Self-disclosure topic model for Twitter conversations

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Overview

- Self-disclosure (SD)
    - Definition from social psychology
    - Relations with social dynamics
    - Limitations in previous research
- Computational approaches for self-disclosure
    - Twitter conversation dataset
    - Self-disclosure topic model (SDTM)
- Self-disclosure & Social dynamics
    - Self-disclosure and conversation length over time
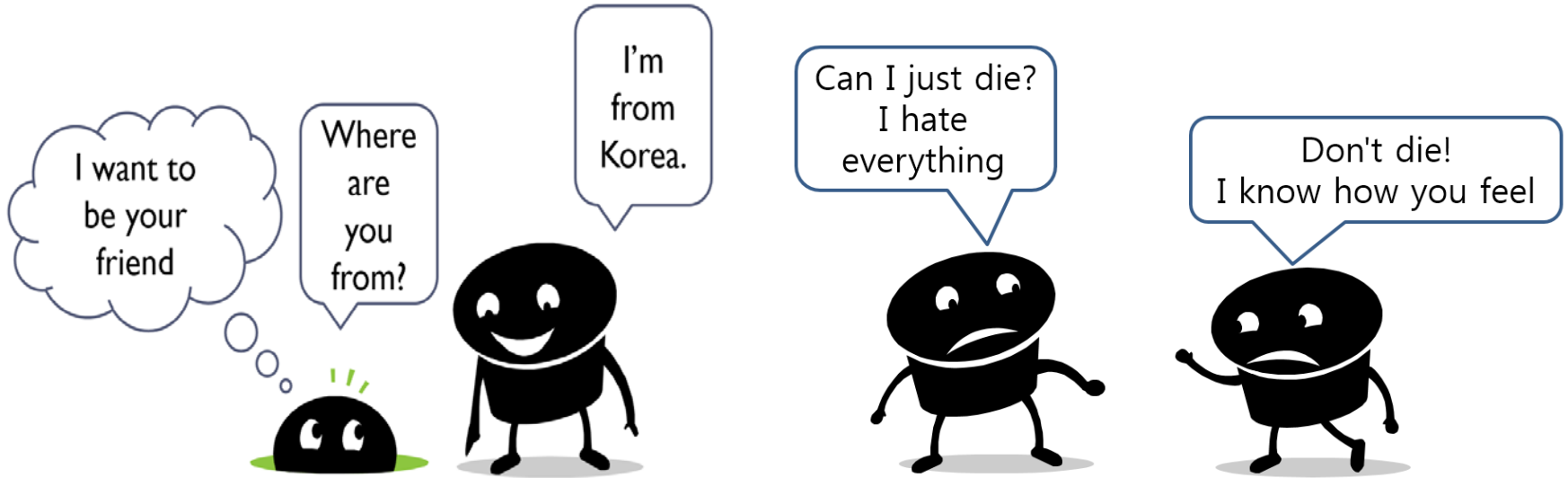
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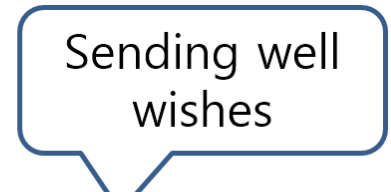# Self-disclosure (SD)

Self-disclosure
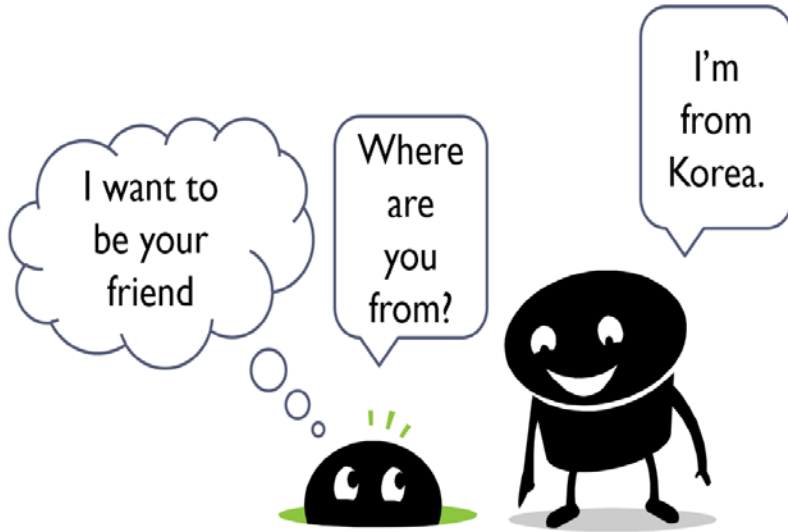
Self-disclosure
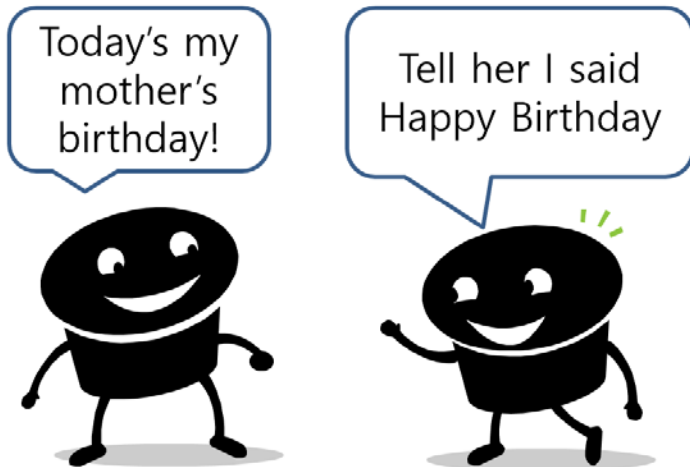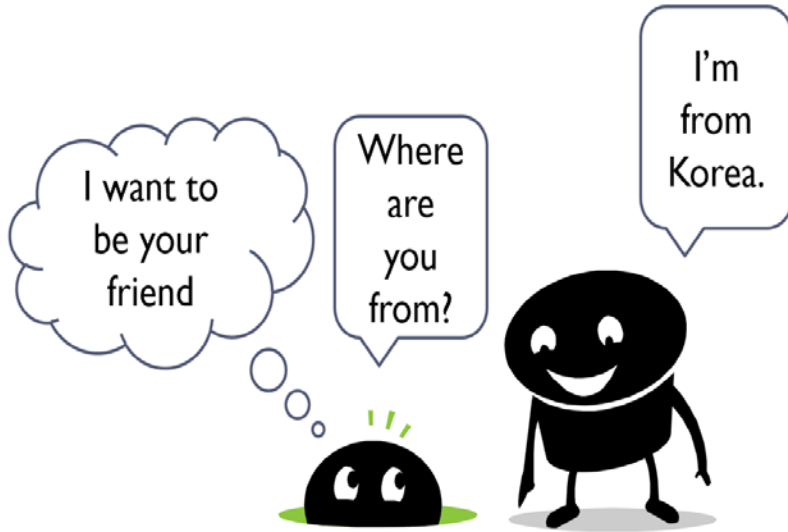
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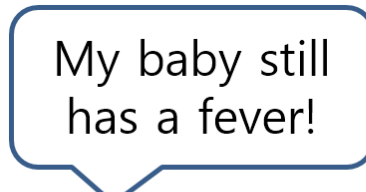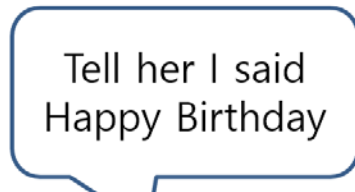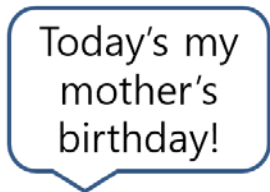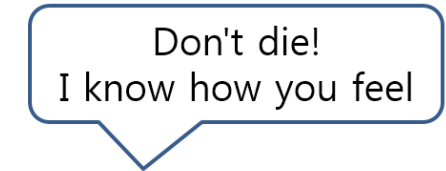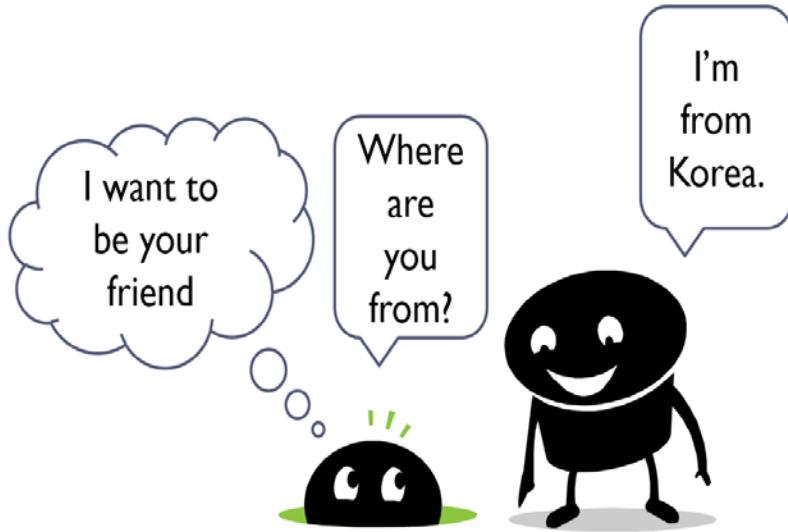
Self-disclosure

Self-disclosure: Definition

- The verbal expressions by which a person reveals aspects of self to others [Jourard1971b]

- Process of making the self known to others [Jourard&Lasakow1958]
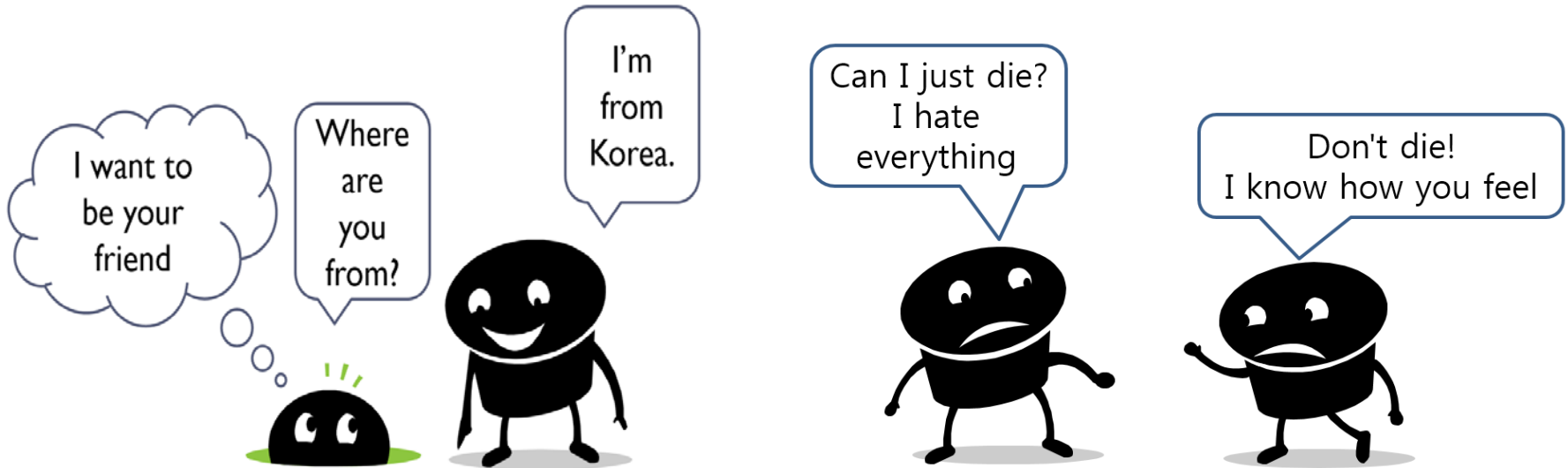
Self-disclosure: Level

Self-disclosure level [Vondracek et al.1971, Barak et al.2007]

- ▸ General level (No disclosure)

- ▸ Medium level (Medium disclosure)

- ▸ High level (High disclosure)

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Self-disclosure: G level

▸ **General information and ideas**

▸ **No information about self or someone close to him**

fabio capello is the manager are u sure its someone else whos playing lol

common you guys England manager is Roy Hodgson
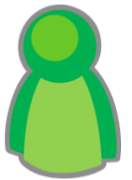
noooooo we mean the manager before!

