

Automatic Classification of Communicative Functions of Definiteness

Archna Bhatia^{LTI} Chu-Cheng Lin^{LTI} Nathan Schneider^{LTI} Yulia Tsvetkov^{LTI} Fatima Talib Al-Raisi^{LTI} Laleh Roostapour^{LTI},

Jordan Bender, Abhimanu Kumar, Lori Levin, Mandy Simons, and Chris Dyer Dyer

Language Technologies Institute / Department of Philosophy, Carnegie Mellon University • Department of Linguistics, University of Pittsburgh, PA

Abstract

Definiteness expresses a constellation of semantic, pragmatic, and discourse properties (the communicative functions) of an NP. Our supervised classifier for English NPs uses lexical, morphological, and syntactic features to predict the communicative functions in terms of a language-universal classification scheme and establishes strong baselines for future work. Additionally, analysis of the features and learned parameters in the model provides insight into the grammaticalization of definiteness in English, not all of which is obvious a priori.

Classification Model

We use an in-house implementation of a multiclass logistic regression classifier with L2-regularization [***AB: Do we want to say why we used L2, why log regression? Also how do I make the following equatoin look better? I don't want the first part to be in the center, but more to the left.***].

$$\hat{\boldsymbol{\theta}} = \arg\max_{\boldsymbol{\theta}} -\lambda ||\boldsymbol{\theta}||_{2}^{2} +$$

$$\sum_{\langle x,y\rangle\in\mathcal{D}} \log \frac{\exp \boldsymbol{\theta}^{\top} \mathbf{f}(x,y)}{\sum_{y'\in\mathcal{Y}} \exp \left(\boldsymbol{\theta}^{\top} \mathbf{f}(x,y') + \kappa \cos t(y,y')\right)}$$

Features

Words of Interest Head of the NP, its dependents, its governor (external to NP), its first ancestor verb

— token, lemma, POS tag, dependency relation, a binary indicator of plurality on the head N, first_dependent, last_dependent, auxiliaries of the first ancestral verb, first ancestral verb with a negative particle as dependent.

Structural — path length to the root, path length to the first ancestral verb, number of dependents, number of dependency relations that link non-neighbors.

Positional — token length of the NP, NP's location in the sentence (first or second half), the first ancestral verb's position relative to the head (left or right), POS & lemma of the left and the right neighbors of the head, governor, and the first ancestral verb.

Above features of NPs in Following NP-NP relation Types

immediate parent, immediate child, immediate precedent, immediate successor, the nearest preceding coreferent mention.

The language independent scheme for Communicative Functions of Definiteness

Nonanaphora		Anaphora & Miscellaneous		
Nonanaphora [-A,-B]	999	Anaphora [+A]	1574	
- Unique [+U]	287	- Basic_Anaphora [-B,+F]	795	
*Unique_Hearer_Old [+F,-G,+S]	251	*Same_Head	556	
Unique_Physical_Copresence [+R]	13	*Different_Head	329	
Unique_Larger_Situation [+R]	237			
Unique_Predicative_Identity [+P]	1	- Extended_Anaphora [+B]	779	
•	1	*Bridging_Nominal [-G,+R,+S]	43	
*Unique_Hearer_New [-F]	36	*Bridging_Event [+R,+S]	10	
	-01	*Bridging_Restrictive_Modifier [-G,+S]	614	
- Nonunique [-U]	581	*Bridging_Subtype_Instance [-G]	0	
*Nonunique_Hearer_Old [+F]	169	*Bridging_Other_Context [+F]	112	
Nonunique_Physical_Copresence [-G,+R,+S]	39		112	
Nonunique_Larger_Situation [-G,+R,+S]	117	Miscellaneous [-R]	732	
Nonunique_Predicative_Identity [+P]	13	- Wilscenafieous [-N]	132	
*Nonunique_Hearer_New_Spec [-F,-G,+R,+S]	231		5 0	
*Nonunique_Nonspec [-G,-S]	181	- Pleonastic [-B,-P]	53	
		- Quantified	248	
- Generic [+G,-R]	131	- Predicative_Equative_Role [-B,+P]	58	
*Generic_Kind_Level	0	- Part_Of_Noncompositional_MWE	100	
*Generic_Idiual_Level		- Measure_Nonreferential	125	
*Generic_maividual_Level	131	- Other_Nonreferential	148	

Examples for Communicative Functions

Unique_Physical_Copresence Unique_Larger_Situation In the days since Hillary Clinton unburdened herself in an interview with The Atlantic's Jeffrey Goldberg Unique_Predicative_Identity Unique_Hearer_New Clark Kent is Superman. Unique_Physical_Copresence Nonunique_Physical_Copresence The podium is too high. Nonunique_Larger_Situation Nonunique_Predicative_Identity He is the manager. Nonunique_Hearer_New_Specific Nonunique_Nonspec Jam looking for a nurse. Her name is Sara. I am looking for a nurse [any nurse would do]. Generic_Kind_Level Generic_Individual_Level Basic_Same_Head I'm going to tell you a quick story. It's a true story. I adopted a cat this weekend. The animal is so cute. Extended_Bridging_Nominal I looked at an apartment yesterday. The kitchen was really large. Extended_Bridging_Restrictive_Modifier Extended_Subtype_Instance Extended_Other_Context I want to focus on what many of you have said you would like me to elabor What can you do about the climate crisis?
Unique_Predicative_IdentityClark Kent is Superman.Unique_Hearer_Newa restaurant chain named Shoney'sNonunique_Physical_CopresenceThe podium is too high.Nonunique_Larger_Situationthe chair (at a conference) / todayNonunique_Predicative_IdentityHe is the manager.Nonunique_Hearer_New_SpecificI am looking for a nurse. Her name is Sara.Nonunique_NonspecI am looking for a nurse [any nurse would do].Generic_Kind_LevelDinosaurs are extinct.Generic_Individual_LevelCats have fur.Basic_Same_HeadI'm going to tell you a quick story. It's a true story.Basic_Different_HeadI adopted a cat this weekend. The animal is so cute.Extended_Bridging_NominalI looked at an apartment yesterday. The kitchen was really large.Extended_Bridging_EventMy friend's son got married this weekend. The bride looked beautiful.Extended_Bridging_Restrictive_Modifierthe house next door/ John's daughterExtended_Subtype_InstanceI collect coins. I have a 1943 steel penny.Extended_Other_ContextI want to focus on what many of you have said you would like me to elabor.
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What can you do about the climate crisis?
What can you do about the chimate crisis:
Pleonastic It is raining.
Quantified All the people / no motorcade
Predicative_Equative_Role He's a teacher . / This is an opportunity .
Part_of_Noncompositional_MWE Ole' Charlie kicked the bucket today.
Measure_Nonreferential hours later / miles away
Other_Nonreferential global warming / concern / the topic of energy

	Accura		
Condition	# Params	ExactMatch(%)	SoftMatch(%)
Aajority baseline		12.1	47.8
og			
attributes	473,064	38.7	77.1
labels	413,931	40.8	73.6
attributes, labels	926,417	43.7	78.2

49.7

Leaf label	N	F1
Bridging_Restrictive_Modifier	552	68
Same_Head	452	41
DIFFERENT_HEAD		32
PLEONASTIC	44	88

20,363

[***AB: will add all teh other labels a bit later.***]

Analysis

Confirmation of known facts ...

Good hypotheses to test ...

Baffling cases ...

Random forest

[***AB: to be added soon***]

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