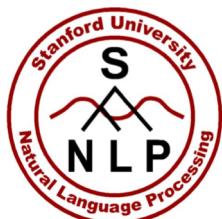


Large-scale Discourse Analysis of Counseling Conversations



Kevin Clark, Tim Althoff, Jure Leskovec



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

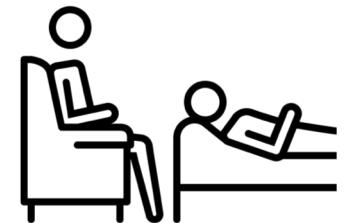


Statistics provided by the National Institute of Mental Health:
<http://www.nimh.nih.gov/>



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





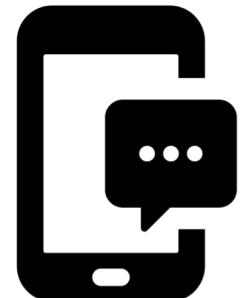
This Talk

- 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

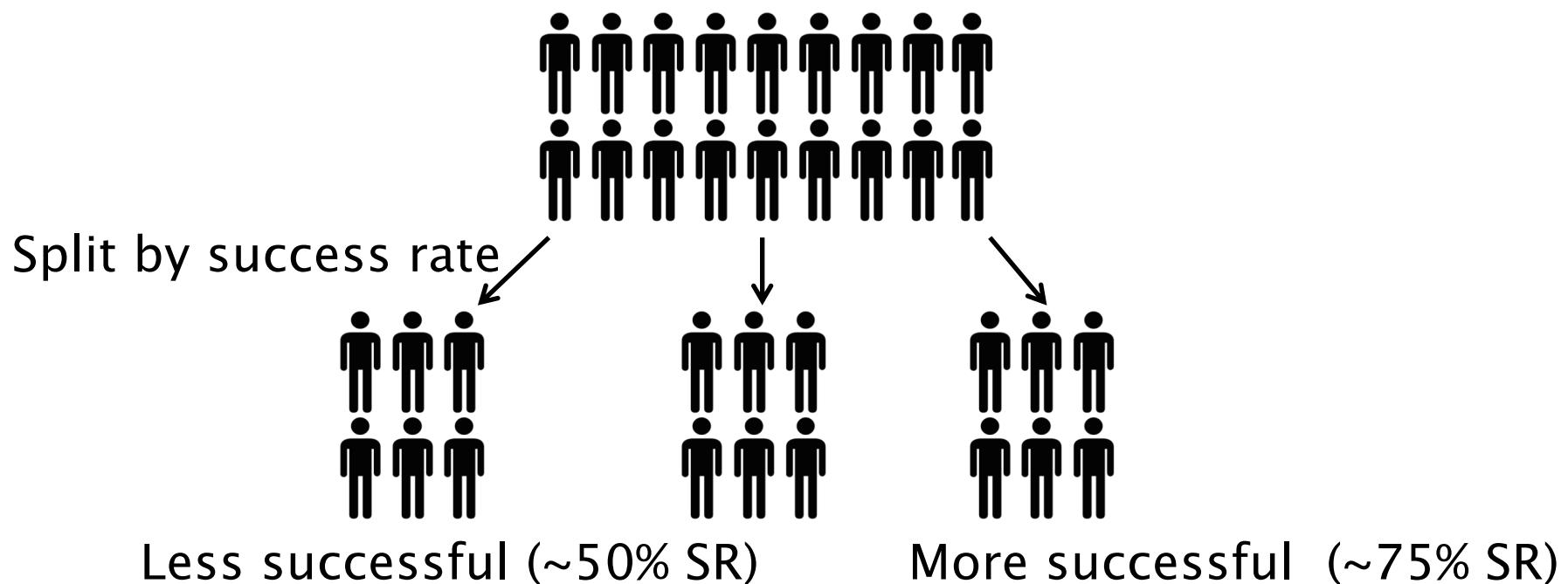
- Collaboration with a nonprofit supporting teenagers in crisis through text messaging
- Texters matched with extensively trained volunteer counselors
- Counseling conversation via SMS
- Texter gets follow-up survey
 - So data includes conversation outcomes