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Self-disclosure: M level

▸ General information about self or someone close to him

▸ Personal events, age, occupation and family members

Today's my mother's birthday and she was extremely happy when I informed her I'm applying for Phoenix soon. Happy Birthday mom! :D

HAHA, nice! Tell her I said Happy Birthday and give her a kiss and hug for me! :3
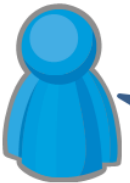
that is a bit problematic. My mommy is not here lol

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Self-disclosure: H level

▸ Sensitive information about self or someone close to him

▸ Problematic behaviors of self and family members

▸ Physical appearance, health, death, sexual topics

My mom has just been taken to the hospital by ambulance. Please pray for her. Thank you

Hugs. Glad your mom is doing better

Thanks, she is in hospital & is very disoriented.

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Self-disclosure: Relations

Human relationship

▸ Degree of self-disclosure in a relationship depends on the strength of the relationship [Duck2007]

▸ Strategic self-disclosure can strengthen the relationship

Self-disclosure: Relations

Benefits

▸ Can get social support from others [Derlega et al.1993]

▸ Can cope with stress [Derlega et al.1993, Tamir and Mitchell2012]

▸ Examples
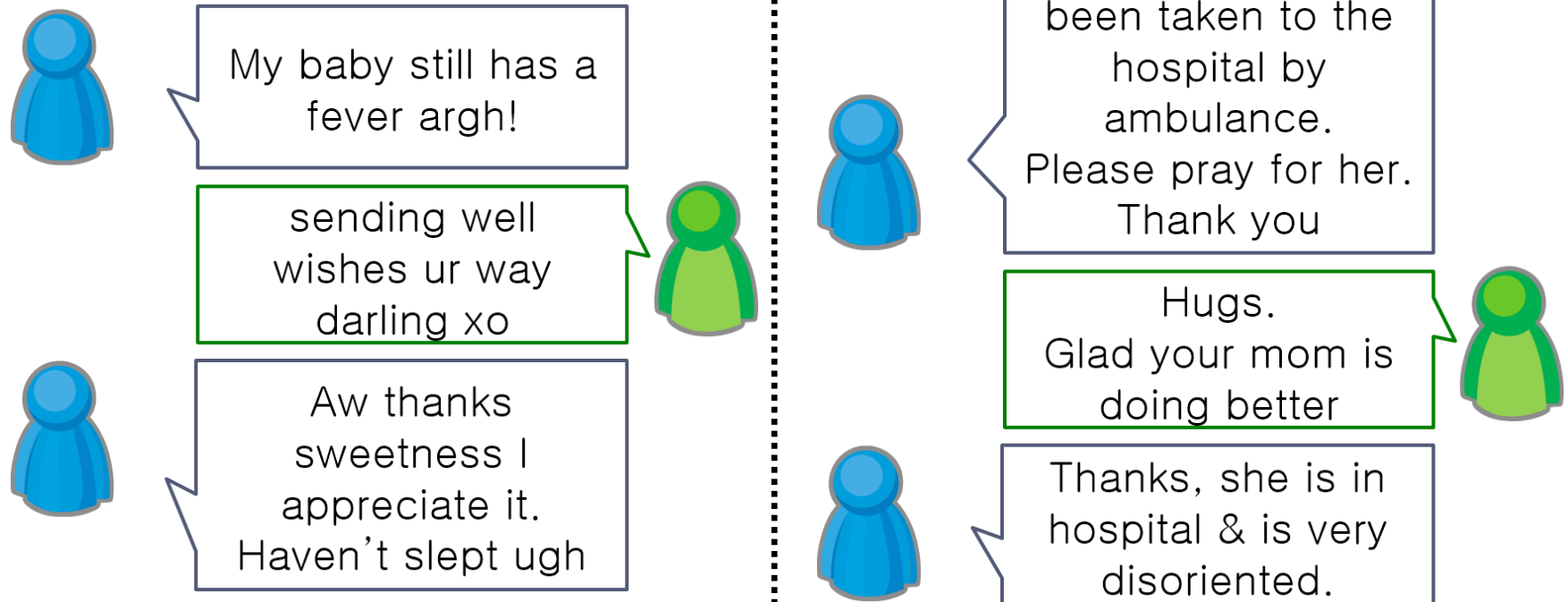
My baby still has a fever argh!

sending well wishes ur way darling xo

Aw thanks sweetness I appreciate it. Haven't slept ugh

My mom has just been taken to the hospital by ambulance. Please pray for her. Thank you

Hugs. Glad your mom is doing better

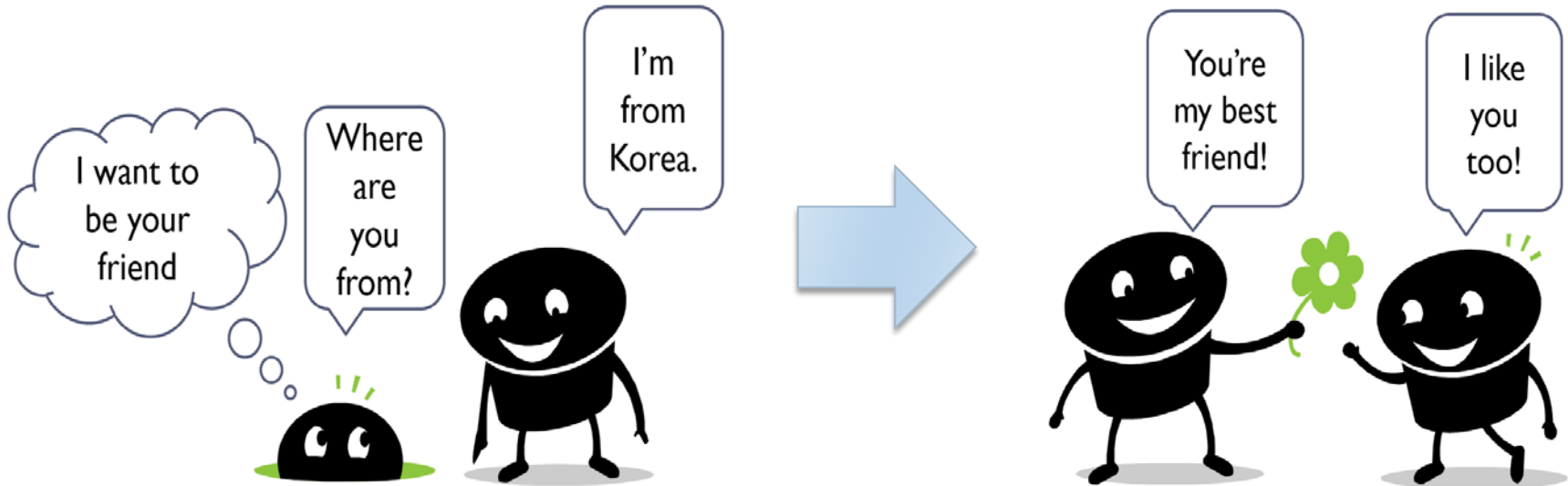Thanks, she is in hospital & is very disoriented.

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Limitations in Previous Works

- ## Survey
    - Asking questions to participants
    - Cons) Biased by participants memory

- ## Hand coding
    - Analyzing dataset by human
    - Cons) Cannot apply to large dataset

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Limitations in Previous Works

- Survey
  - Asking questions to participants
  - Cons) Biased by participants memory

- Hand coding
  - Analyzing dataset by human
  - Cons) Cannot apply to large dataset

- Lab environment
  - Experiments held in lab or artificial environment
  - Cons) Not real/naturally occurring dataset

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Research Questions

▸ How can we find self-disclosure in large & naturally occurring corpus automatically?

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Research Questions

▸ How can we find self-disclosure in large & naturally occurring corpus automatically?

▸ What are relations between self-disclosure and social dynamics in large & naturally occurring corpus?

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Twitter Conversations

Conversation in Twitter

Bak JinYeong
@NoSyu

@smd4 Thanks to make **excel2wiki.net** It's really helpful for me!

↩ Reply　★ Favorite　••• More

RETWEET
1

11:19 AM - 21 Aug 2012

Reply to @smd4

Shawn Douglas @smd4 · 27 Aug 2012
@NoSyu glad you find it useful!

↩ Reply　⇄ Retweet　★ Favorite　••• More

https://twitter.com/NoSyu

Britney Spears ✔
@britneyspears

@MadonnaMDNAday love the new album - every single song is incredible. congrats girl! ♫ Girl Gone Wild by Madonna — path.com/p/1zoiB

Madonna ✔
@Madonna

@britneyspears please come on stage and kiss me again. I miss you!!

Britney Spears ✔
@britneyspears

@MadonnaMDNAday Tempting...

