

Table 1 examples of coreference in discharge summaries

Type	Sentences
Person	The patient underwent an angioplasty of his SMA from 90-20% residual .
Problem	1) Serratia urosepsis treated with ceftizoxime . 2) Azotemia presumed secondary to sepsis and dehydration , creatinine decreased to 2.1 with intravenous fluids and antibiotics .
Treatment	He was also started on p.o. Vancomycin for question C. difficile colitis . Intravenous antibiotics were discontinued and the patient was continued on p.o. Vancomycin .
Test	An echocardiogram was scheduled and Cardiology was consulted . Echocardiogram showed moderate anterior pericardial effusion of approximately 600 cc with diastolic indications of the right ventricle and low velocity paradox .
Pronoun	The diagnosis of recurrent bowel ischemia , however , was not ruled out and this will continue to be a concern in the future .

Table 4 The applications of contextual semantic extractors in three types

	Problem	Treatment	Test
Anatomy	+		+
Position	+	+	+
Medication		+	
Indicator			+
Temporal		+	+
Spatial		+	
Section	+	+	+
Modifier			+
Equipment			+
Operation		+	
Assertion	+		

Table 6 Features for Pronoun coreference

Relation		
Feature and Feature Perspectives	Possible Value	Description
First previous mention type	0, 1, 2, 3, 4	Person, Problem, Treatment, Test, Null
Second previous mention type	0, 1, 2, 3, 4	Person, Problem, Treatment, Test, Null
First next mention type	0, 1, 2, 3, 4	Person, Problem, Treatment, Test, Null
Distance		
Feature and Feature Perspectives	Possible Value	Description
Sentence distance	0, 1, 2...	
Grammatical		
Feature and Feature Perspectives	Possible Value	Description
Pronoun	0, 1, ..., 14	Index into the array of the 15 pronouns
Syntax		
Feature and Feature Perspectives	Possible Value	Description
Part of speech	0, 1, 2	DT, WDT, PRP
Pronoun is determined by chunking	0, 1	
First next verb after mention		
First word before mention is preposition		
First one/two/three words before mention		
First one/two/three words after mention		
An adjacent mention after pronoun + VP	0, 1	
Semantic		
Feature and Feature Perspectives	Possible Value	Description
And, as well as, in addition to	0, 1	Is after “and”, “as well as” or “in addition to”

Table 7 Different thresholds for the three submitted systems

	Person	Problem	Treatment	Test
System 1	-0.1	-0.3	-0.5	-0.6
System 2	0	-0.3	-0.7	-0.6
System 3	0	-0.3	-0.7	-0.7

Table 9 Performance of patient classification (Patient-Class feature)

	P	R	F
Patient	0.996	0.997	0.996

Table 10 Person effectiveness with Patient-Class feature

	P	R	F	Increase
Without Patient-Class feature	0.726	0.841	0.768	
With Patient-Class feature	0.940	0.951	0.945	23.1%

Table 11 Contributions of world knowledge for Problem/Treatment/Test system

			Problem		Treatment		Test		All	
			F	Increase	F	Increase	F	Increase	F	Increase
World knowledge	baseline		0.855		0.836		0.789		0.911	
	+Public domain		0.863	0.008	0.838	0.002	0.794	0.005	0.913	0.002
	+MSRA resource		0.869	0.006	0.839	0.001	0.800	0.006	0.915	0.002

Table 12 Contributions of contextual semantic extractors for Problem/Treatment/Test system

		Problem		Treatment		Test		All	
		F	Increase	F	Increase	F	Increase	F	Increase
Extractors	baseline	0.809		0.821		0.757		0.899	
	+Anatomy	0.817	0.008	0.821		0.758	0.001	0.901	0.002
	+Position	0.830	0.013	0.822	0.001	0.759	0.001	0.904	0.003
	+Medication	0.830		0.832	0.010	0.759		0.906	0.002
	+Indicator	0.830		0.832		0.764	0.005	0.906	
	+Temporal	0.830		0.833	0.001	0.765	0.001	0.906	
	+Spatial	0.830		0.834	0.001	0.765		0.906	
	+Section	0.847	0.017	0.837	0.003	0.779	0.014	0.910	0.004
	+Modifier	0.847		0.837		0.780	0.001	0.910	
	+Equipment	0.847		0.837		0.800	0.020	0.911	0.001
	+Operation	0.847		0.839	0.002	0.800		0.911	
	+Assertion	0.869	0.022	0.839		0.800		0.915	0.004

Table 13 Contributions of baseline + a single semantic extractor for Problem/Treatment/Test system

	Problem		Treatment		Test		All	
	F	Increase	F	Increase	F	Increase	F	Increase
Extractors	baseline	0.809		0.821		0.757	0.899	
	baseline+Anatomy	0.817	0.008/0.008	0.821		0.758	0.001/0.001	0.901
	baseline+Position	0.829	0.020/0.013	0.822	0.001/0.001	0.758	0.001/0.001	0.903
	baseline	0.809		0.831	0.010/0.010	0.757	0.901	0.002/0.002
	+Medication							
	baseline +Indicator	0.809		0.821		0.762	0.005/0.005	0.899
	baseline +Temporal	0.809		0.826	0.005/0.001	0.761	0.004/0.001	0.900
	baseline +Spatial	0.809		0.822	0.001/0.001	0.757		0.899
	baseline +Section	0.836	0.027/0.017	0.832	0.011/0.003	0.777	0.020/0.014	0.906
	baseline +Modifier	0.809		0.821		0.760	0.003/0.001	0.910
	baseline	0.809		0.821		0.777	0.020/0.020	0.900
	+Equipment							
	baseline +Operation	0.809		0.824	0.003/0.002	0.757	0.899	0.001/0.001
	baseline +Assertion	0.834	0.025/0.022	0.821		0.757	0.904	0.005/0.004