

## **Representing Online Conversation Structure with** Graphs: A New Corpus and Model

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## A conversation graph expresses what each utterance is a response to

Jonathan - Conversation graphs express what each utterance is a response to Professor - What defines an utterance?

Jonathan - An utterance could be many things, like a line in IRC, or a post on a website, and in every case it might respond to multiple other messages, forming a graph.

- Student Why is it a graph?



## These graphs are directed, acyclic, and can have disconnected components





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 Trees	Graphs





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Du et al. (2016)	Schuth et al. (2007) Wang et al. (2008) Kim et al. (2010)
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## IRC logs are multi-user and multi-conversation



- [03:06] <BurgerMann> does anyone know a consoleprog that scales jpegs fast and efficient?.. this digital camera age kills me when I have to scale photos :s
- [03:06] <Seveas> BurgerMann, i used that to convert
- [03:06] <BurgerMann> Oh... I'll have a look.. thx =)





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## One common ambiguity is multiple responses vs. elaboration



## <delire> BurgerMann: convert, display and others are



# We annotated 20,000 lines, from 58 hours of IRC

#### Definition **Data** Models

## We annotated 20,000 lines, from 58 hours of IRC

#### Number of antecedents

#### $\left( \right)$

#### 2

#### 3+

Definition

#### % of lines

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#### $\left( \right)$

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Definition

#### % of lines

27.8

68.3

3.5

0.4

## We annotated 20,000 lines, from 58 hours of IRC



#### Definition Data Models

#### 5-9 10-14 15-19 20-29 30-39 40-49 50+

# from 58 hours of IRC



#### Definition Data Models

#### Definition This annotated data reveals potential issues with heuristic disentanglement Threads Trees Graphs Schuth et al. (2007) Adams and Martell (2008) Wang et al. (2008) Elsner and Charniak (2010) Annotated Du et al. (2016) Kim et al. (2010) Mayfield et al. (2012) Riou et al. (2015) This work Wang and Rose (2010) Wang et al. (2011) Natural Aumayr et al. (2011) Shen et al. (2006) Balali et al. (2013) **Abbott et al. (2016)** Lowe et al. (2015) Automatic This work **Ouchi and Tsuboi (2016)**







#### Definition Data Models





























### We are exploring a range of models and inference methods

#### Binary Classifier

#### Ranking Classifier







#### Structured Search

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#### Perceptron



#### **Feed-Forward** Network

#### **Dynamic Network**

#### Structured Search

#### Baselines are majority class, and an improved heuristic





#### Link to Previous (majority baseline)

Improved Heuristic

	(	Graph Structure							
System	Р	R	F						

#### Thread Extraction ARand AMI Ρ VI R





	Graph Structure				Thread Extraction				
System	Р	R	F	VI	ARand	AMI	Р	R	
Link to previous	36.9	35.9	36.4	0.719	0.380	0.470	0.0	0.0	0
Lowe et al. (2017)	[40.3]	[39.6]	[39.9]	0.772	0.361	0.402	16.8	54.6	2
New Heuristic	[38.5]	[37.4]	[37.9]	0.787	0.548	0.470	16.6	50.6	2
Linear	65.0	63.2	64.1	0.923	0.773	0.877	58.5	61.4	5
Feedforward	64.9	63.1	64.0	0.924	0.774	0.875	58.3	60.5	5
+ text repr.	65.2	63.4	64.3	0.926	0.798	0.880	58.7	61.9	6
x10 union	62.1	64.7	63.4	0.925	0.804	0.856	61.9	56.5	5
x10 intersection	61.9	60.2	61.0	0.852	0.468	0.633	38.5	62.4	4
Human	82.1	82.3	82.2	0.963	0.895	0.917	76.3	83.1	7

#### Definition Data Models



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## Thank you!

#### **Jonathan Kummerfeld**

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