Analyzing the Language of Therapist Empathy in Motivational Interview based Psychotherapy

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Outline
• Introduction
  • What is empathy? what is Motivational Interview?
  • Why do we want to study empathy? How do we capture?
• Datasets
  • What kind of data we use? Why MISC + MITI?
• Language Model
  • What method we use to model empathy?
  • How to fuse local instances to infer global rating?
• Experiments
• Discussion
• Conclusion

Introduction

Empathy
• What is empathy
• A natural human ability
• Feeling for and taking the perspective of others
• Why is empathy important to study
• The other party feels acknowledged
• Better and more efficient communication
• Important skill, a quality index in psychotherapy

MI
• The spirit of Motivational Interview
• Client’s own will of making a change
• Therapist: understand, facilitate, no dictate
• The practice of Motivational Interview
• Intervention of substance use
• In college and community
• Audio-visual recorded interactions for research

Capture
• Traditional method
  • Systematically design coding manuals
  • Train coders to review and judge
• New method
  • Automatic analysis through BSP --- behavioral signal processing
  • Advantage: scalability, new dimensions
  • In particular, with the cues of language use

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Datasets --- MISC + MITI

- Use manual transcripts
- Motivational Interviewing Skill Code (MISC)
- Motivational Interviewing Treatment Integrity (MITI)
- Learn the language model on MISC set
- Apply it to MITI set to correlate with global rating

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Unit</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>MISC</td>
<td>Utterance</td>
<td>Empathic: 854 Non-empathic (background): 6439</td>
</tr>
<tr>
<td>MITI</td>
<td>Sessions</td>
<td>Empathy rating on 1-7 likert scale 88 sessions, 97% in the 4-6 range</td>
</tr>
</tbody>
</table>

Datasets -- Example

- Therapist: Yeah. So it sounds like the drug's really helpful in terms of kinda; you stress out wondering what's going on with my body and it puts you in a better frame of mind.

- Client: {Mm-hmm.} Yeah. I'm it's hard for me to fall in sleep.

- Therapist: Okay.

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Language Model --- Max. Likelihood

- N-gram model
- Empathy (EMP) and Background (BG) sets disjoint, small in size
- Adopt a large size LM to construct a UBM
- Mixing weight
  - $\lambda_1$ in constructing UBM
  - $\lambda_2$ in mixing with Emp and Bg
- Obtain $P($utterance $|$ EMP) and $P($utterance $|$ BG)

Language Model --- Training

Language Model --- Features

- Goal: correlate utterance level language modeling to session level empathy score
- Threshold: count salient empathic utterances

<table>
<thead>
<tr>
<th>Feature</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Sum of soft decisions $d = \log P($utterance $</td>
</tr>
<tr>
<td>F2</td>
<td>Count hard decisions per utterance $F2 =</td>
</tr>
<tr>
<td>F3</td>
<td>Count hard decisions per utterance with optimized priors $F3 =</td>
</tr>
</tbody>
</table>
• Goal: correlate utterance level language modeling to session level empathy score
  • Threshold: count salient empathic utterances

<table>
<thead>
<tr>
<th>Feature</th>
<th>Correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f1</td>
<td>0.11</td>
<td>0.3</td>
</tr>
<tr>
<td>f2</td>
<td>0.35</td>
<td>1e-3</td>
</tr>
<tr>
<td>f3</td>
<td>0.41</td>
<td>8e-5</td>
</tr>
<tr>
<td>f4</td>
<td>0.43</td>
<td>3e-5</td>
</tr>
<tr>
<td>f5</td>
<td>0.40</td>
<td>1e-4</td>
</tr>
<tr>
<td>f6</td>
<td>0.43</td>
<td>2e-5</td>
</tr>
<tr>
<td>f1..f6</td>
<td>0.56</td>
<td>2e-8</td>
</tr>
<tr>
<td>f3..f6</td>
<td>0.50</td>
<td>1e-6</td>
</tr>
</tbody>
</table>

• Leave one out cross-validation on regression:
  feature to empathy score
  • Significant correlation

• Higher scored sessions tend to be on the right side

• Threshold \( \rightarrow \) saliency: \( P(U|EMP) >> P(U|BG) \)
  • \( \delta \) bounded by \( \text{Max}(\log P(U|EMP) – \log P(U|BG)) \)
  • Search for \( \delta^* \) that maximize the correlation of the features and MITI empathy score

• Empathic / Non-empathic utterance classification
• 5-fold cross validation

• Uni-gram high in recall low in precision
• In average bi-gram performs better

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Discussion --- Word use

- Discriminative power of word
  \[ D(w) = (\log P(w|\text{EMP}) - \log P(w|\text{BG})) \times \text{occurrence}(w) \]
- High: second person pronouns, reflective listening
- Low: first, third person pronouns, following-neutral

<table>
<thead>
<tr>
<th>High empathy word</th>
<th>Low empathy word</th>
</tr>
</thead>
<tbody>
<tr>
<td>you're you it like sounds so and you've your of that to it's a with kind not really for kinda time friends maybe</td>
<td>they mm-hmm what we alcohol this yeah think about okay drinks right if do is that's they're b_a_c us um-hum</td>
</tr>
</tbody>
</table>

Discussion --- Saliency, etc.

- Feature f1 does not work, f3 --- f6 works better
- Salient events lead to judgment rather than accumulation of every instance
- Limitation: Background utterances are not un-empathic

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Conclusion and future work

- Computational language modeling provides useful insights into the expressed empathy behavior of therapists

Future work

- Empathy in a context: consider client language
- Locate reflection: empathy closely related to reflective listening
- Multimodal: acoustic, facial, gesture

Thank you!

Questions & Answer