CREATING FREUD 2.0

USING REXX FOR AI

Mike Beer

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mike@mindcoa.ch
AGENDA

• Why?
• History
• Artificial Intelligence & REXX
• Implementation
• Surprises & Wishlist
WHY?
95% who need mental help do NOT receive it. The 5% who do, get it 5–10 years too late. (*)

*: EU Study 2010
The coronavirus pandemic is a game changer for mental health care

"There is a tremendous amount of anxiety right now, not just with people with preexisting conditions. We're seeing it across the board," said Dr. Leann Truehart, a Mandeville psychiatrist.

For people with severe or persistent mental illness, anxiety about COVID-19 — from fear of getting sick or of job loss and economic fallout — can exacerbate their condition and cause them to need more help, the professionals say.

A recent study from medical journal The Lancet notes that the psychological impact of quarantine can be great, resulting in a range of mental health concerns from anxiety and anger to sleep disturbances, depression and post-traumatic stress disorder (PTSD). Indeed, separate studies of quarantined patients of SARS, a previous coronavirus outbreak in 2003, found between 10% and 29% suffered PTSD.

The Lancet’s report found mental health concerns could be inflamed by stressors associated with quarantine, such as infection fears, frustration, boredom, inadequate supplies, lack of information, financial loss and stigma associated with contracting the disease.

That can be an issue not only for people with preexisting mental health concerns, but also those in seemingly good psychological health.
HISTORY
SIGMUND FREUD

- born May 6, 1856, Freiberg, Moravia, Austrian Empire [now Příbor, Czech Republic]
- Austrian neurologist and the founder of psychoanalysis.

https://www.britannica.com/biography/Sigmund-Freud
Sigmund Freud

Psychotherapy is just an exchange of words.
JOSEPH WEIZENBAUM

- German-born American computer scientist
- born Jan. 8, 1923, Berlin, Germany
- died March 5, 2008, Gröben, Germany
- was a visiting professor at the Massachusetts Institute of Technology

https://www.britannica.com/biography/Joseph-Weizenbaum
ELIZA – A Computer Program for the Study of Natural Language Communication between Man and Machine
Joseph Weizenbaum
January, 1966
Volume 9, Number 1
pp. 36-45

ELIZA – FIRST CHATBOT

Men are all alike.
IN WHAT WAY
They're always bugging us about something or other.
CAN YOU THINK OF A SPECIFIC EXAMPLE
Well, my boyfriend made me come here.
YOUR BOYFRIEND MADE YOU COME HERE
He says I'm depressed much of the time.
I AM SORRY TO HEAR YOU ARE DEPRESSED

An ELIZA Script

(HOW DO YOU DO. PLEASE TELL ME YOUR PROBLEM.)
START
(SORRY ((O) (PLEASE DON'T APOLOGIZE)
(APOLOGIES ARE NOT NECESSARY) (WHAT FEELINGS
DO YOU HAVE WHEN YOU APOLOGIZE) (I'VE TOLD YOU
THAT APOLOGIES ARE NOT REQUIRED)))
(DONT = DON'T)
(CANT = CAN'T)
(WONT = WON'T)

Symmetric List Processor

J. Weizenbaum
General Electric Co.,* Sunnyvale, Calif.

A Simple List
IBM 7094

- IBM’s last commercial scientific mainframe (built at a time when computers for scientific and business computing used separate instruction sets).
- It had about 1.4-2.4 time the computer power of its predecessor, the IBM 7090. It was upwardly compatible with the 7090, but did have extra index registers (going from three to seven), and hardware double-precision floating point support.
- It appeared in two models: the original 7094 (sometimes known as the 7094 I); and the 7094 II, announced in May, 1963, with the first installation in April, 1964.
- The latter had about twice the speed of the original; due in part to the introduction of pipeline techniques (pioneered by the IBM 7030 Stretch), but also a slightly faster clock.
- Total production amounted to 130 7094 I’s, and 125 7094 II’s.
MAD PROJECT (1963)

