

Mental Health

ter.ps/389iweek12

Mental Health Crisis

- Nearly $\frac{1}{5}$ Americans suffer from a form of mental illness
- Suicide rates at all-time high
- 115 people die daily from opioid abuse
- Depression: \$210 billion/year



Shortage of Professional Help

- ~40% Americans live in areas with shortage of mental health professionals
- More than 60% of US counties don't have a single psychiatrist
- Many therapists don't accept insurance



How can AI help?

- Patients can let their guard down more with AI-powered tools
- Much lower cost than seeing a psychiatrist/psychologist
- Benefits:
 - Diagnose people earlier (at all)
 - Speed up treatment
 - Improve outcomes



Current Diagnostics

How is depression diagnosed?

- Doctors ask questions about feelings & behavior
- Challenge: symptoms are unique to each patient
 - Patient knows themselves best in this regard
- If symptoms persist for longer than 2 weeks, diagnosis is likely
 - Patient is responsible for reporting change of feelings and emotions



Challenges

- Patient has obligation to tell their doctor, which may be uncomfortable
- Many doctors are rushed and have many patients to see
- Psychological conditions are often not addressed



Privacy

- Digitizing mental health information poses many risks
- Intimate details linked to consumer data & social media logins
- Providers must design solutions to:
 - store minimally personally identifiable data
 - Regularly deleting session transcripts after analysis
 - Encrypting data on the server itself



Discrimination

- Machine learning tends to discriminate on race, gender, age
- If AI tool uses speech patterns to detect mental illness on only one demographic group, testing that on patients in another group can result in incorrect diagnoses



Discrimination, cont'd

- Virtual therapist trained mostly on tech company employees may lack effectiveness on reading nonverbal cues from women, people of color, seniors
- AI vendors must develop tools with rigorous standards, just as research clinicians who make sure they test groups representative of the whole community



Regulation

- One programming mistake is risky
- Can affect millions of patients
- Careful regulation is a must for such large-scale treatment protocols



Regulation: HIPAA

- Patient is in control of the sharing of their personal health information
- Identifiable patient info removed before data is shared for research
 - Descriptions of patient experiences are deeply personal and hard to anonymize, store, and share
- Does not cover all personally identifiable information
 - Healthcare information is separated from patient reported information collected during therapy
 - Linking the two sources of information is a regulatory challenge



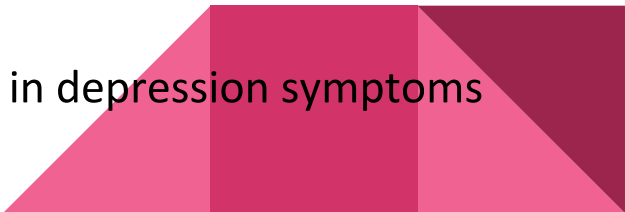
Issues

- We treat mental health often by symptoms rather than underlying factors
- General health information is not mixed with patient reported emotions and issues historically
- ML algorithms are not effective if the underlying features are not representative
- Early detection is hard to identify without enough information



Approaches with Promise

Improving professionals

- Help psychiatrists and mental health professionals
 - Ex: ginger.io video and text-based therapy sessions
 - Help specialists track:
 - patient progress
 - identify crises
 - develop individualized plans
 - 72% of users reported clinically significant improvements in depression symptoms
- 

Predicting / anticipating problems

- Machine learning tools for diagnosis
- Ex: Quartet Health
 - Screens patient medical histories & behavioral patterns
 - Recommend pre-emptive follow-up for patients who receive diagnoses for serious/major illnesses
 - Already adopted by insurance companies + medical plans
 - Reduced hospital/ER visits by 15-25% for some users



Chatbots!

- Computer programs that simulate human conversation
 - Text or voice-enabled AI interface
- Chatbot counseling that uses AI has shown promise
- Bots are being used by employers + health insurers to root out individuals who might struggle with substance abuse, depression, or anxiety
- Help provide access to convenient, cost-effective care



