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
  • 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
- 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)
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

Time

Adapting

Not adapting
1. Adapt to the conversation

![Graph showing the distance between positive and negative conversations for more and less successful counselors.]

- More successful counselors (Adapting)
- Less successful counselors (Not adapting)

Viewpoint: the distance between positive and negative conversations increases with the portion of the conversation (% of messages).
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.
How do more and less successful counselors talk differently?

• More successful counselors ...
  • writing longer messages
  • use more check questions
    • “it sounds like…”
  • use more hedges (lessen the impact of an utterance)
    • “maybe”, “fairly”
  • avoid “why” questions

• Many more examples in the paper
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**

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

<table>
<thead>
<tr>
<th>Stage</th>
<th>Interpretation</th>
<th>Texter top words</th>
<th>Counselor top words</th>
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</thead>
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<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>
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<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 (percent of conversation) for more successful and less successful counselors.]

- More successful counselors
- Less successful counselors
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
- Texters who talk less about themselves and more about others tend to have successful conversations.
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

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
Since This Research...

• Project no longer active at Stanford (no data access), but...

• The counseling organization has a research fellowship program
  • Looking for AI/ML/NLP Experts, 3-6 months working on site

• Lots of new research on applying NLP to mental health
  • Especially on identifying/risk-assessing mental illness, depressions, etc.
  • CLPsych: Computational Linguistics and Clinical Psychology Workshop

• Also a growing number of startups in this space
Thanks!
Any Questions?
New Research on the data

- Outside event causing increased volume
New Research on the data