- Explore development and use of time-sharing
- Development of a next-generation time-sharing system called Multics.
- CTSS was to be used as the programmers’ tool to develop this new system, as well as the tool to support other research projects, such as database and language research. The Director of Project MAC was MIT Professor Robert M. Fano

- https://www.slideshare.net/sebastianwoinar/ctss-compatible-time-sharing-system
- https://multicians.org/thvv/7094.html
- https://www.youtube.com/watch?v=sjnmcKVnLi0
ARTIFICIAL INTELLIGENCE WITH REXX
AI = MACHINE/DEEP LEARNING?

- Machine Learning:
  - learn without explicitly being programmed
- Deep Learning:
  - Think like humans
  - Neural Networks
AI OVERVIEW

- Deep learning
- Predictive analytics
- Translation
- Classification & clustering
- Information extraction
- Speech to text
- Text to speech
- Natural language processing (NLP)
- Expert systems
- Planning, scheduling & optimization
- Robotics
- Image recognition
- Machine vision
- Machine learning

Artificial Intelligence (AI)
WHY DOES THERAPY WORK? COMMON FACTORS (GRAWE)

• Focus on specific issues of the patient
• Activation of resources within the patient
• Addressing and solution of specific problems
• Analysis of problem causes
• Therapeutic relationship
**Therapist: Rogers-Variables**

- 1. Empathy
- 2. Unconditional positive regard
- 3. Authenticity

**Patient**
- Willingness to work with online app

**Change Process**
- within the client

**Treatment Structure**
- more sessions
- more flexibility
- additional material

**Relationship**
- Online-Therapy vs. Face 2 Face
5 MAIN FACTORS
GRENCAVAGE UND NORCROSS (1990)

- Properties of the Therapist 21%
- Properties of the Patient 6%
- Change Processes 41%
- Treatment Structure 17%
- Therapeutic Relationship 15%
# WAMPOLD-CRITERIA

<table>
<thead>
<tr>
<th>#</th>
<th>Therapist</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Interpersonal Skills (empathy, warmth, verbal fluency..)</td>
<td>8</td>
<td>Flexible, adjusts therapy</td>
</tr>
<tr>
<td>2</td>
<td>Clients feel understood, trust the therapist</td>
<td>9</td>
<td>Addresses difficult material</td>
</tr>
<tr>
<td>3</td>
<td>Working alliance: therapeutic bond &amp; agreement on goals</td>
<td>10</td>
<td>Communicate hope and optimism</td>
</tr>
<tr>
<td>4</td>
<td>Provide explanations</td>
<td>11</td>
<td>Awareness of client's characteristics &amp; context</td>
</tr>
<tr>
<td>5</td>
<td>Provide treatment plan</td>
<td>12</td>
<td>Aware of own psychological process („Gegenübertragung“)</td>
</tr>
<tr>
<td>6</td>
<td>Influential, convincing</td>
<td>13</td>
<td>Use best research evidence</td>
</tr>
<tr>
<td>7</td>
<td>Monitor progress</td>
<td>14</td>
<td>Seeks to continually improve.</td>
</tr>
</tbody>
</table>
SOME STUDIES ON INTERNET-INTERVENTIONS


SAMPLE WORKFLOW

- Interview Chatbot
- Clinical Test(s)
- Screening Result
- Digital Interventions
- Human Expert
SOME AI FUNCTIONS

- **Audio:**
  - Text to Speech
  - Speech to Text (Voice Recognition)
- **Chatbot**
- **Summarize Texts**
- **Natural Language Understanding** – understand sentiments

- **BeyondVerbal** – Voice Stress Analysis
- **Fitbit** – biometric data
- **SimyLife** - stress data
BUILDING BLOCKS

- TEST: perform a test - e.g. with LIKERT scale
- INTERVIEW: chatbot with virtual coaches
- REPORT: display results
- VIDEO: play a youtube video
- FORM: input form
- IMAGE: display one or more images
- INFO: display text page
- MENU: structure flow within app
- Direct ACCESS to coach
- SCRIPTING LANGUAGE FOR INTEGRATION
OVERVIEW