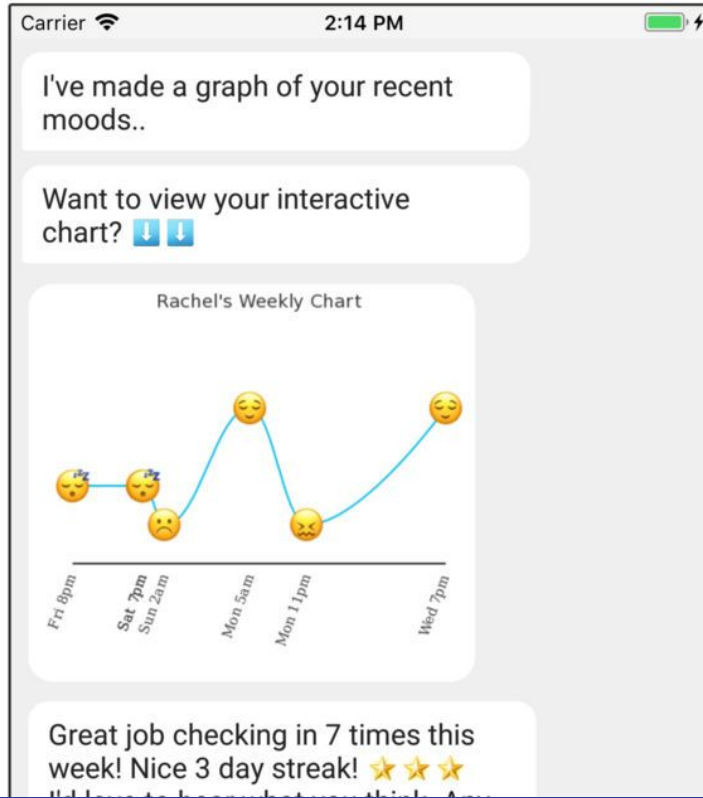
Woebot

- Chatbot developed by clinical psychologists at Stanford (2017)
- Treats depression and anxiety using cognitive behavioral therapy (CBT)
- CBT
 - Highly structured psychotherapy that alters patients' negative thought patterns

<https://www.youtube.com/watch?v=KGh8dNkpZWk>



Learn about yourself with some help from Woebot





hey Mark, what are you up to?

Hey Weebot, studying for finals.. freaking out 😬



that's totally understandable, I think it shows how committed you are to doing well.



I could help you dial it down a little, would that be of interest?

yes please!!



ok, what are some negative thoughts you're having?

Woebot



How often over the last two weeks were you bothered by feeling anxious, nervous or on edge?

1. not at all

2. several days

3. more than half the days

4. nearly every day



1

2

3

4

cancel

Type a message...




Woebot



What's going on in your world?



write it here 

I'm feeling really stressed out all the time and I feel overwhelmed



What's your energy like?

High

Middle

Low

Type a message...



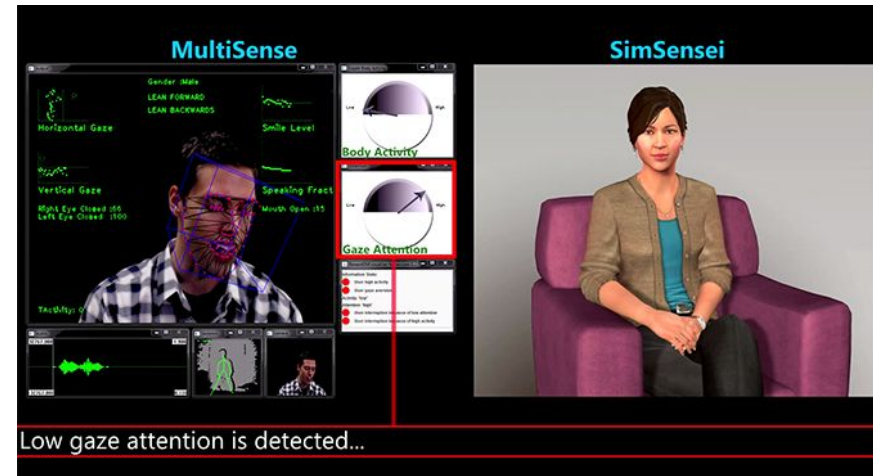
Woebot cont'd

- In a study of university students suffering from depression:
 - Using Woebot led to nearly 20% improvement in just 2 weeks, based on PHQ-9 scores (common measure of depression)
- However, study group had high level of participant engagement
- Most were talking to the bot nearly every day
 - Level of engagement not possible w/ in-person counseling



Next Generation

- Virtual Therapy
 - Accessible alternatives to those afraid of traditional therapy
 - Personalized care that responds to behavior changes and emotional cues
 - <https://futurism.com/killer-robots-the-soldiers-that-never-sleep>
- Wearable devices
 - Tracks patient consistently to track behavior
 - Detects behavior changes faster than therapy
 - Provides additional vital health information



Readings

- <https://hbr.org/2018/10/ais-potential-to-diagnose-and-treat-mental-illness>
- <https://hbr.org/2018/10/ais-potential-to-diagnose-and-treat-mental-illness>
- <https://healthitanalytics.com/news/machine-learning-wearables-accurately-predict-poor-mental-health>