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





Counseling “Strategies”

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



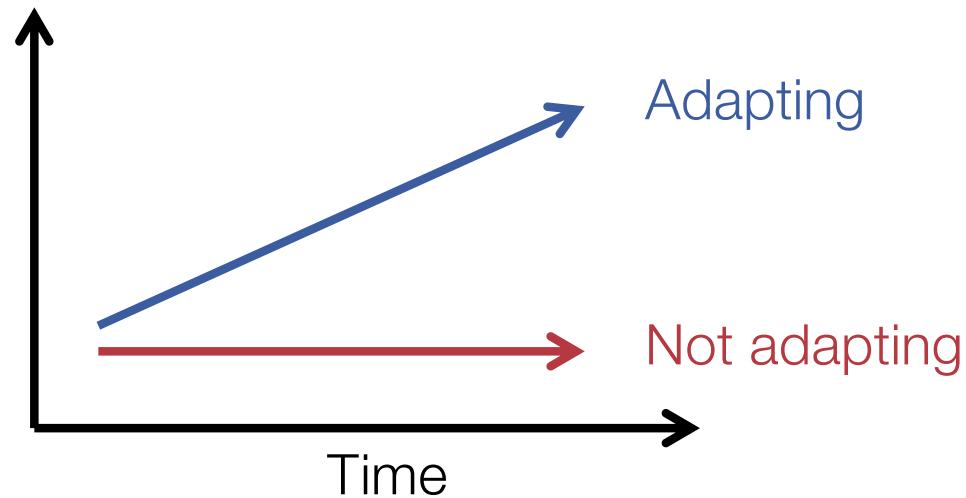
Adaptability

- 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