Authoring System

App
App
App
App

Platform
SOFTWARE STACK

CLIENT
- Browser
- HTML5
- Javascript
- Several libs
  - E.g. JqueryMobile

SERVER
- WIN/LINUX
- REGINA
- APACHE with REXX interface
- Own Framework
- Database
  - MARIADB
CALLING AI FUNCTIONS

- HTTP(S) calls
- Websockets
- REXX Functions
TEXT TO SPEECH
STRING → MP3

IBM

outfile_mp3=tmpfile(".mp3")
cmd='curl -X POST -u "user':pw"'
   --header "Content-Type: application/json",
   --header "Accept: audio/mp3",
   --data "{"text":"text"}"
   --output outfile_mp3,
   "url/v1/synthesize?voice=voice"

address command cmd with output stem out.err.
files=xmlput("mp3", outfile_mp3)

READSPEAKER

url = "https://tts.readspeaker.com/a/speak"
data = "--data key="apikey,
   "--data lang="lang,
   "--data voice="voice,
   "--data "text=\"text\"

address command "curl -L -o" outfile_mp3
url data
files = xmlput("mp3", outfile_mp3)
• Endpoint in CLIENT
  e.g. Web browser
• ➔ JAVASCRIPT
• Generation of client code on server ➔

  when language="de-DE" then do
    script=readfile("msasr.ctl")
    script=changestr("$language;",script/language)
    script=changestr("$output;",script/output)
    script=changestr("$wait;",script/wait)
  end
ATTENTION ON EXTERNAL FUNCTIONS

- Documentation often misleading/missing
- keep on changing very often
  - Functionality and
  - Interface (API)
- Expect downtime (not 5 NINES)
- no systems management API / notification
- Usually no planning information
Auf einer Skala von 1 (nicht gut) bis 10 (sehr gut) - wo stehst Du?

5

ok

exit
s = getitems(token,testname)
ret = dsput(token,"s",s)
GOAL = sum(pick(s,4 6 8 11))
TASK = sum(pick(s,1 2 10 12))
BOND = sum(pick(s,3 5 7 9))

ret = mind("&cmd=put user" user "WAI", xmlput("GOAL",GOAL),
xmlput("TASK",TASK),
xmlput("BOND",BOND))

• APL:
GOAL ← +/ s[4 6 8 11]
TASK ← +/ s[1 2 10 12]
BOND ← +/ s[3 5 7 9]

Open Source APL2:
http://nars2000.org/
MACHINE LEARNING IN REXX

Simple Neural Network

Deep Learning Neural Network

- **Input Layer**
- **Hidden Layer**
- **Output Layer**

**WEIGHT**

**ACTIVATION FUNCTION**
Activation Functions

**Sigmoid**
\[ \sigma(x) = \frac{1}{1+e^{-x}} \]

**tanh**
\[ \tanh(x) \]

**ReLU**
\[ \text{max}(0, x) \]

**Leaky ReLU**
\[ \text{max}(0.1x, x) \]

**Maxout**
\[ \text{max}(w_1^T x + b_1, w_2^T x + b_2) \]

**ELU**
\[ \begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases} \]
FUNCTIONS

• Roots & rational exponents
• Trigonometric functions
• Iff(cond,a,b)

• List=„a + b; x/y; 3.14“
• Say word(list,2,“,;“)

VARIABLES

• Real lists
• APL2-Variables and
  • Functions/operators on them
PERFORMANCE

• Preloading of external functions (macro space)
• Rexx compiler
QUESTIONS

• RxSock 64bit version (REGINA)?
• Coexistence ooREXX & REGINA in production environment
• Migration from Regina to ooRexx?
• Future of Regina?
• (oo)REXX roadmap?
THANK YOU

Special thanks to MFC for creating a wonderful language