Madonna ✔
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@britneyspears Are you gonna make me work for this?
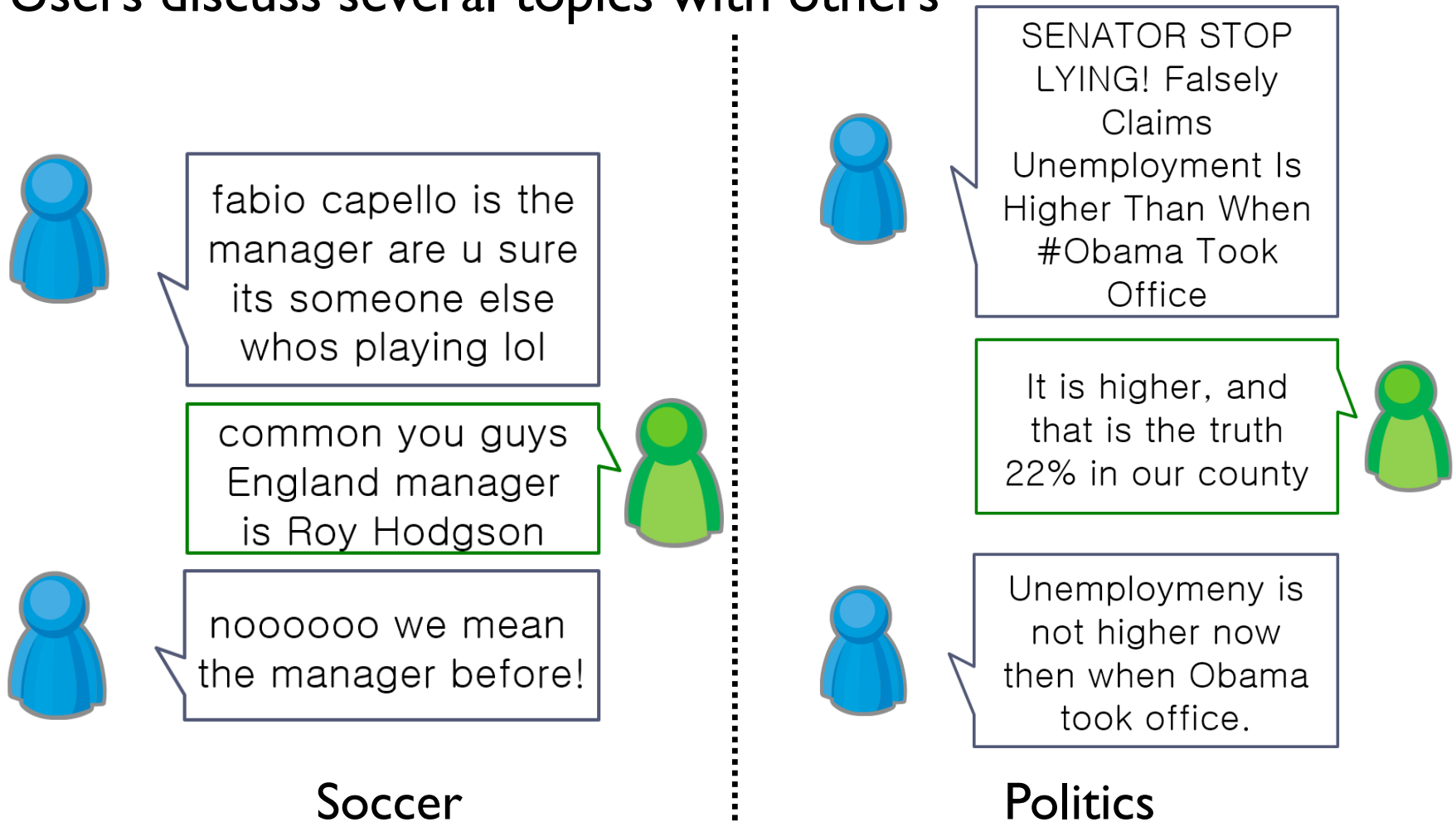
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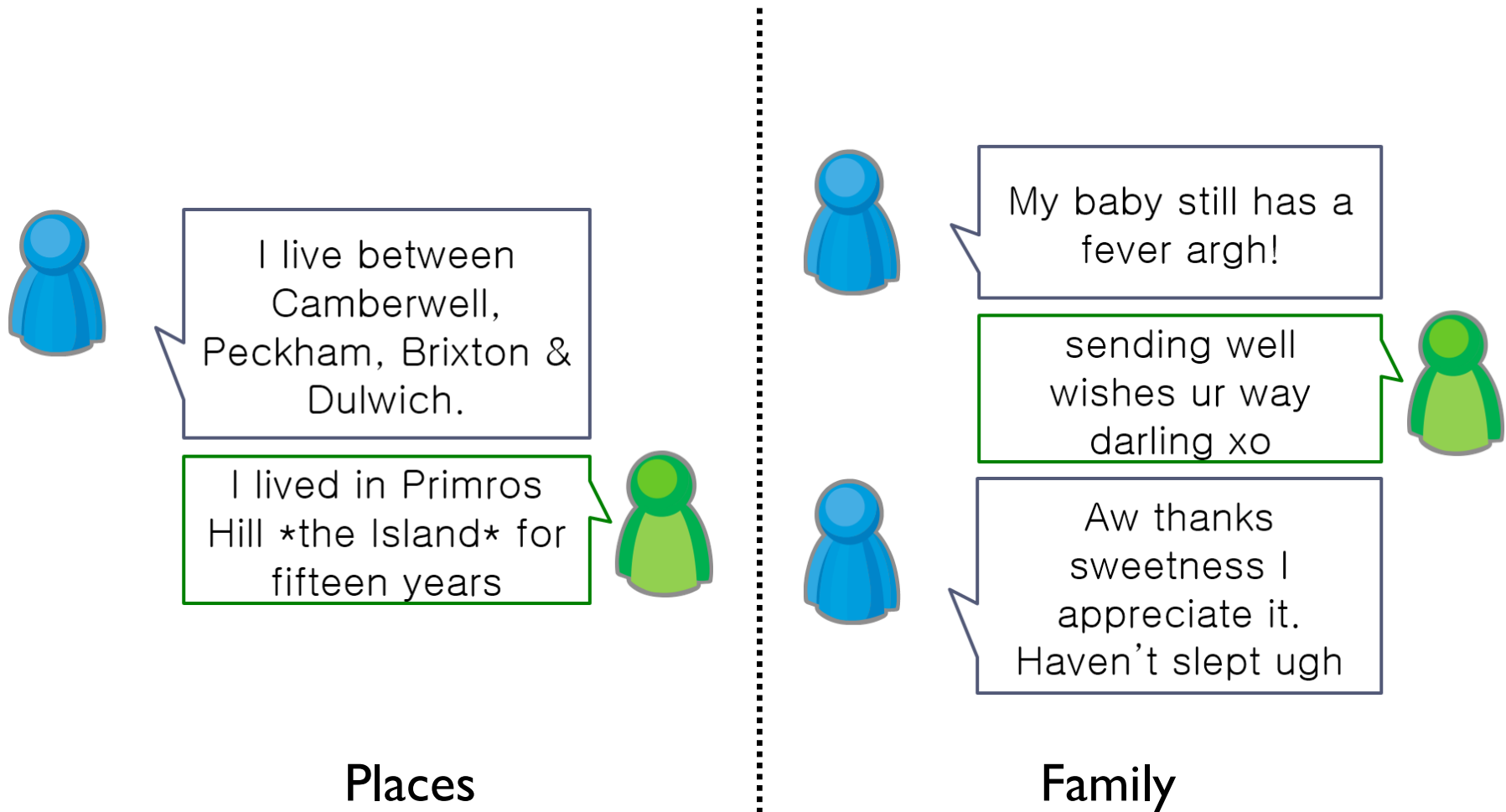
https://twitter.com/britneyspears

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Conversation Topics

Users discuss several topics with others

Soccer

Politics

Conversation Topics

Users discuss several topics with others

Places

Family

Twitter Conversations

- ## A Twitter conversation
  - ### 5 or more tweets
  - ### At least one reply by each user

Example of a Twitter conversation

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Twitter Conversations

- ## A Twitter conversation
  - 5 or more tweets
  - At least one reply by each user

- ## Twitter conversation data
  - Aug 2007 to Jul 2013
  - 102K users
  - 2M conversations
  - 17M tweets

Britney Spears ☑
@britneyspears

@MadonnaMDNAday love the new album - every single song is incredible. congrats girl! ♫ Girl Gone Wild by Madonna — path.com/p/1zoiB

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Britney Spears ☑
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https://twitter.com/britneyspears

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Self-disclosure Topic Model (SDTM)

Challenges for SD research

▸ **Lack of ground-truth dataset of SD level**

  ▸ No tagged dataset for Twitter conversation

  ▸ No accessible self-disclosure datasets

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Challenges for SD research

- Lack of ground-truth dataset of SD level
  - No tagged dataset for Twitter conversation
  - No accessible self-disclosure datasets

- Lack of study about SD in computational linguistics
  - Definitions and examples in social psychology
  - Survey or hand-coding
  - Related word categories in LIWC [Houghton2012]

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Ground-truth Dataset

▶ **Process**

    ▸ Sample 301 random Twitter conversations

    ▸ Ask it to three judges

    ▸ Tag self-disclosure level

    ▸ Work on a web-based platform

Screenshot of annotation web-based platform

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Ground-truth Dataset

▶ **Process**

- ▶ Sample 301 random Twitter conversations
- ▶ Ask it to three judges
- ▶ Tag self-disclosure level
- ▶ Work on a web-based platform

▶ **Result**

- ▶ Tagged G: 122, M: 147, H: 32 conversations
- ▶ Fleiss kappa: 0.68

Annotating Self-disclosure level f...   +

Google

Conversation

User A	User B	SD level
	My mom has just been taken to the hospital by ambulance. Please pray for her. Thank you.	○ L1 ○ L2 ○ L3
@B Hugs B. Glad your mom is doing better.		○ L1 ○ L2 ○ L3
	@A thanks, SS.....she is in hospital & is very disoriented. She thought my sister was a table & the nurse was cotton batting	○ L1 ○ L2 ○ L3
@B lol too funny. My dad was like that when he was in the hospital. Talked to ppl who had been dead for years.		○ L1 ○ L2 ○ L3
	@A yeah, she did that too -- had a conversation with my brother and went to lunch at my grandmother's house -- both r deceased.	○ L1 ○ L2 ○ L3
	@A it is so scary to see her that way.....but trying to maintain some sense of humor.....	○ L1 ○ L2 ○ L3
@B Extra hugs sweetie. I am glad it wasn't a stroke.		○ L1 ○ L2 ○ L3

Reason

Submit

Screenshot of annotation web-based platform

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Assumptions: First person pronouns

First person pronouns are good indicators for self-disclosure

- ▸ Ex) 'I', 'My'
- ▸ Used in previous research [Joinson et al.2001, Barak et al.2007]

> I live between Camberwell, Peckham, Brixton & Dulwich.

> I lived in Primros Hill *the Island* for fifteen years

> Today's my mother's birthday and she was extremely happy when I informed her I'm applying for Phoenix soon. Happy Birthday mom! :D

> HAHA, nice! Tell her I said Happy Birthday and give her a kiss and hug for me! :3

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Assumptions: First person pronouns

First person pronouns are good indicators for self-disclosure

- ▶ Ex) 'I', 'My'
- ▶ Observed as highly discriminative features between G and M/H in annotated dataset

Unigram	Bigram	Trigram
my	**I love**	**I have a**
I	**I was**	is going to
I'm	**I have**	to go to
but	**my dad**	want to go
was	go to	**and I was**
I've	**my mom**	going to miss

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Assumptions: Topics

M and H level have different topics

- ▸ [General **vs** Sensitive] information about self or intimate

Assumptions: Topics

Self-disclosure related topics by LDA [Bak2012]

| Location	Time	Adult	Health	Family	Profanity
san	tonight	pants	teeth	family	nigga
live	time	wear	doctor	brother	lmao
state	tomorrow	boobs	dr	sister	shit
texas	good	naked	dentist	uncle	ass
south	ill	wearing	tooth	cousin	bitch

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Assumptions: Topics

M and H level have different topics

▸ [General **vs** Sensitive] information about self or intimate

▸ Can be formalized as topics

  ▸ Personally Identifiable Information

    ▢ General information about self

    ▢ Ex) name, location, email address, job, …

  ▸ Secrets

    ▢ Sensitive information about self

    ▢ Ex) physical appearance, health, sexuality, death, …
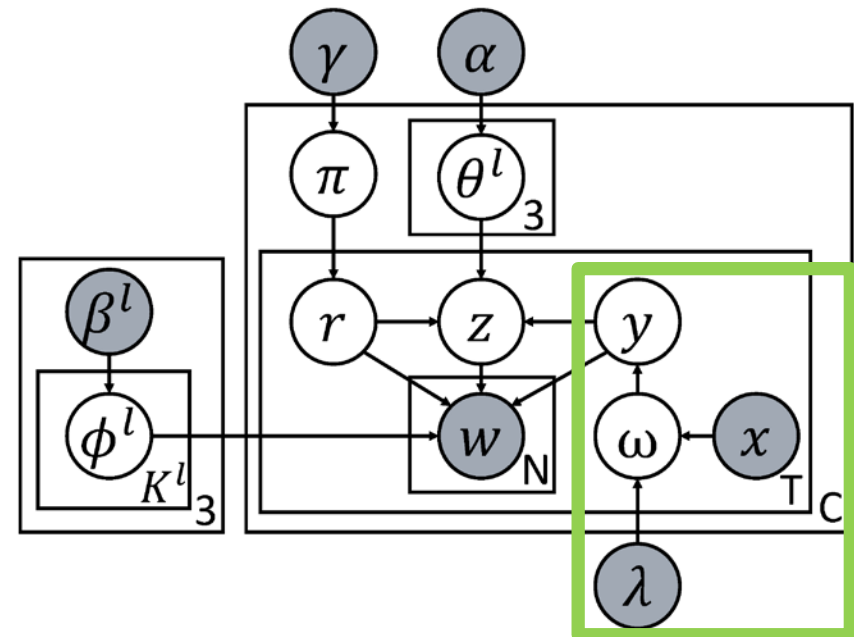
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Self-Disclosure Topic Model (SDTM)
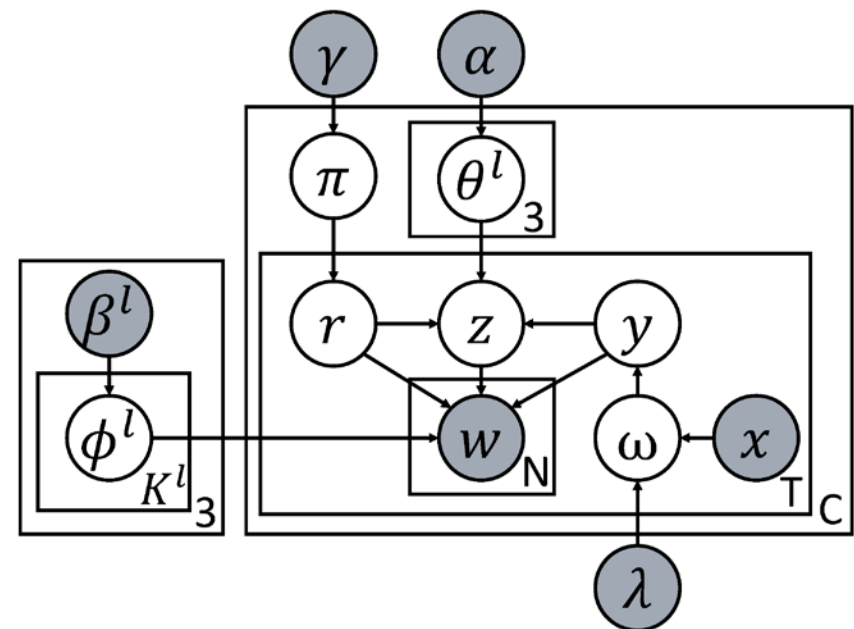
Graphical model of Self-Disclosure Topic Model