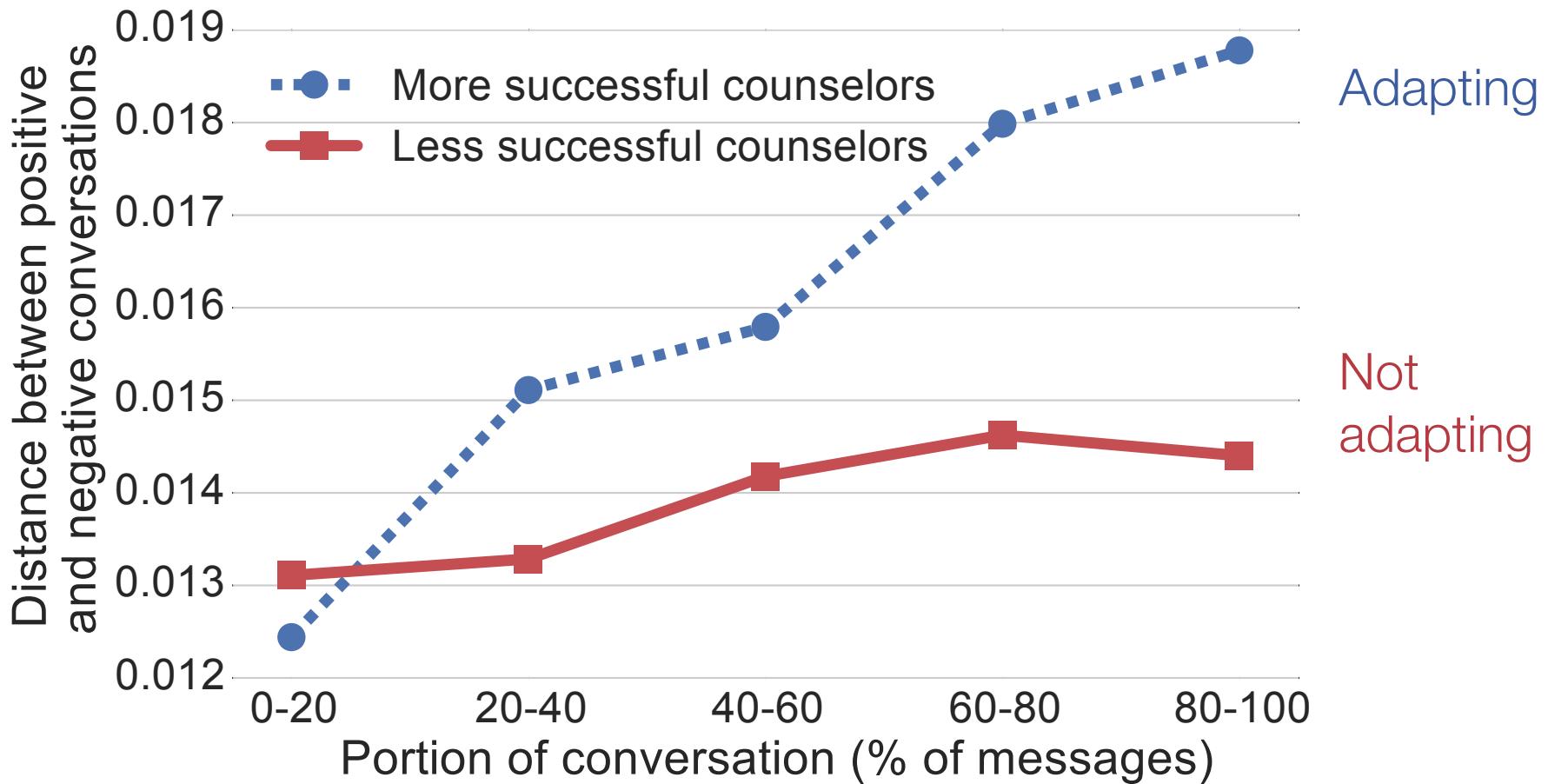
Adaptability

Difference in language
between positive and
negative conversations





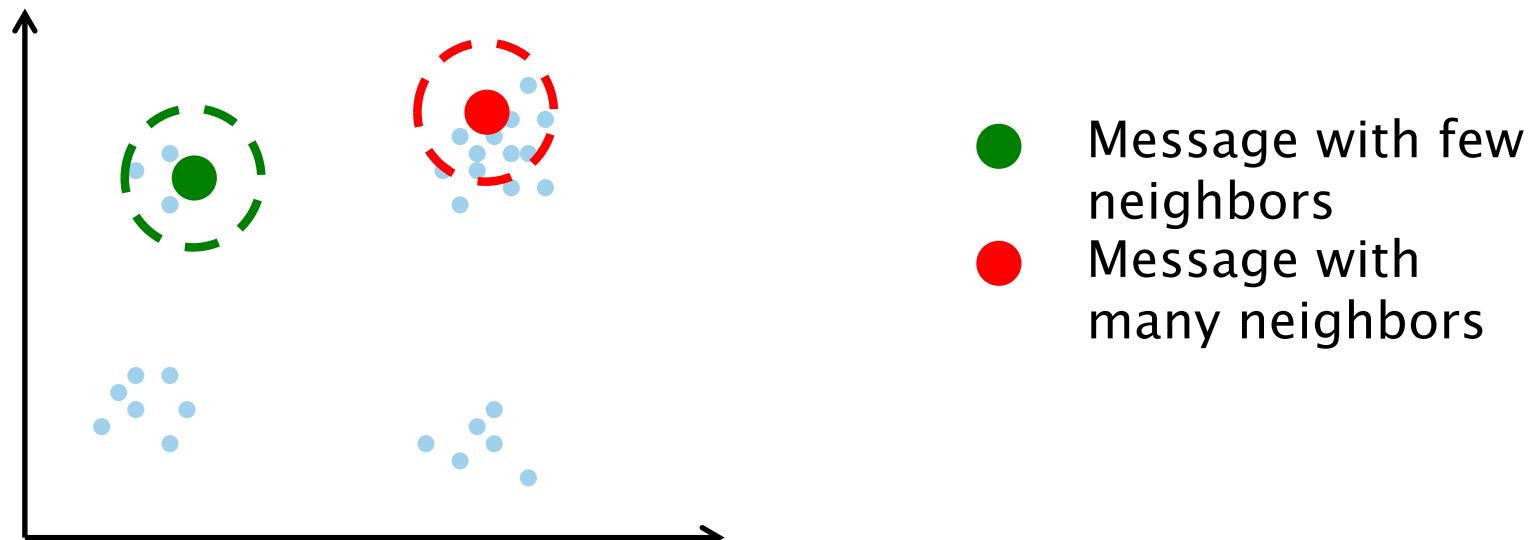
1. Adapt to the conversation





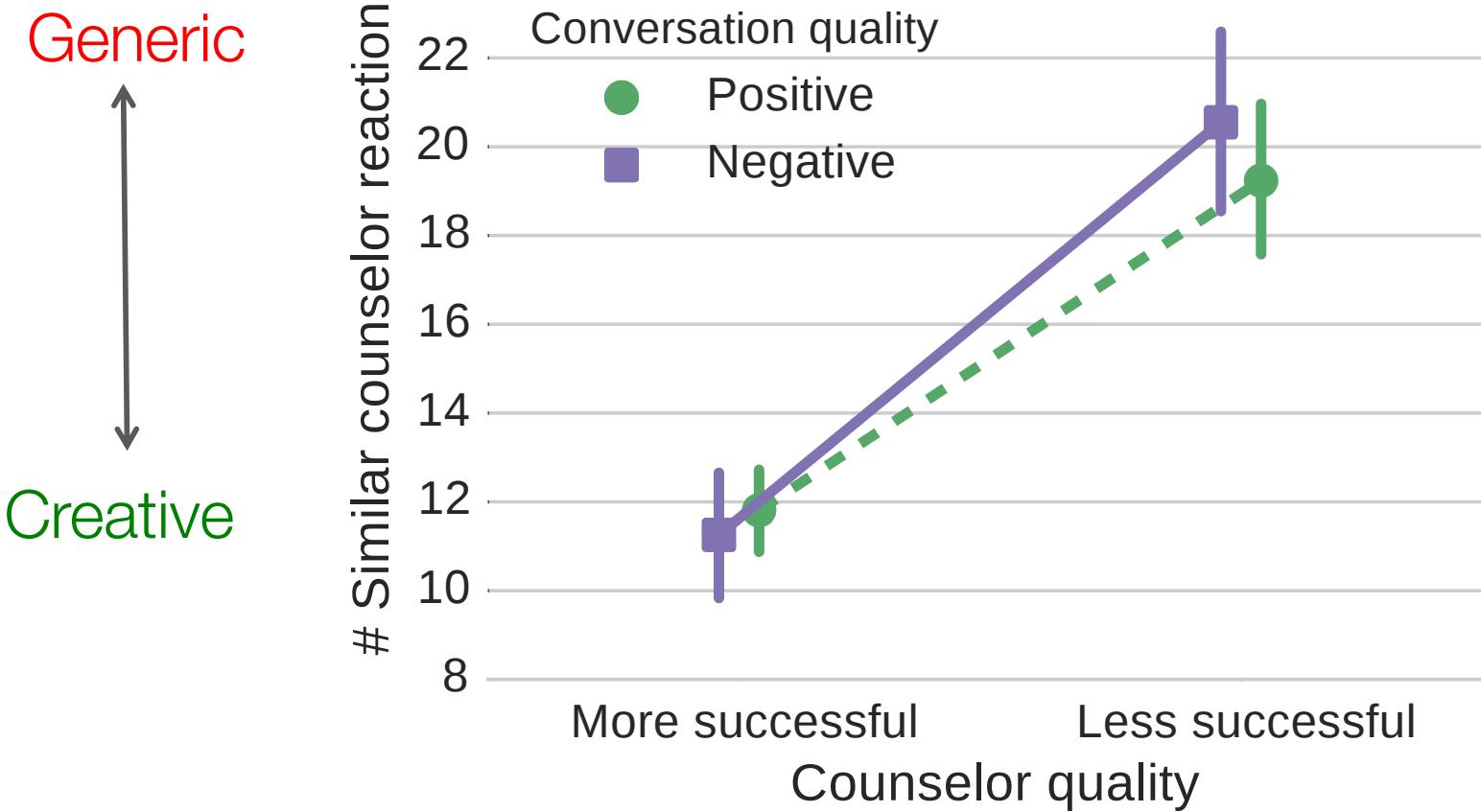
Creativity & Generic Responses

