Learning Human Behavior From Data (Part 2)

Lecture #9
Brief Recap of last lecture

• We talked about a few behaviors
  – Topic Control
  – Involvement
  – Task Control
  – Disagreement

• Behaviors are computed using indices
  – How to compute indices directly from text?
### Topic Control map for a discourse

<table>
<thead>
<tr>
<th>speaker</th>
<th>Topic introductions</th>
<th>Topic mentions</th>
<th>Citing others</th>
<th>Turn length</th>
<th>Degree of Topic Control</th>
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<tbody>
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<td>JR</td>
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<tr>
<td>KN</td>
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<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
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<td>1</td>
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Social Phenomena

- Social Roles
  - Leader
  - Influencer
  - Pursuit of Power

And others .....
Leadership

• **Leader** is a social role.
  – The leader: guides group toward an outcome, manages interaction, controls discussion
  – Other group members: recognize the leader
Influencer

• **Influencer** is a social role
  – The influencer: introduces ideas, has credibility
  – Other members: pick up & support influencer’s ideas
Pursuit of Power

• **Pursuit of Power** is a social role
  – Anyone who makes repeated efforts to gain control
  – and whose behavior causes tension within the group
2-tier design

2nd level models ➔
Complex Social Roles and States
Influencer ➔ Leader ➔ Other social phenomena

1st level models ➔
Sociolinguistic behaviors
Topic Control ➔ Task Control ➔ Disagreement ➔ Involvement
Network Centrality ➔ Argument Diversity ➔ ......

Observables ➔
Linguistic Phenomena
dialogue acts ➔ communicative acts and types ➔ topics and co-references ➔ valence/polarity
......
Topic Control indices

- Topic Introductions (LTI)
- Subsequent Mentions (SMT)
- Citation Score (CS)
- Turn Length (TL)
Influencer model

Influencer

- Topic Control (TCM)
  - Topic Introductions (LTI)
  - Subsequent Mentions (SMT)
- Network Centrality (NCM)
  - Citation Score (CS)
  - Turn Length (TL)
- Argument Diversity (MAD)
- Disagreement (CDM)
  - Emotive Language
  - Topical Positioning
Influencer Component Behaviors

Network Centrality
- Communicative Links Measure
- Citation Rate Index
- Meso-Topic Introduction

Measure of Argument Diversity
- Vocabulary Range Index
- Vocabulary Introduction Measure

Emotive Language Use
- Emotive Word Index
Influencer Component Behaviors

• **Topic Control (TCM)**
  – As seen in last class

• **Cumulative Disagreement (CDM)**
  – Based on expressive and topical disagreement
  – As seen in last class

• **Emotive Language Use (ELM)**
  – Emotive Word Index: % of emotive words used

• **Network Centrality Measure (NCM)**
  – % in-links (address/response) + citations to each speaker

• **Measure of Argument Diversity (MAD)**
  – Vocabulary Range: % unique words + % unique content words
Automated scores and correlations

• Correlations between indices comprising a measure (MAD)

Measure of argument diversity

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<th>VIM</th>
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<tr>
<td>α</td>
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</table>

• This means we are measuring the same phenomena using these two indices
Automated scores and correlations

• Good correlations between Influencer measures

*Exception: Very low correlation found between EWI and rest of measures*

<table>
<thead>
<tr>
<th></th>
<th>NCM</th>
<th>MAD</th>
<th>TCM</th>
<th>CDM</th>
<th>EWI</th>
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<tr>
<td>EWI</td>
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</table>
Analysis of Automated Results

• Performance against human assessments based on subject questionnaires

During the discussion, some of the people are more influential than others. For the conversation you just took part in, please rate each of the participants in terms of how influential they seemed to you.
Sample Influencer scores

- Scores computed from automated process

<table>
<thead>
<tr>
<th>Human Scores</th>
<th>MAD</th>
<th>NCM</th>
<th>TCM</th>
<th>CDM</th>
<th>Influencer</th>
</tr>
</thead>
<tbody>
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<td>0.05761</td>
<td>0.11089945</td>
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<td>0.1</td>
<td>0.105719</td>
</tr>
</tbody>
</table>

- Influencer score computed by taking average across measures
- Does not reflect correlation relationship
  - TCM should be given higher weight than others
  - NCM found to correlate more than MAD
### Adjusted Influencer scores

- Adjusted influencer scores by weighting scheme

<table>
<thead>
<tr>
<th>Human Scores</th>
<th>MAD</th>
<th>NCM</th>
<th>TCM</th>
<th>CDM</th>
<th>Influencer</th>
<th>Influencer with weights</th>
</tr>
</thead>
<tbody>
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<td>0.17203</td>
<td>0.05761</td>
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<td>0.105719</td>
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</tr>
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</table>

- Influencer score = $(\alpha_{\text{MAD}} \times \text{MAD}) + (\alpha_{\text{NCM}} \times \text{NCM}) + (\alpha_{\text{TCM}} \times \text{TCM}) + (\alpha_{\text{CDM}} \times \text{CDM})$
- Where $\alpha_{\text{TCM}} > \alpha_{\text{NCM}} > \alpha_{\text{MAD}} > \alpha_{\text{CDM}}$
• Adjusting weights to different cultures
  – English -> Chinese
Influencer in Chinese

• Correlations with measures differ

<table>
<thead>
<tr>
<th></th>
<th>NCM</th>
<th>MAD</th>
<th>TCM</th>
<th>CDM</th>
<th>Human</th>
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<tbody>
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</tbody>
</table>

• On average, MAD correlates higher with human survey assessments than TCM and NCM in Chinese dialogues
• Let’s look at another social role - Leadership
Leadership behaviors

Topic control (TCM)

![Graph showing topic control (TCM) results]

Task Control (SCM)

![Graph showing task control (SCM) results]

Disagreement (CDM)

![Graph showing disagreement (CDM) results]

Total score: Leader

![Graph showing total score for Leader]
Collective Behaviors

• **Group Cohesion** *(state)*
  – general consistency in group objectives or values over time
  – persistence in the cooperative nature of the members’ interactions
One component behavior of Group Cohesion

• **Sociability Measure**
  – Socio-emotional involvement between speakers, including observance of group conversational norms.
Sociability indices

• Conversational Norms Measure (CNM). Degree to which the speakers adhere to conversational principles: question-answer, offer-response, etc.

• Agreement Disagreement Measure (ADM). Degree to which the levels of agreement and disagreement among participants are balanced.

• Network Density Index (NDI). Density of communicative links and topic citations between speakers.

• Cite Disparity Index (CDI). Disparity of citation links between the speakers.
Group Cohesion

• Key idea: With the behaviors related to Group Cohesion, we are primarily looking for balance vs. imbalance on the component behaviors.

• Balanced distribution would indicate greater group cohesion.
Assigned Reading – Paper 5

I Can Already Guess your answer: Predicting Respondent Reactions during Dyadic Negotiation

Sunghyun Park, Stefan Scherer, Jonathan Gratch, Senior Member, IEEE, Peter J. Carnevale, and Louis-Philippe Morency

Responses due 3/28 by 11:59 pm