Self-Disclosure Topic Model (SDTM)
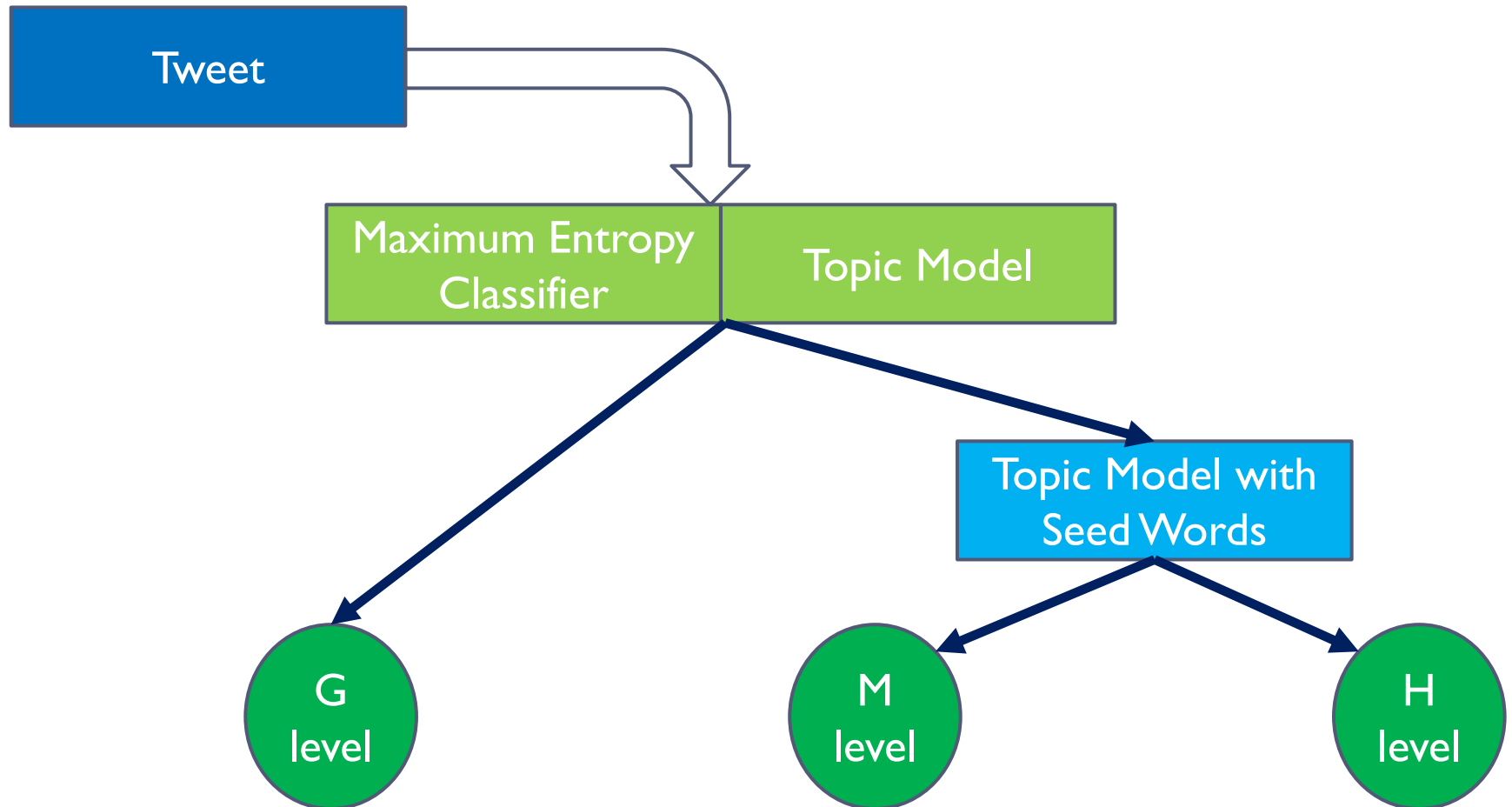
▶ **Classifying G and M/H level**

  ▶ Maximum entropy classifier

  ▶ Observed first-person pronouns

Graphical model of Self-Disclosure Topic Model

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Self-Disclosure Topic Model (SDTM)

▸ **Classifying G and M/H level**

  ▸ Maximum entropy classifier

  ▸ Observed first-person pronouns

▸ **Classifying M and H level**

  ▸ Seed words for each level

  ▸ Observed words

Graphical model of Self-Disclosure Topic Model

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Self-Disclosure Topic Model (SDTM)

Rough figure of how to infer self-disclosure in SDTM

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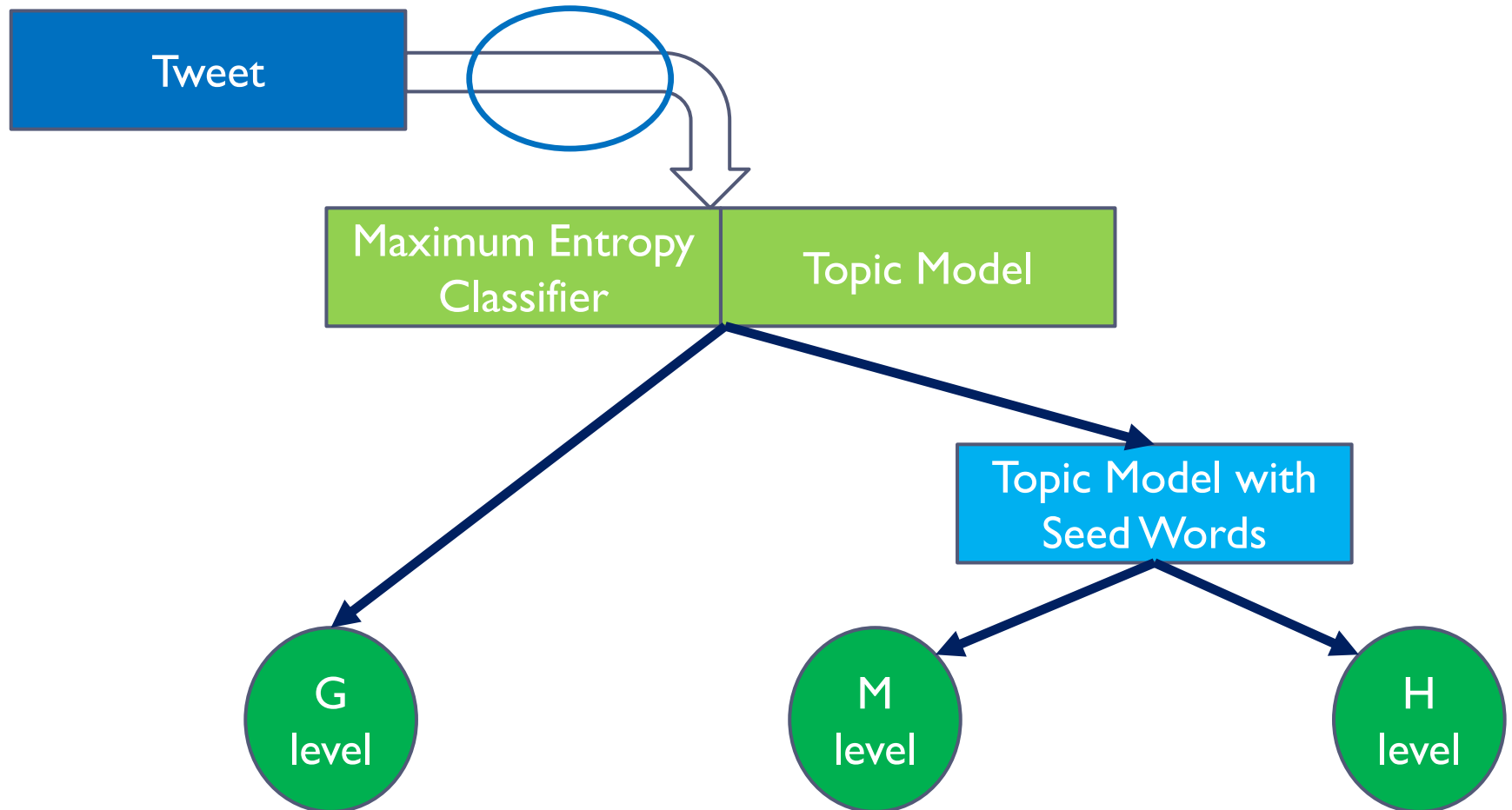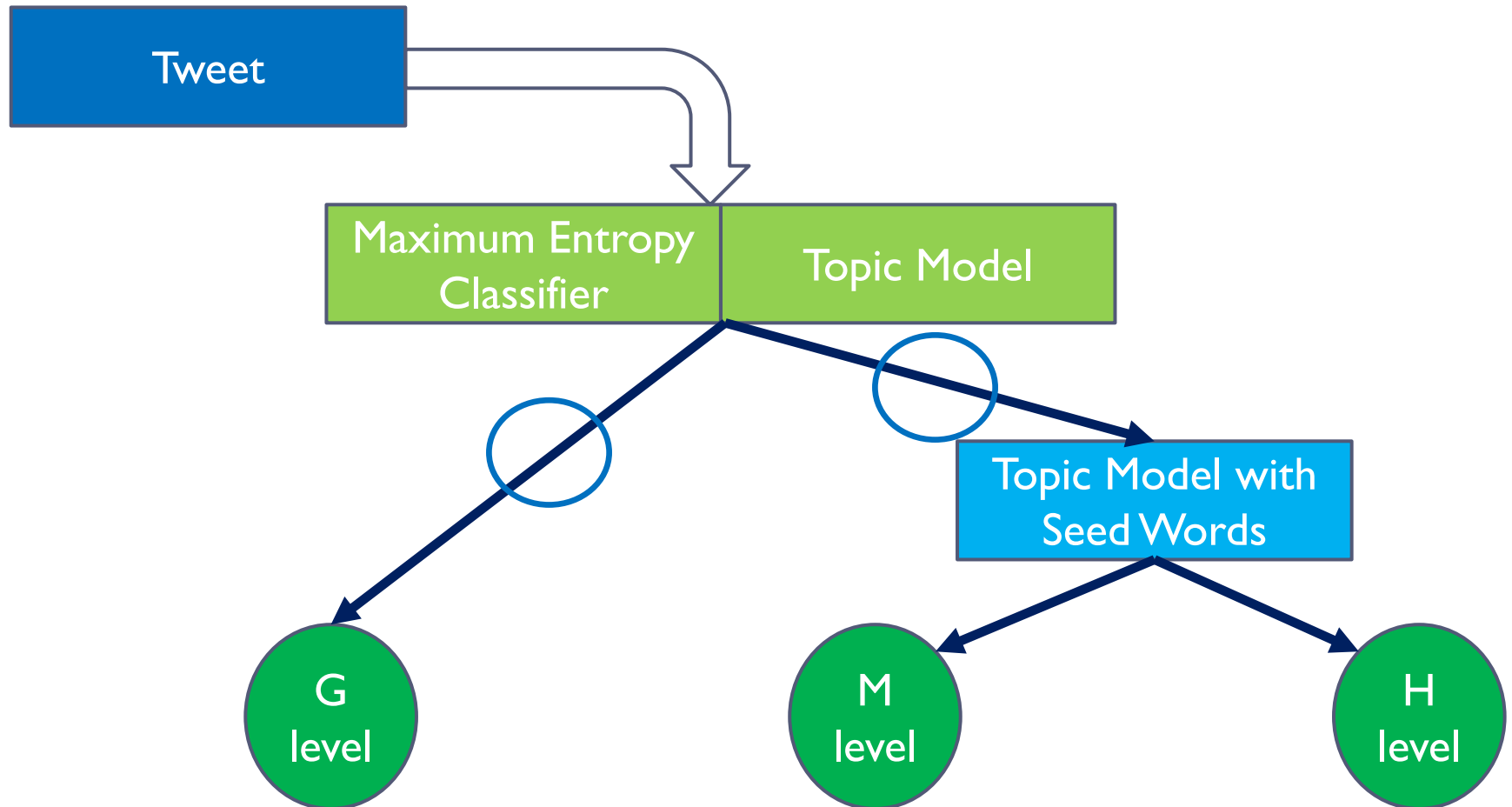
Self-Disclosure Topic Model (SDTM)