- 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





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

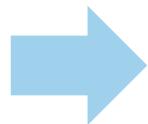
m_3

m_4

m_5

m_6

m_7



**Model assigns a stage to each
message**

m_1 stage 1

m_2 stage 2

m_3 stage 2

m_4 stage 3

m_5 stage 4

m_6 stage 4

m_7 stage 5



Conversation Stages

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

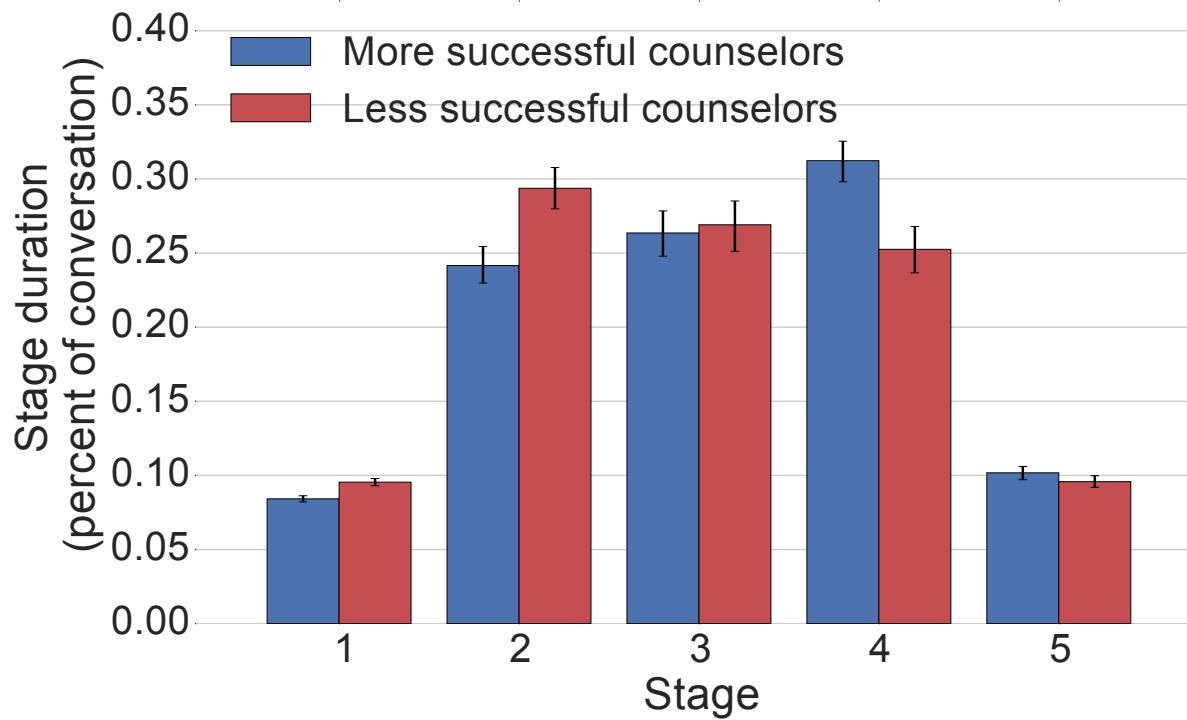


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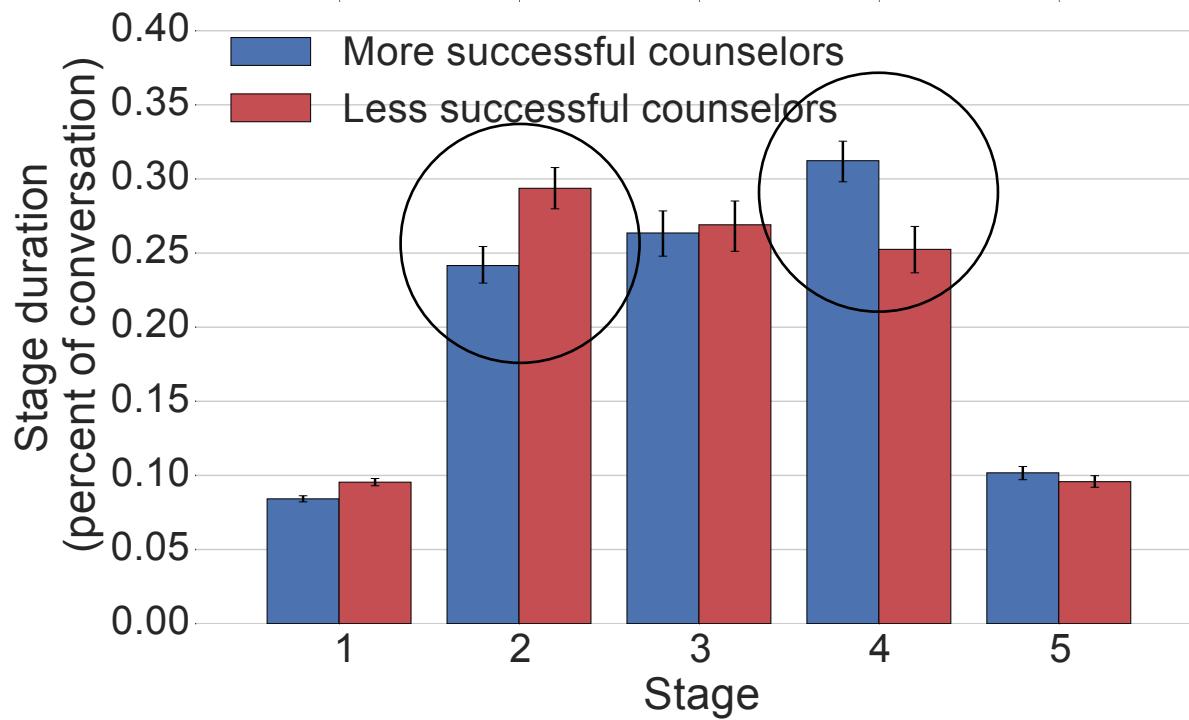


