Ordering (CAEVO) System Architecture

Publications & Impact

- T. Cassidy, B. McDowell, N. Chambers, S. Bethard. (2014) An Annotation Framework for Dense Event Ordering. ACL
- N. Chambers, T. Cassidy, B. McDowell, S. Bethard. (2014) Dense Event Ordering with a Multi-Pass Architecture. TACL
- Used as benchmark for temporal QA task (Semeval2015)
- Software and corpus available on github

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

Computational Linguistics for Low Resource Languages

- **Temporal natural language semantics**
- **Event extraction**
- **Unsupervised machine learning**

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