Large-scale Discourse Analysis of Counseling Conversations

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Mental Health by the Numbers

- 43.8 million adults (18.5%) in the U.S. experience mental illness each year

- Suicide is leading cause of death for people aged 15-24
- Nearly 50% of youths (aged 12-18) with mental illness didn’t receive treatment in the previous year

Statistics provided by the National Institute of Mental Health: http://www.nimh.nih.gov/
Counseling

• Treatments like psychotherapy and counseling can help!
  • Lots of great research on how to counsel effectively
  • But typically small scale and qualitative

• Technology-mediated counseling has greatly broadened access to counseling resources
  • Also allows for large scale quantitative studies
This Talk

- What makes a good counselor?
- How do you help someone feel better?

- Various techniques from NLP to discover effective conversation strategies
- Use data from technology-mediated counseling
- Largest quantitative study of crisis counseling to date
The Data

- Collaboration with a nonprofit supporting teenagers in crisis through text messaging
- Texters matched with extensively trained volunteer counselors
- Counseling conversation via SMS
- Texter gets follow-up survey
  - So data includes conversation outcomes
Dataset Statistics

- 80,855 conversations, 3.2 million messages
- 15,555 (19.2%) of conversations have survey responses
- 408 counselors
  - 130 counselors with over 15 conversations with survey responses

Split by success rate

- Less successful (~50% SR)
- More successful (~75% SR)
How do more and less successful counselors talk differently?

• More successful counselors ...
  • address ambiguity by writing more
  • use more check questions
    • “it sounds like...”
  • use more hedges (lessen the impact of an utterance)
    • “maybe”, “fairly”
• Many more examples in the paper
Counseling “Strategies”

1. Adapt to the conversation
2. Be creative in responses
3. Work towards making progress
4. Facilitate perspective change
Adaptability

• Are counselors aware of how conversations are going? How do they react?

• Compute distance between counselor language in positive/negative conversation
  • Represent language with TF-IDF vector of word occurrences
  • Cosine similarity for distance

• Observe how this changes over time
Adaptability

Difference in language between positive and negative conversations
1. Adapt to the conversation

Distance between positive and negative conversations

Portion of conversation (% of messages)

Adapting

Not adapting
Creativity & Generic Responses

- Do counselors use generic or “templated” responses?
  - “How does that make you feel?” vs.
    “Thanks for sharing that with me. That sounds really challenging. How do you feel about X, Kevin?”

- Measure “creativity”
  - Compute the number of close neighbors to each response
  - Cosine distance in TF-IDF space is below a threshold

Message with few neighbors
Message with many neighbors
2. Be creative in responses

**Finding:** More successful counselors use more **creative** responses than less successful counselors
Conversation Progress

• Is there a general higher-level structure to counseling conversations?

• How do counselors navigate this structure?

• Use techniques from unsupervised conversation modeling to learn ordered sequence of conversation stages
Conversation Model

- Assign each message in each conversation a stage using a variant of Hidden Markov Models
  - Force stages to be in increasing order

Conversation as sequence of text messages

\[ m_1, m_2, m_3, m_4, m_5, m_6, m_7 \]

Model assigns a stage to each message

\[ m_1 \rightarrow \text{stage 1}, \ m_2 \rightarrow \text{stage 2}, \ m_3 \rightarrow \text{stage 2}, \ m_4 \rightarrow \text{stage 3}, \ m_5 \rightarrow \text{stage 4}, \ m_6 \rightarrow \text{stage 4}, \ m_7 \rightarrow \text{stage 5} \]
## Conversation Stages

<table>
<thead>
<tr>
<th>Stage</th>
<th>Interpretation</th>
<th>Texter top words</th>
<th>Counselor top words</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>hi, hello, name, listen, hey</td>
<td>hi, name, hello, hey, brings</td>
</tr>
<tr>
<td>2</td>
<td>Problem introduction</td>
<td>dating, moved, date, liked, ended</td>
<td>gosh, terrible, hurtful, painful, ago</td>
</tr>
<tr>
<td>3</td>
<td>Problem exploration</td>
<td>knows, worry, burden, teacher, group</td>
<td>react, cares, considered, supportive, wants</td>
</tr>
<tr>
<td>4</td>
<td>Problem solving</td>
<td>write, writing, music, reading, play</td>
<td>hobbies, writing, activities, distract, music</td>
</tr>
<tr>
<td>5</td>
<td>Wrap up</td>
<td>goodnight, bye, thank, thanks, appreciate</td>
<td>goodnight, 247, anytime</td>
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3. Work towards making progress

![Graph showing stage duration for more successful and less successful counselors.](Image)
3. Work towards making progress

- More successful counselors are quicker to know the problem and spend longer on the problem solving stage
Perspective Change

• Prior research on depression finds
  • Focusing on others instead of yourself can help (Campbell and Pennebaker, 2003)
    • Having a positive view of the future can help (Pyszczynski et al., 1987)

• We quantify perspective change by tracking the frequency of LIWC markers (Tausczik and Pennebaker, 2010)
  • “I, me, myself, ...” vs “he, she, they, ...”
  • Past vs Present vs Future
Perspective Change: Self-Focus

- Texters who talk less about themselves and more about others tend to have successful conversations
Perspective Change: Future

- Texters who talk less about the present and more about the future tend to have successful conversations
4. Facilitate perspective change

- Simple hypothesis: The texter will talk more about something (e.g., the future) if the counselor talks about it first

- Linguistic coordination
  - Use coordination measure from (Danescu-Niculescu-Mizil, 2012)

- We find significant coordination of texter towards counselor for all perspective change markers (e.g., future)
  - Counselor can help facilitate perspective change
Conclusion

Applying NLP techniques can teach us a lot about counseling strategies

1. Adapt to the conversation
2. Be creative in responses
3. Work towards making progress
4. Facilitate perspective change

Full study in paper: “Large-Scale Analysis of Counseling Conversations: An Application of Natural Language Processing to Mental Health”

This is a new area, and there are many possibilities for more detailed analysis and building tools to help counselors
Thanks!
Any Questions?