3. Work towards making progress





3. Work towards making progress



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

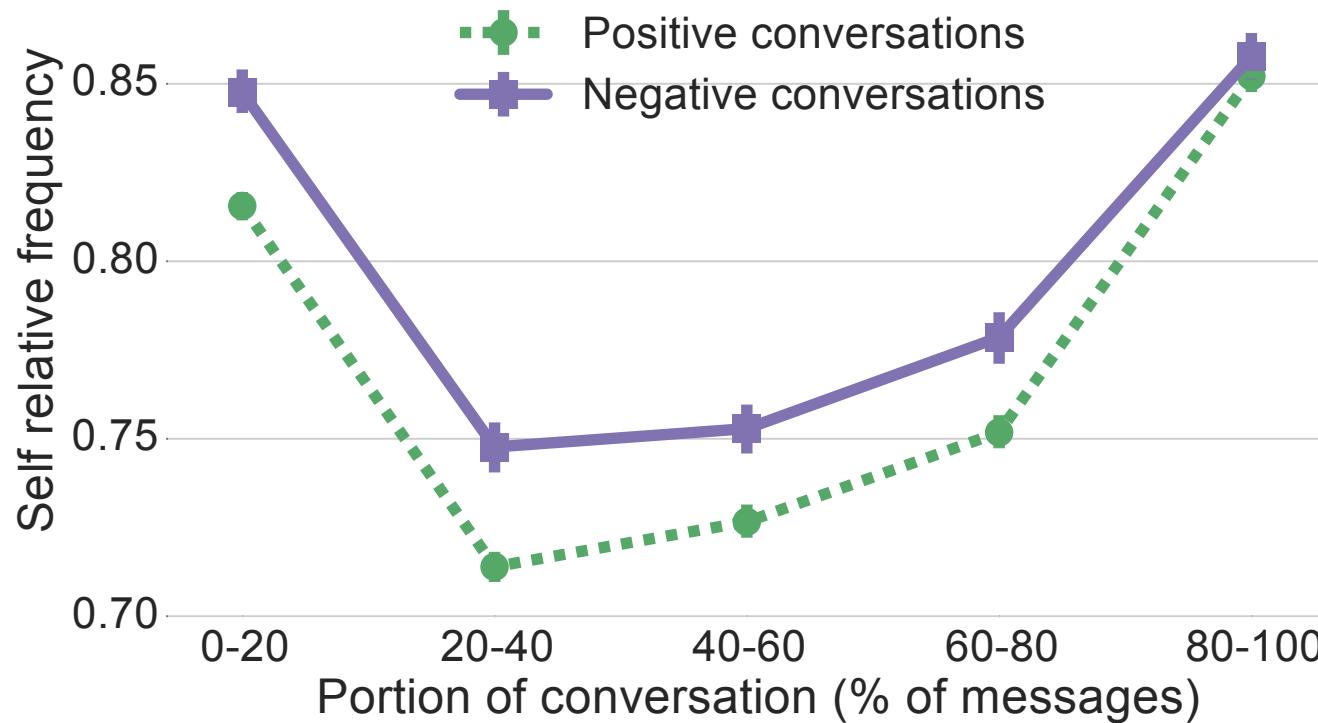


Perspective Change

- 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

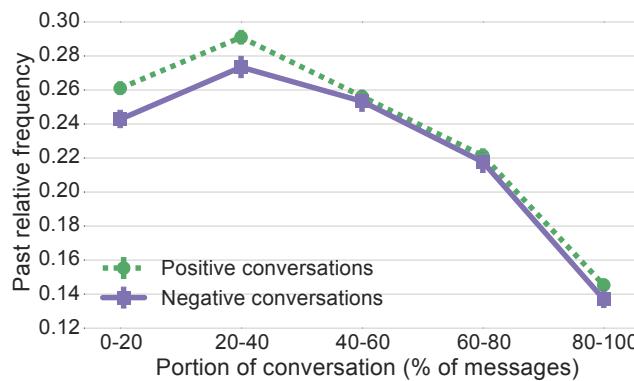


- Texters who talk less about themselves and more about others tend to have successful conversations

