Conversations That Make You Feel Better
Applying Natural Language Processing to Mental Health

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Joint work with Kevin Clark and Jure Leskovec
Social Support & Conversations

- Social support: We rely on others to care for us in times of need

- Emotional and informational support are typically offered through conversations

- Conversations are a critical building block to every day life and our relationships
How do you help someone feel better?

- Focus on mental illness & counseling
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- Focus on mental illness & counseling

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

- Counseling conversations can help in crises and with mental illness

- Existing research typically small scale & qualitative
Our Study

1. Develop novel computational discourse analysis methods applied to counseling conversations
2. Quantify conversation dynamics in the largest quantitative study of counseling to date
3. Discover successful conversation strategies
   - Findings have already impacted counselor training
The Data

- Collaboration with nonprofit supporting people in crisis through text messaging
- Texters talk to extensively trained volunteer counselors
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- Collaboration with nonprofit supporting people in crisis through text messaging
- Texters talk to extensively trained volunteer counselors
- Conversation outcomes: measure of “success”
  - Follow-up survey
  - Positive / negative conversations
- Scale: 80,855 conversations, 3.2 million messages
From Conversation to Counselor Quality

- Outcome of conversation depends on issue
- Counselor success rate: Fraction of conversations rated positively by texter
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Split by success rate

40 less successful (~50% success)  40 more successful (~75% success)
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- Counselor success rate: Fraction of conversations rated positively by texter

40 less successful (~50% success)  
40 more successful (~75% success)
1. Adaptability: Concept

- Are counselors aware of how conversations are going? Do they adapt to the conversation?
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- Compute distance between counselor language in positive/negative conversations
  - Represent language with TF-IDF vector of word occurrences
  - Cosine similarity for distance

- Observe how distance changes over time
1. Adaptability: Result

Distance between positive and negative conversations

0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012

0-20 20-40 40-60 60-80 80-100

Portion of conversation (% of messages)
1. Adaptability: Result

- More successful counselors
- Less successful counselors

Distance between positive and negative conversations

Portion of conversation (% of messages)

Adapting

Not adapting
1. Adaptability: Result

The graph illustrates the difference in the distance between positive and negative conversations for more successful counselors (blue dotted line) and less successful counselors (red line). The x-axis represents the portion of conversation (% of messages) ranging from 0-20 to 80-100. The y-axis shows the distance between positive and negative conversations ranging from 0.012 to 0.019.

- More successful counselors (blue dotted line) show a significant increase in distance between positive and negative conversations as the portion of conversation increases, indicated by asterisks (*), with a significance level of p<0.05.
- Less successful counselors (red line) do not show a significant increase in distance between positive and negative conversations.

The graph indicates that adapting behavior is associated with a higher distance between positive and negative conversations for more successful counselors, suggesting a more effective and adaptable counseling style.

*p<0.05"
2. Conversation Progress

- Is there a 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
2. Conversation Progress: Model

- Assign each message in each conversation a stage using a Hidden Markov Model with constraints on state transitions.

<table>
<thead>
<tr>
<th>Conversation as sequence of text messages</th>
<th>Model assigns a stage to each message</th>
</tr>
</thead>
<tbody>
<tr>
<td>m₁</td>
<td>m₁ stage 1</td>
</tr>
<tr>
<td>m₂</td>
<td>m₂ stage 2</td>
</tr>
<tr>
<td>m₃</td>
<td>m₃ stage 2</td>
</tr>
<tr>
<td>m₄</td>
<td>m₄ stage 3</td>
</tr>
<tr>
<td>m₅</td>
<td>m₅ stage 4</td>
</tr>
</tbody>
</table>
## 2. Conversation Progress: 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>
</tr>
</tbody>
</table>


2. Conversation Progress: Results

![Bar chart showing stage duration comparison between more successful and less successful counselors.](chart.png)
2. Conversation Progress: Results

The bar chart illustrates the stage duration (in percent of conversation) for more successful counselors and less successful counselors across different stages of conversation: Intro, Problem, Exploration, Solving, and Wrap up. The chart shows a significant variation in stage duration for different stages and between more successful and less successful counselors.
2. Conversation Progress: Results

Finding: More successful counselors are quicker to know the problem and spend more time in the problem solving stage (p<0.05)
3. Perspective Change

- Prior theory relates depression to a self-focusing style instead of focusing on others (Pyszczynski and Greenberg, 1987)
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- We quantify perspective change by tracking the frequency of LIWC markers (Tausczik and Pennebaker, 2010)
  - “I, me, myself, …” vs “he, she, they, …”
3. Perspective Change: Self-Focus

![Graph showing the change in self-focus in positive and negative conversations.](image)
3. Perspective Change: Self-Focus

- **Finding**: Texters who talk less about themselves and more about others tend to have successful conversations.
- **Linguistic coordination**: Counselors can actively facilitate perspective change through their language.
Conversation Strategies

1. Adapt to the conversation
2. Work towards making progress
3. Facilitate perspective change

- Already impacted counselor training
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- Implications for counselor training and conversation support tools
  - Is conversation going well?
  - How would a successful response look like?
How to help someone feel better?

- Better social support through good conversations
- Computationally operationalized anecdotal knowledge through novel discourse analysis methods
- Dataset available!

http://snap.stanford.edu/counseling

Ask me anything!

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