Rough figure of how to infer self-disclosure in SDTM
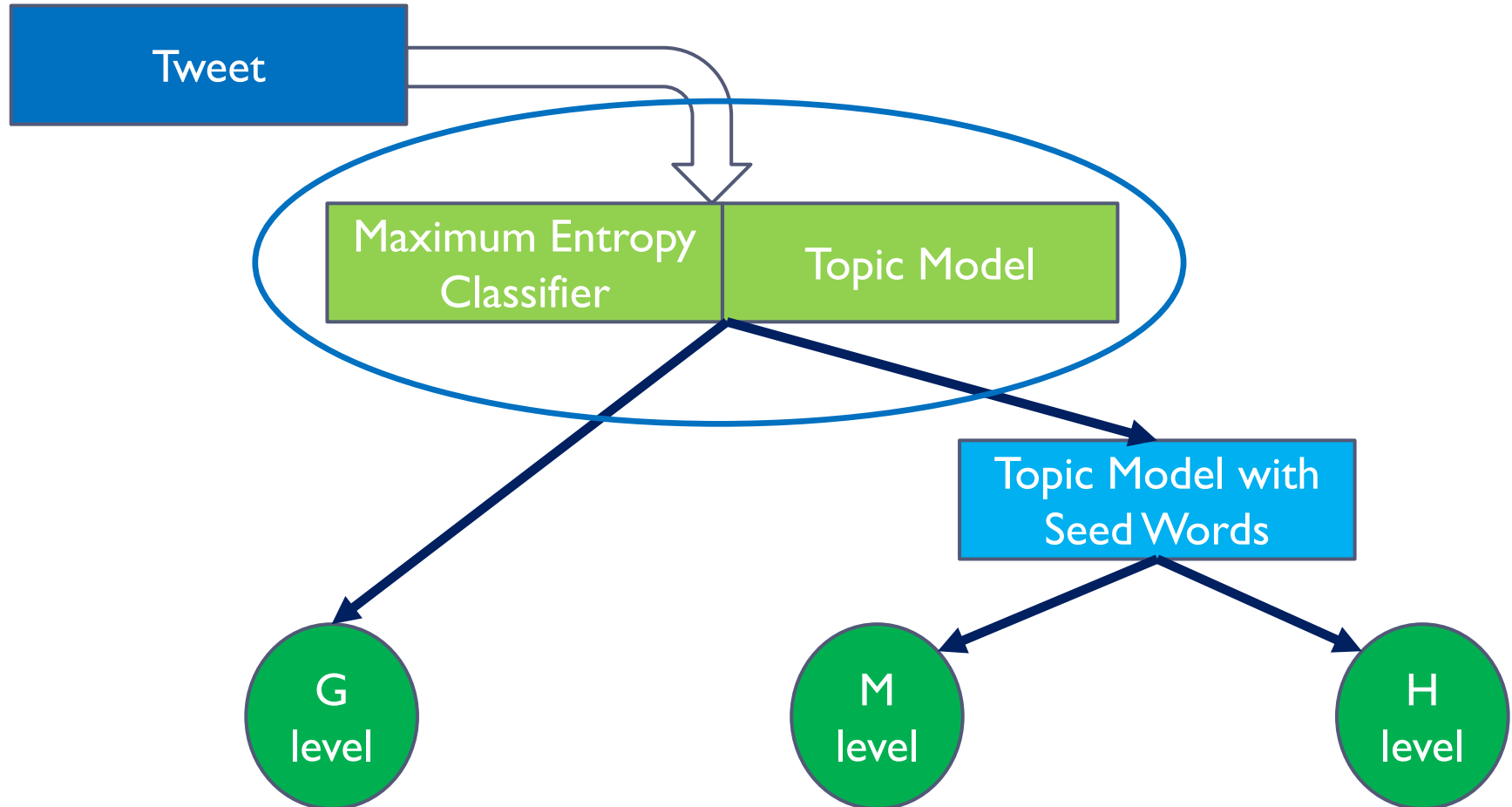
Self-Disclosure Topic Model (SDTM)

Rough figure of how to infer self-disclosure in SDTM

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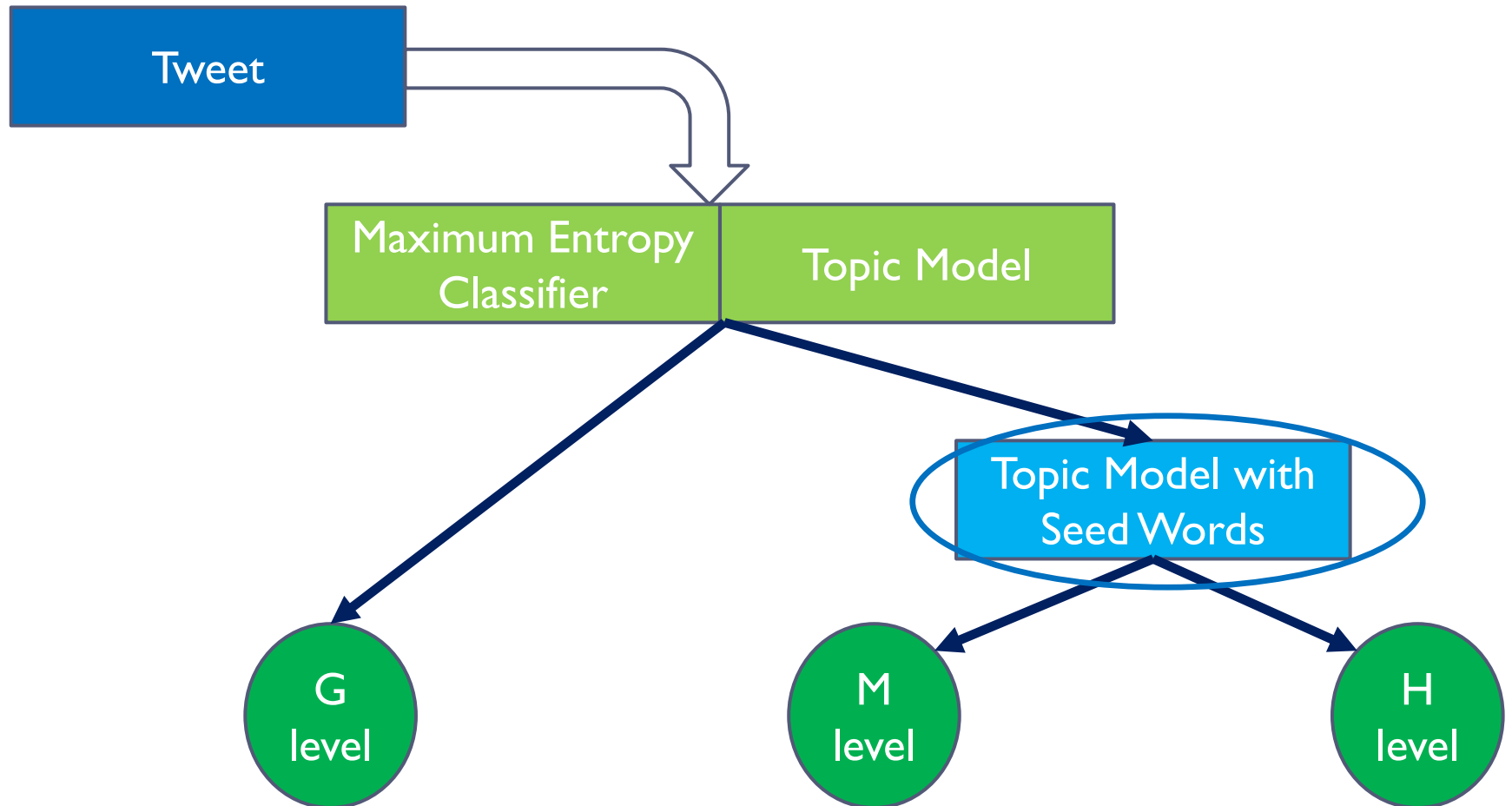
Maximum Entropy Classifier

▸ Learned from annotated dataset

▸ Works better than others
(C4.5, Naïve Bayes, SVM with linear kernel, polynomial kernel and radial basis)

▸ Used to identify aspect and opinions in topic model [Zhao2010]

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Seed Words

Seed words are prior knowledge for each level

- **G level**
  - No seed words (symmetric prior)
- **M level**
  - Data-driven approach in Twitter conversation
- **H level**
  - Data-driven approach from external dataset

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Seed Words

- ## M level
  - ### Data-driven approach
    - Use Twitter conversation dataset
    - Get frequently occurred trigram that begin with 'I' and 'my'

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Seed Words

▸ **M level**

  ▸ Data-driven approach

    ▸ Use Twitter conversation dataset

    ▸ Get frequently occurred trigram that begin with 'I' and 'my'

  ▸ Example seed words

Name	Birthday	Location	Occupation
My name is	My birthday is	I live in	My job is
My last name	My birthday party	I lived in	My new job
My real name	My bday is	I live on	My high school

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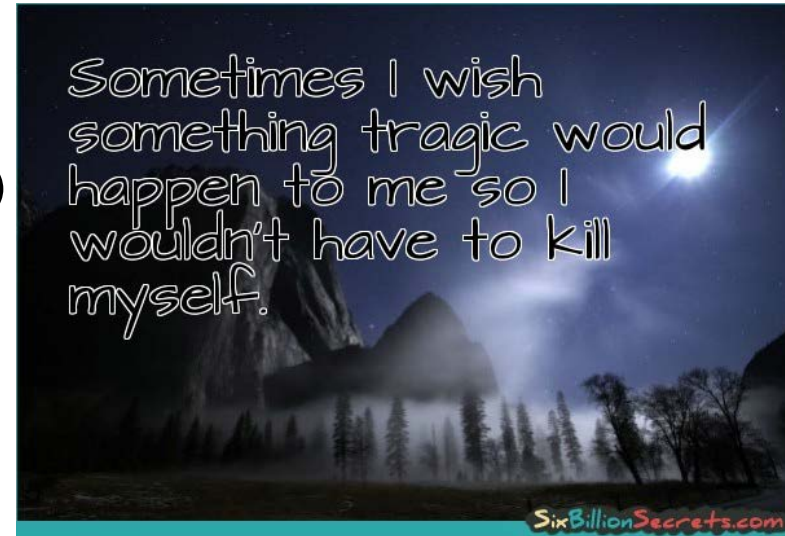
Seed Words

- ▶ **H level**
  - ▶ Data-driven approach
    - ▶ Use external dataset (*Six Billion Secrets*)
      - ☐ http://www.sixbillionsecrets.com
      - ☐ Users write and share his/her secrets
      - ☐ 26,523 posts
    - ▶ Extract high ranked word features

Example of secret posts in *Six Billion Secrets*

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Seed Words

- ## H level
  - ### Data-driven approach
    - Use external dataset (*Six Billion Secrets*)
      - □ http://www.sixbillionsecrets.com
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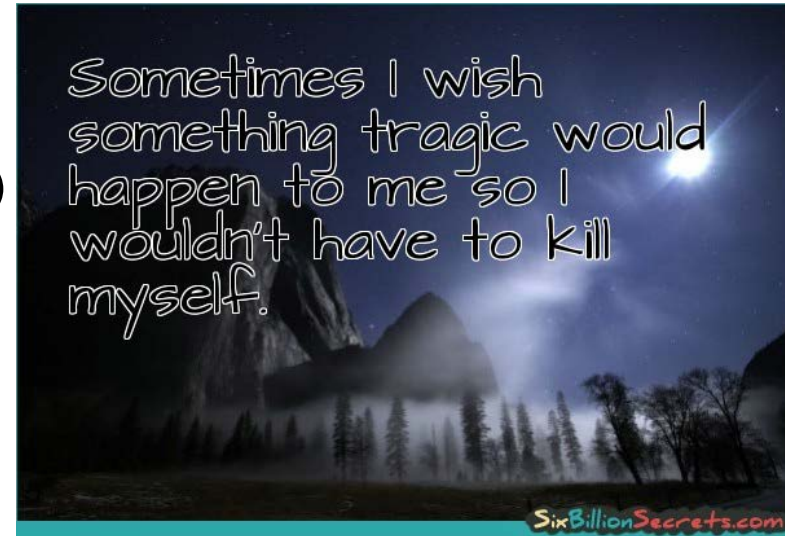
  ### Example seed words