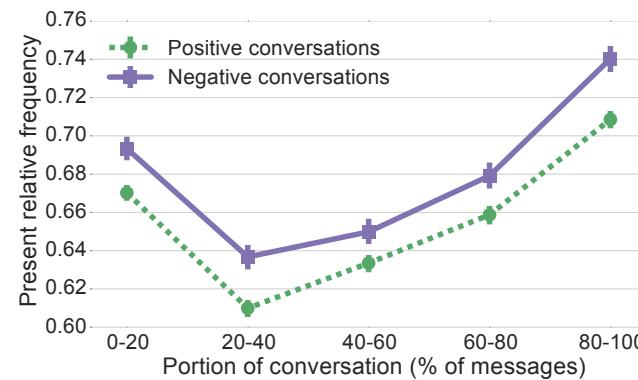


Perspective Change: Future

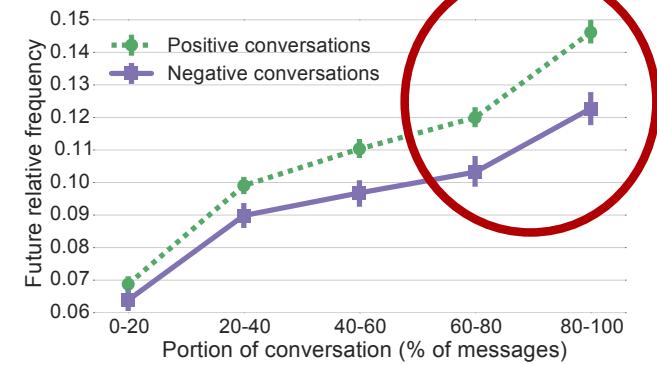
Past



Present



Future

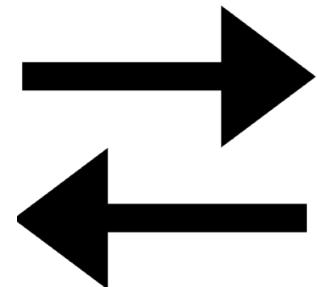


- Texters who talk less about the present and more about the future tend to have successful conversations



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

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



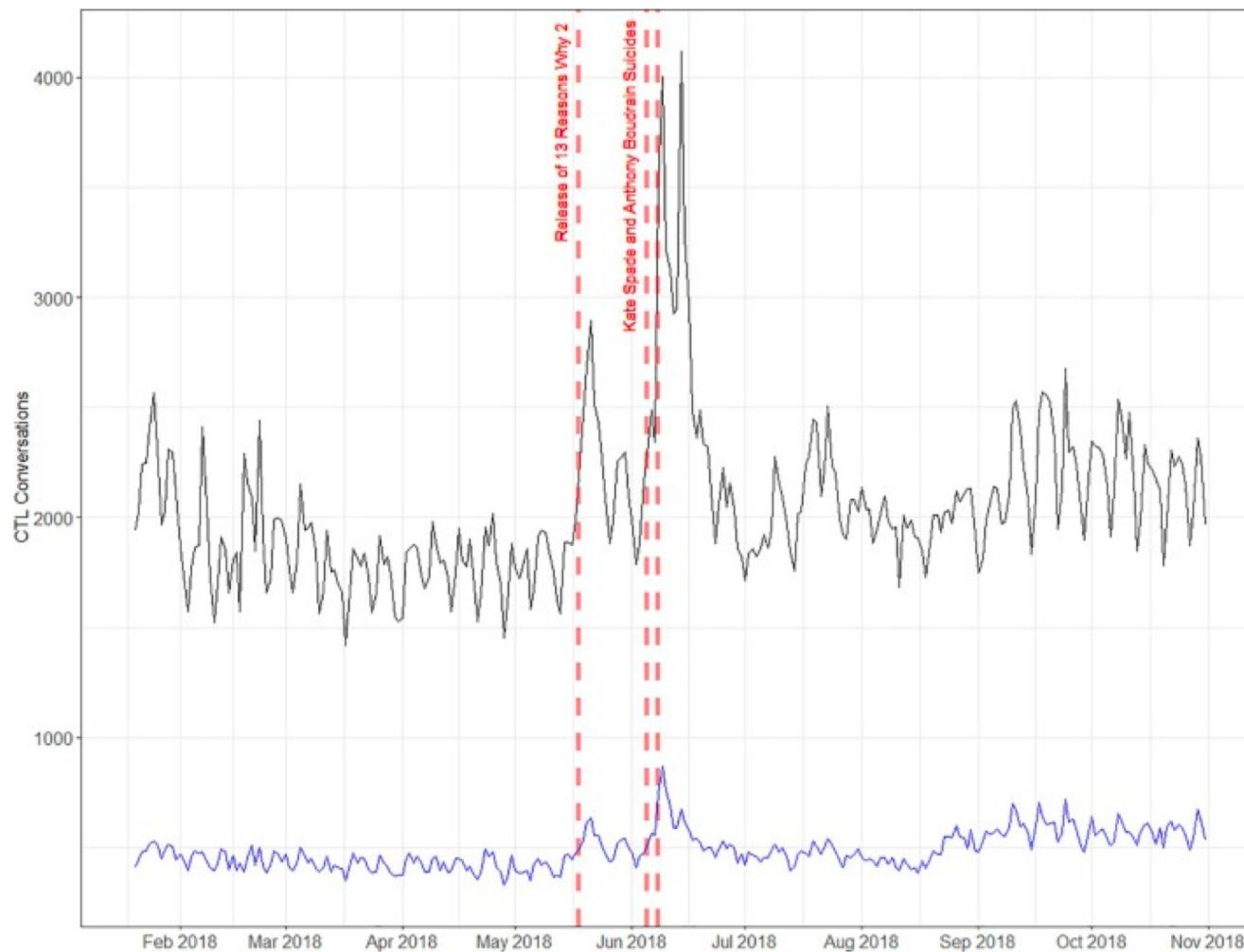


Thanks!
Any Questions?



New Research on the data

- Outside event causing increased volume





New Research on the data