Example of secret posts in Six Billion Secrets

Physical appearance	Health condition	Death
chubby	addicted	dead
fat	surgery	died
scar	syndrome	suicide
acne	disorder	funeral

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Classifying Performance

- Data
  - Annotated Twitter conversation
  - 80/20 train/test randomly

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Classifying Performance

- Data
  - Annotated Twitter conversation
  - 80/20 train/test randomly
- Methods
  - BOW+

    Bag of Words + Bigrams + Trigrams features
  - FirstP

    First-person pronouns features
  - SEED

    Seed words and trigrams features
  - FirstP+SEED

    FirstP and SEED feature
  - SDTM

    Self-disclosure Topic Model

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Classifying Performance

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Classifying Performance

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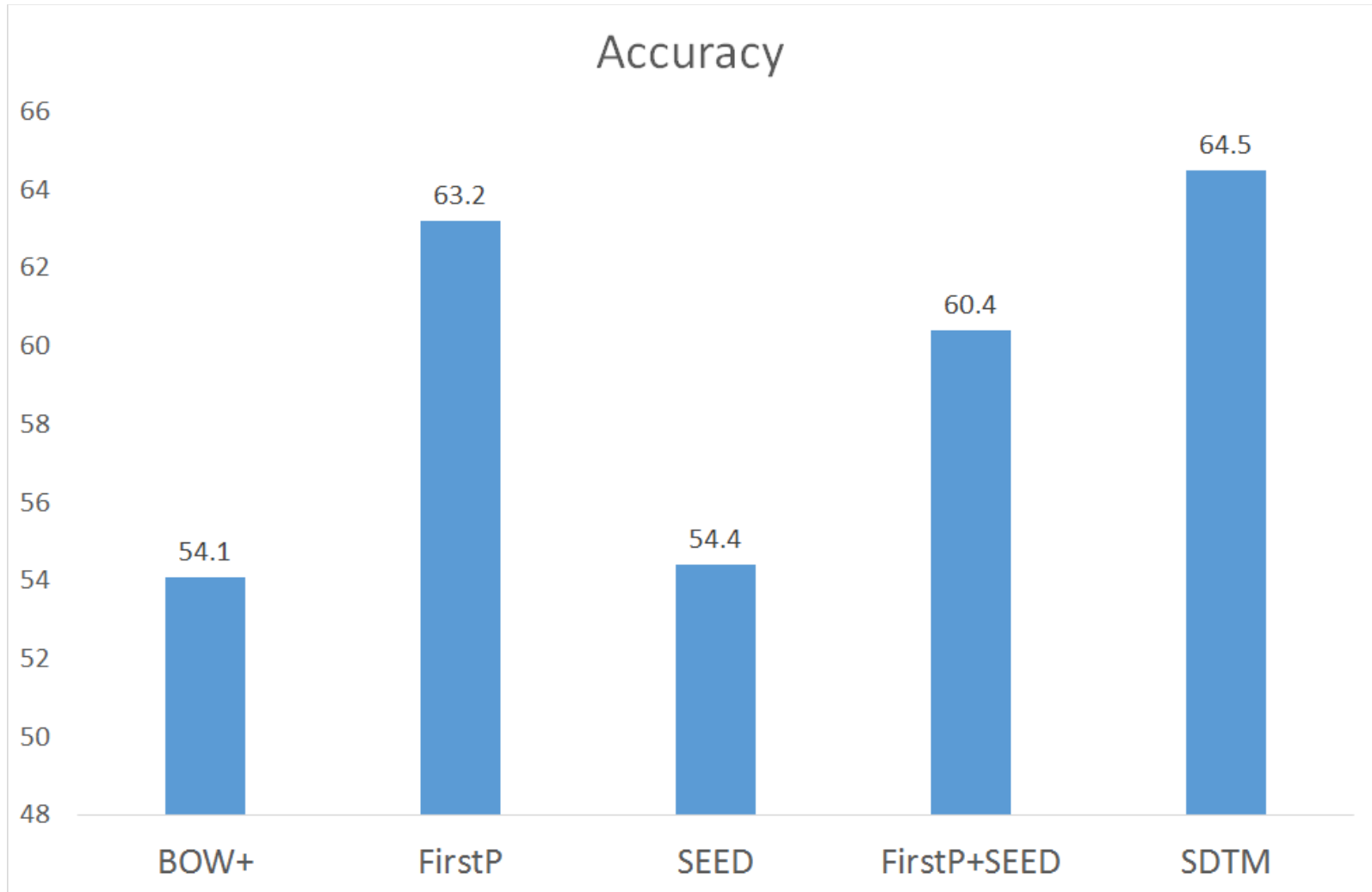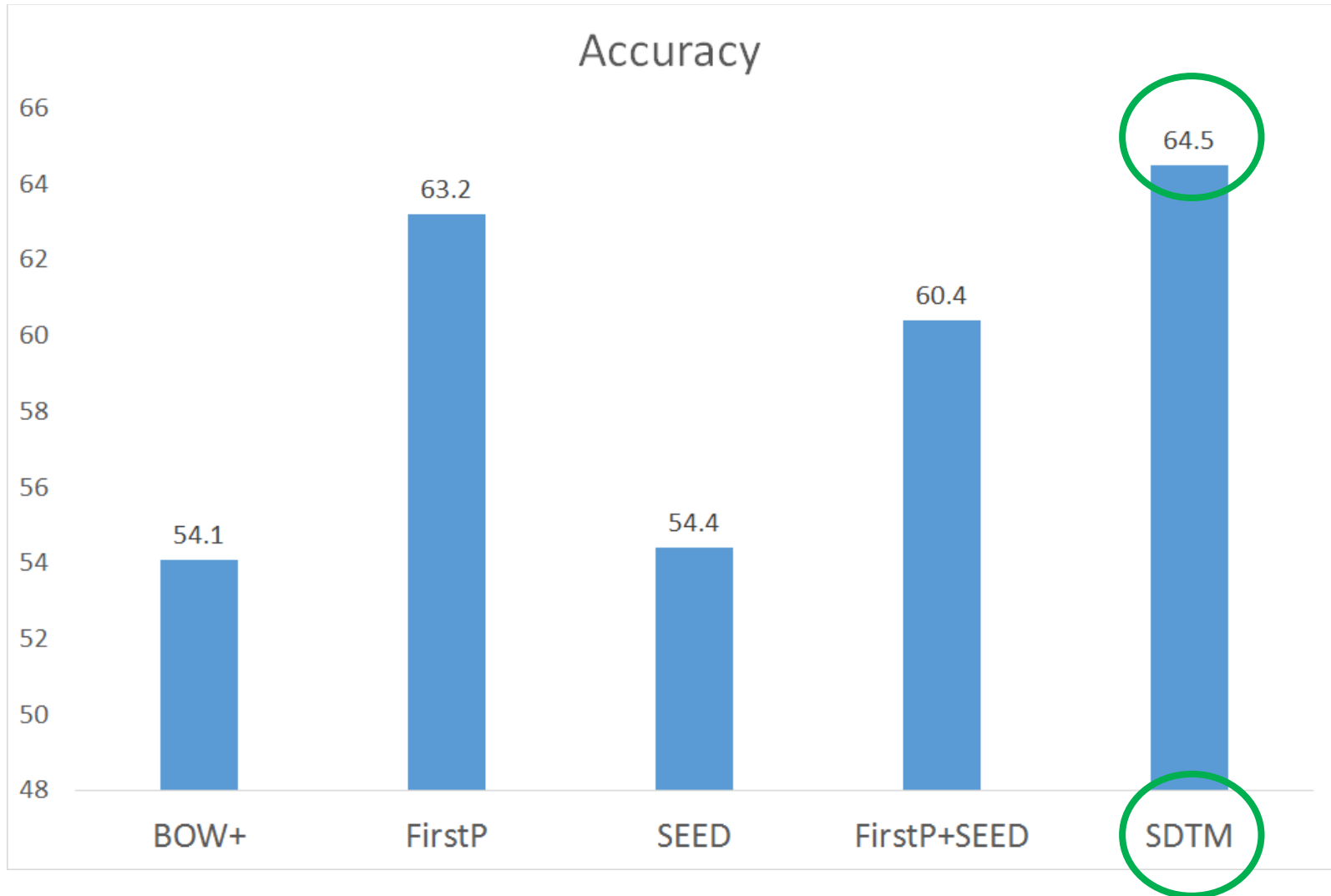
Classifying Performance

F1 Measure

Classifying Performance

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Classifying Performance

41

Classifying Performance

2014-10-28
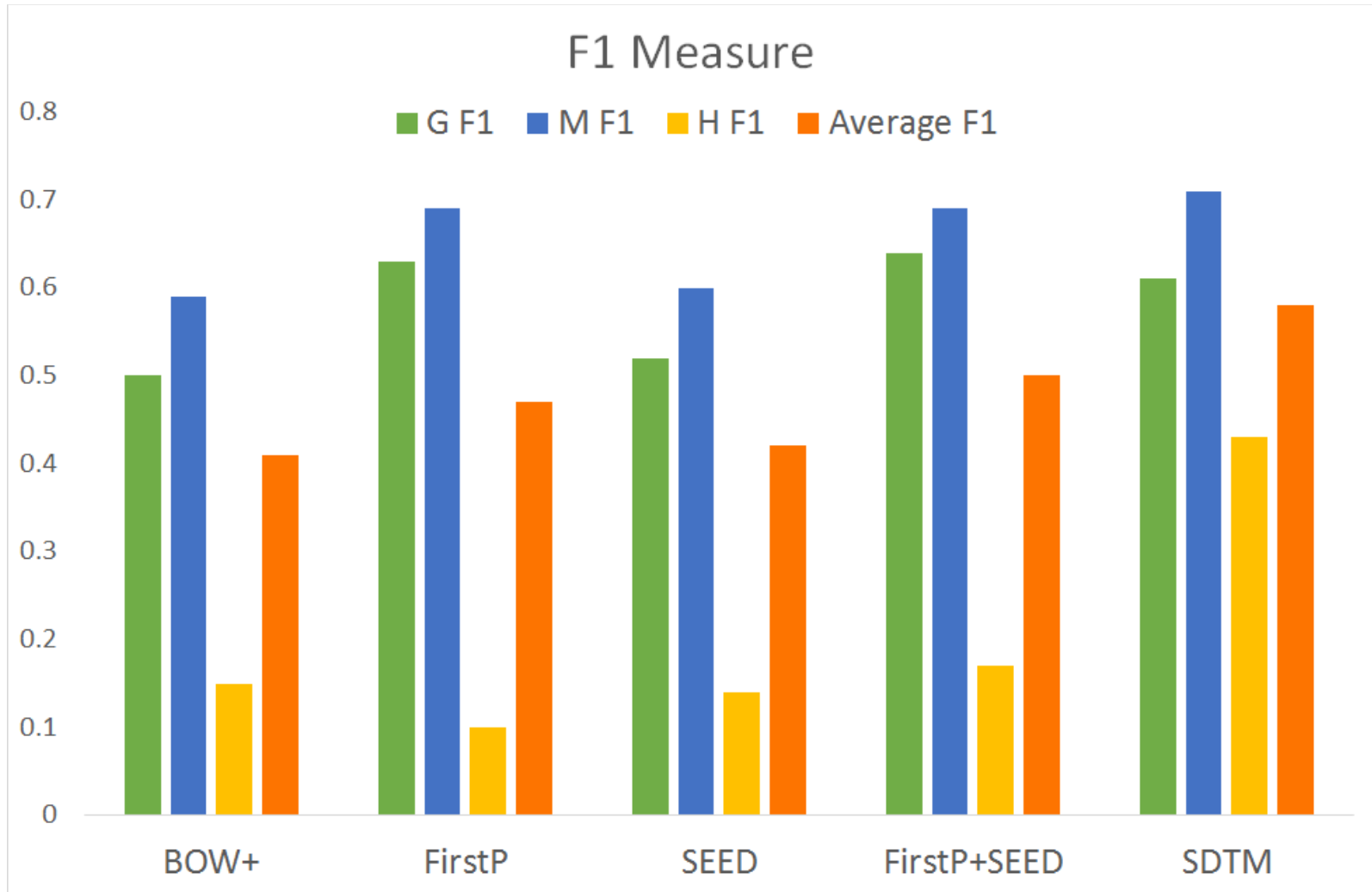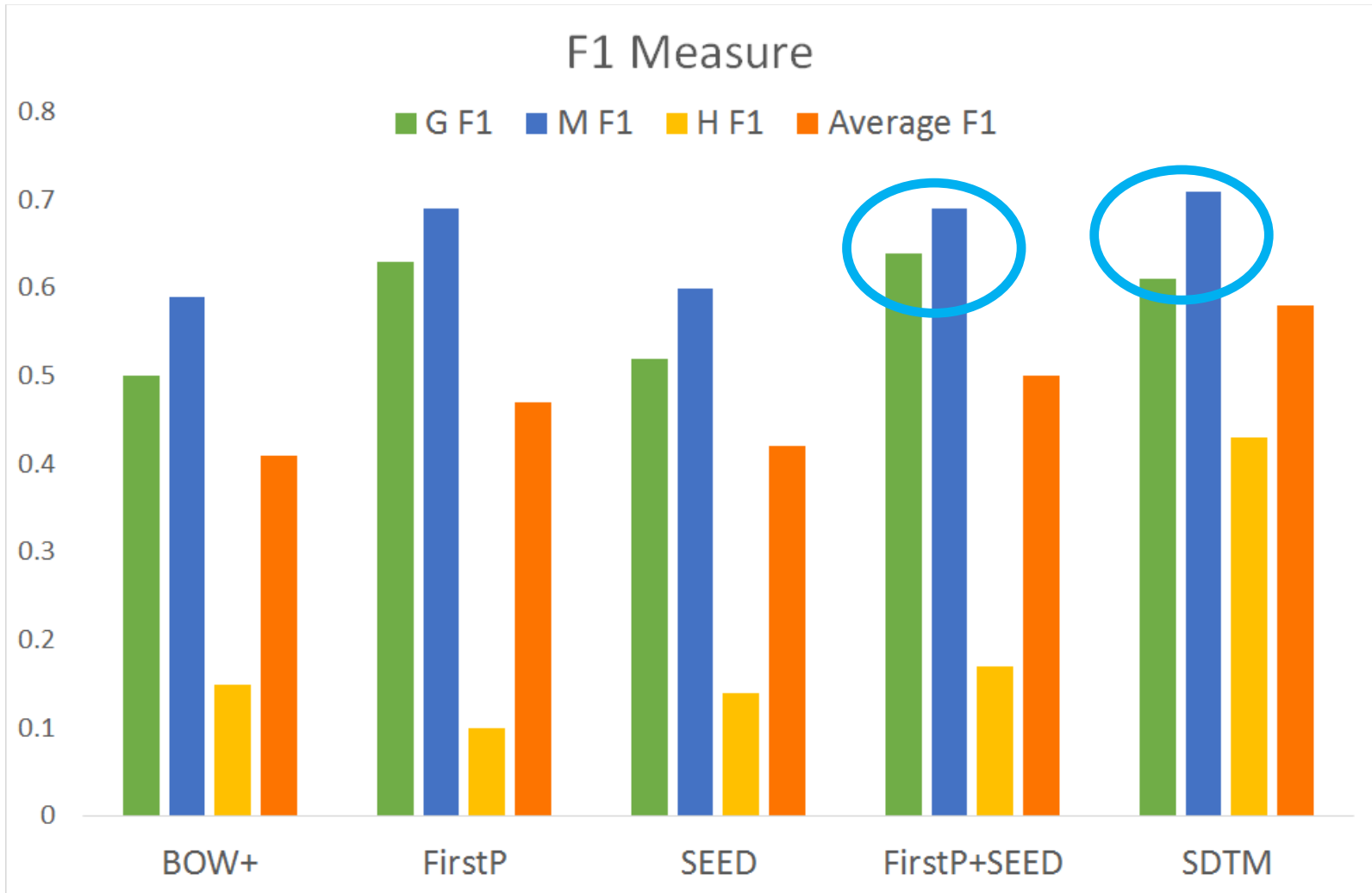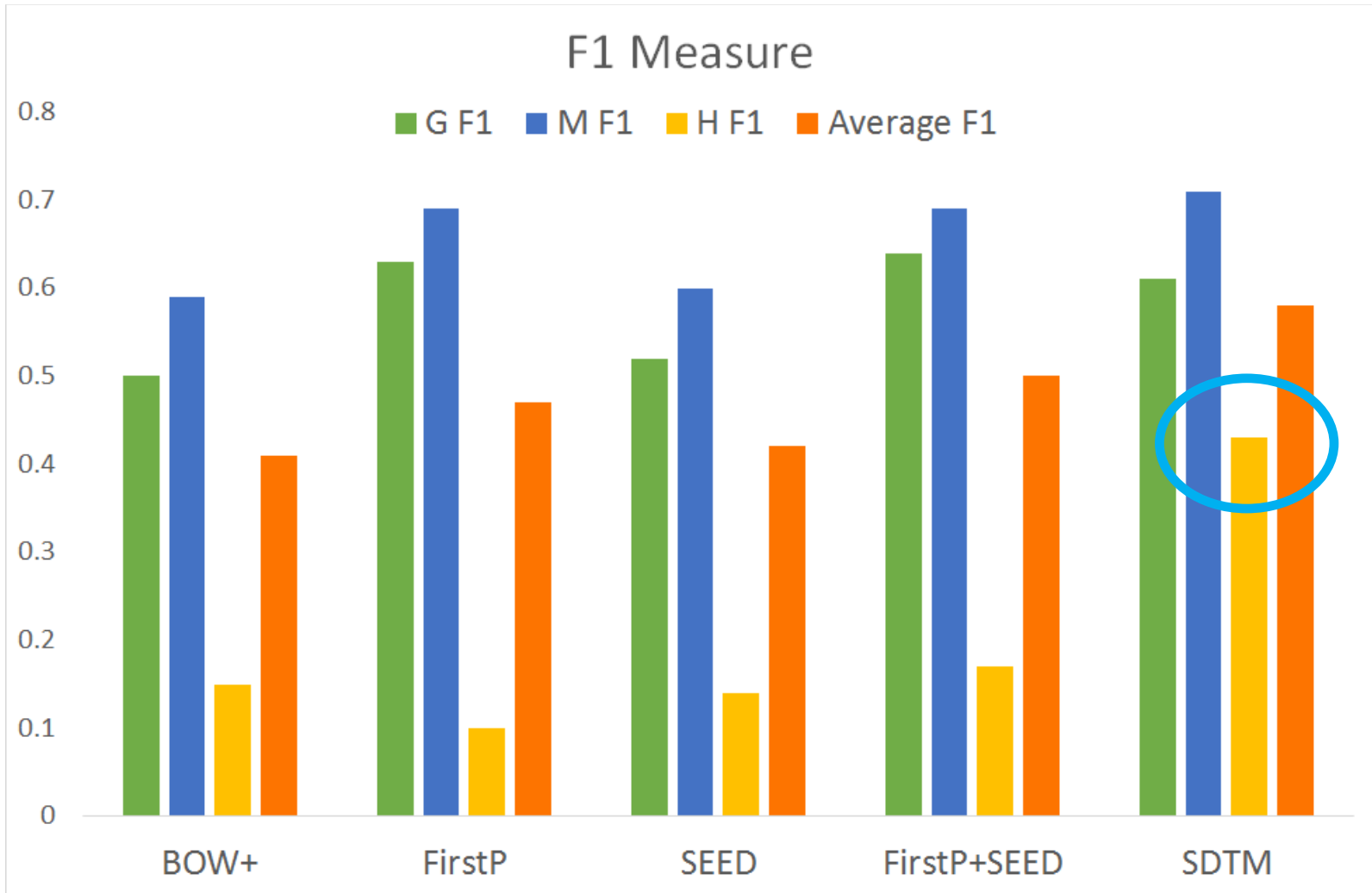
Self-disclosure & Social dynamics

Research Questions

Q1) Does high self-disclosure lead to longer conversations?
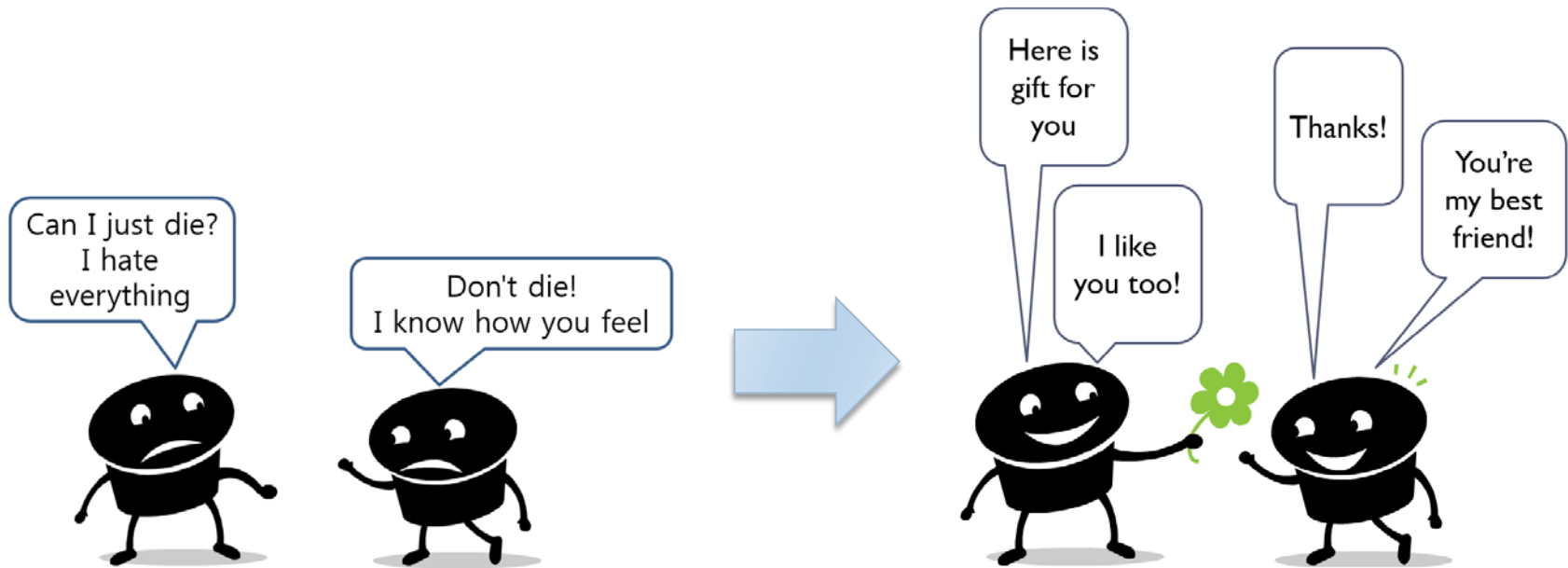
Research Questions

Q2) Is there difference in conversation length patterns over time depending on overall self-disclosure level?

High SD level dyad

Low SD level dyad

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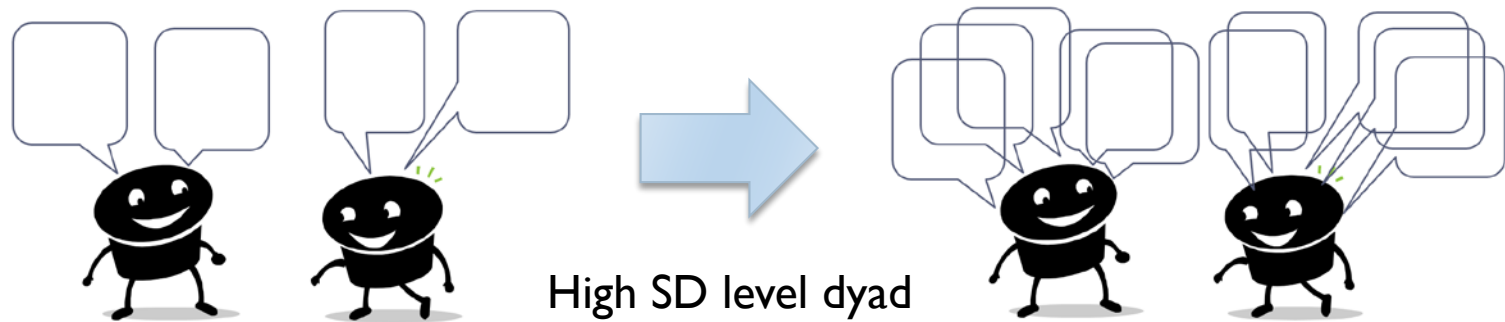
Results

High ranked topics in each level (G, M, H levels)

Shown by high probability words in each topic
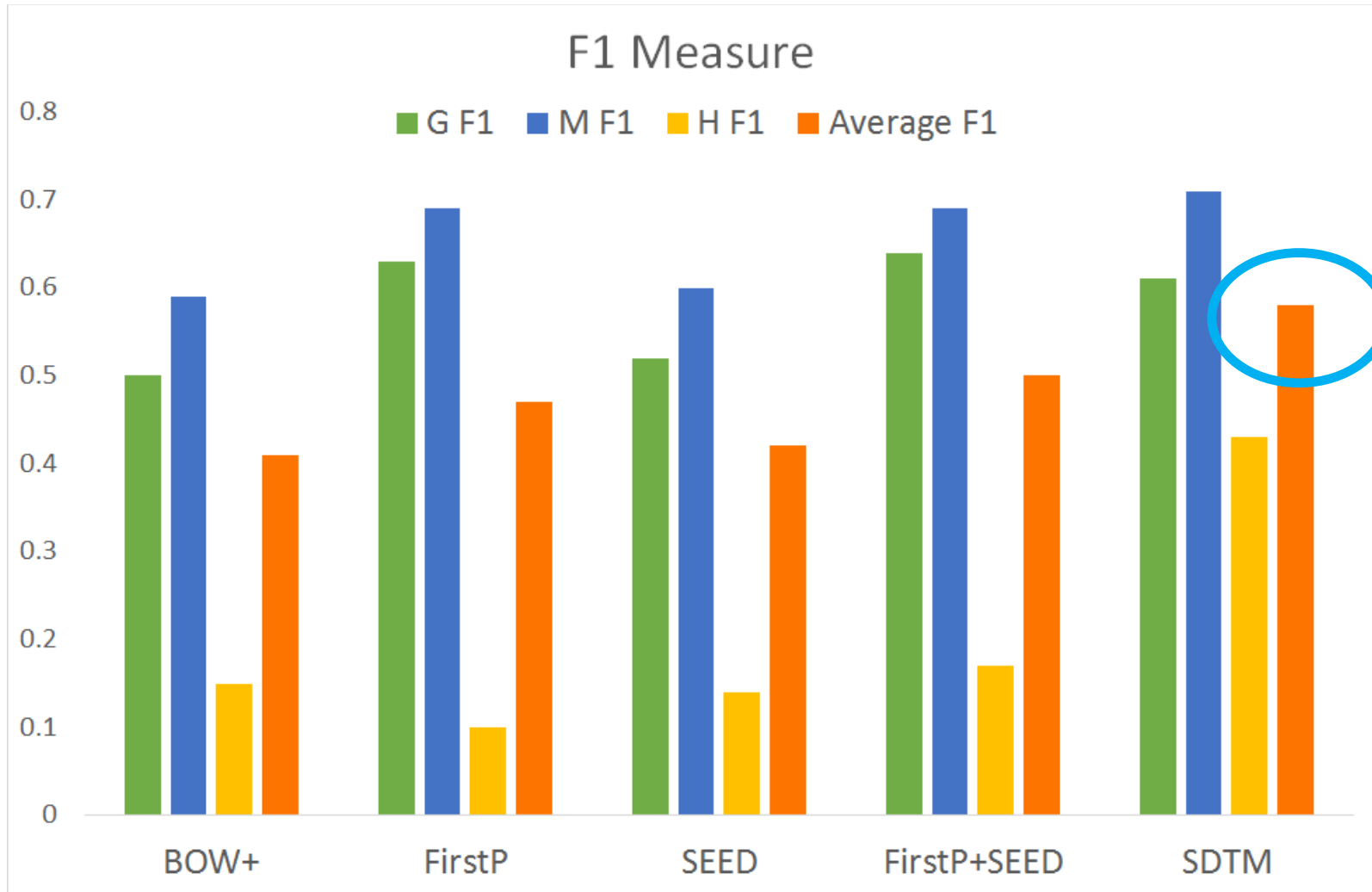
G 1	G 2	M 1	M 2	H 1	H 2
obama	league	send	going	better	ass
he's	win	email	party	sick	bitch
romney	game	i'll	weekend	feel	fuck
vote	season	sent	day	throat	yo
right	team	dm	night	cold	shit
president	cup	address	dinner	hope	fucking

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Results

Q1) Does high self-disclosure lead to longer conversations?

Ans) Positive relations between initial SD level and changes CL

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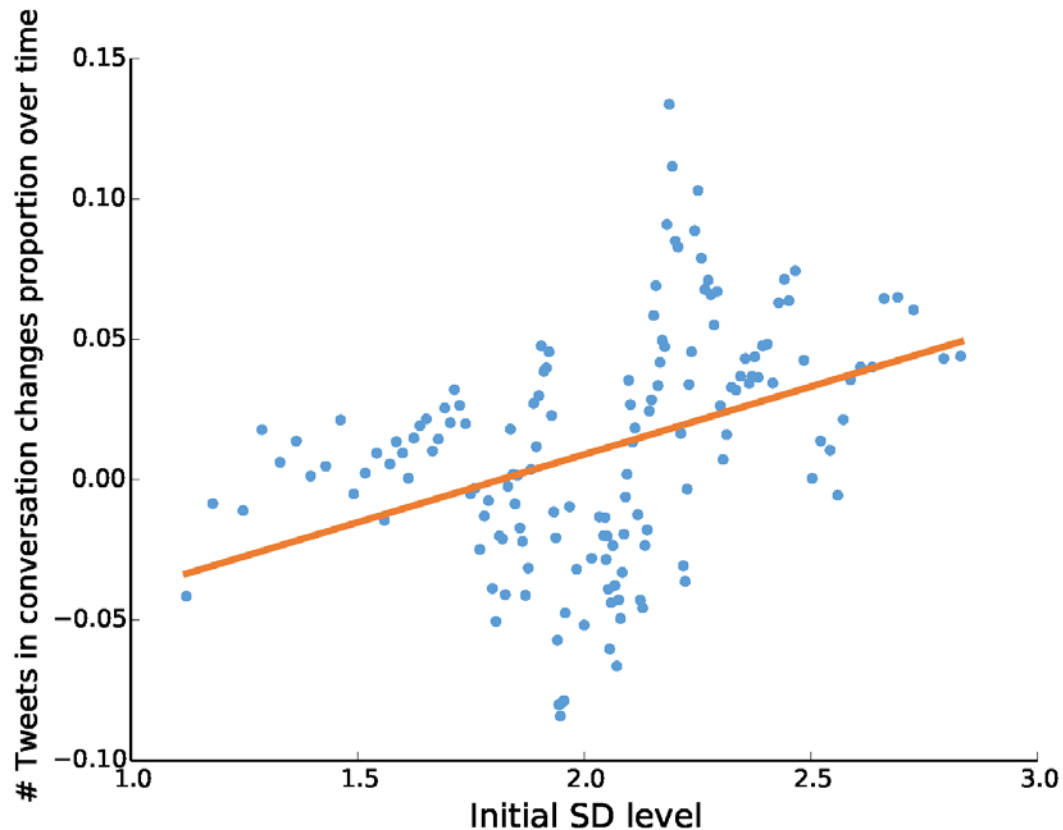
Results

Q2) Is there difference in CL patterns over time by overall SD level?

Ans) 'high' and 'mid' groups increase CL over time, not 'low'

'high' groups talk more in a conversation than 'mid' & 'low' groups
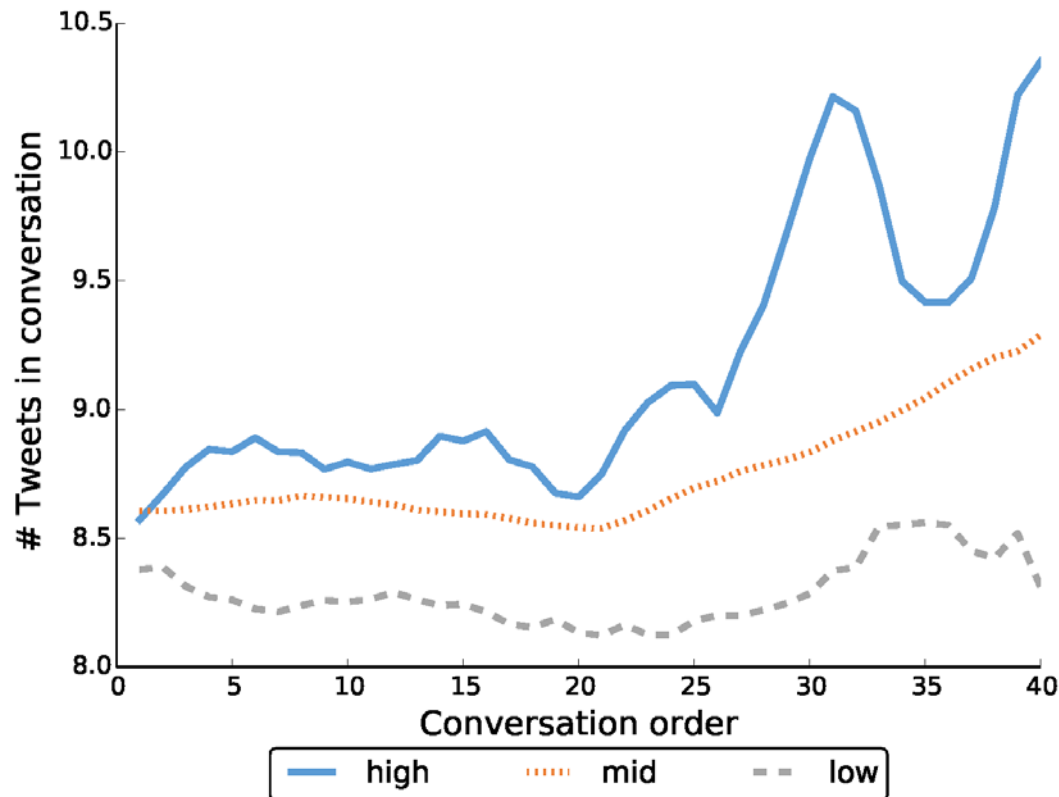
Contributions

▸ Made ground-truth Twitter conversation dataset for SD level

  ▸ Made first annotated Twitter conversations for SD level

  ▸ Share it with researchers

▸ Suggested novel method for identifying SD level (SDTM)

  ▸ Our assumptions are reasonable and verified by experiments

  ▸ SDTM performs better than others

▸ Showed relations between SD & social dynamics

  ▸ Strategic self-disclosure can strengthen the relationship supported by Twitter conversation dataset and SDTM

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Future Work

Self-disclosure for a user general messages

- Self-disclosure is related with
  - Loneliness [Al-Saggaf.2014]
  - Online social network usage [Trepte2013]
- We can predict user's
  - Loneliness and give a social support
  - Usage patterns and give a feedback

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Reference

▸ [Jourard1971b] Sidney M Jourard. 1971b. The transparent self (rev. ed.). Princeton, NJ: VanNostrand.

▸ [Jourard1958] Sidney M Jourard and Paul Lasakow. 1958. Some factors in self-disclosure. The Journal of Abnormal and Social Psychology, 56(1):91.

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Thank you!
Any questions or comments?

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