Enhancing A Therapeutic Mobile App Through Continual Learning And Automated Conversation

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The main objective of Cognitive Behavioural Therapy (CBT) is to treat depression, anxiety disorders and chronic fatigue syndrome. The app developed here is to provide such therapy using automated intervention and conversation through a mobile app.

- To enhance the performance of neural networks interacting with patients
- To model a more effective conversation automation script reacting to patients
- To implement an app into a directly executable form
NEURAL NETWORKS

Training Flow

Patient Group 1

Set Preferences → Train Neural Networks → Therapy → Give Patient’s Feedback

Get Recommendations → Sequence/ Ambiguous Group Question Neural Networks → Train Neural Networks

Patient Group 2

Train Neural Networks → Therapy → Get Patient’s Feedback

Get Recommendations → Sequence/ Ambiguous Group Question Neural Networks → Train Neural Networks
THERAPEUTIC CONVERSATION

Questions from therapists

Group of Questions
- Group 1
- Group 3
- Group 5
- Group 7
- Group 9
- Group 11
- Group 2
- Group 4
- Group 6
- Group 8
- Group 10

Target
- Thought
- Behaviour
- Goal

Sequence
- Seq 1
- Seq 2
- Seq 3
- Seq 4
- Seq 5
- Seq 6
- Seq 7
- Seq 8
IMPLEMENTATION

Application Overview

Server Encog

Upload

Android Encog

Train

Record

MySQL database
Generalisation relying on Cross-Validation

\[
\text{Validation Error} = \frac{1}{2} \sum_{i} (\text{output}_i - \text{target}_i)^2 + \gamma \sum_j w_j^2
\]
Generalisation

♦ It is the goodness of performance of the net on unfamiliar data in this CBT project such as that from patients at a new stage in therapy, or new patients.
Simulation on Artificial Patients

An artificial agent whose control level responds to random and learnt neural recommendations differently indicates that therapy with the neural recommendations tends to increase patient control level with a significant speed.
## Comparison to Previous Work

<table>
<thead>
<tr>
<th>Advantages of New System</th>
<th>Advantages of Previous System</th>
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</thead>
<tbody>
<tr>
<td>Intervention system reacts with only the user’s preferences.</td>
<td>Intervention system reacts to both the user’s preferences and the user’s feedbacks to received neural recommendation.</td>
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<tr>
<td>The neural networks are trained without attempting good generalisations.</td>
<td>The neural networks are trained using generalisation techniques relying on cross-validation.</td>
</tr>
<tr>
<td>There was only a simple and crude script to automatically guide a conversation.</td>
<td>Conversation is guided by a varying sequence of questions tailored to the patient.</td>
</tr>
<tr>
<td>The Android app is only built in development form.</td>
<td>The Android app is built in directly executable form and published on Google play.</td>
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</tbody>
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DEMO

New & Updated Games

- Racing Rivals
  - Glu
  - ★★★★★
- Running Circles
  - BoomBit Games
  - ★★★★★
- Siegefall
  - Gameloft
  - ★★★★★

Popular Apps & Games

- Wally & Friends
- SimCity BuildIt
- Dumb Ways to
DEMO
How are you travelling just now?

I am thinking about

my final project

What is running through your mind as you think about your final project?

Enter your answer

Speak to you

Next
♦ Extendable neural networks used to produce recommended interventions and therapeutic conversation are trained with generalisation techniques for dealing with the unfamiliar data.

♦ The therapy questions have been designed to be comprehensive in extracting target data from the patient in a conversational and interactive style.

♦ Simple artificial patients are simulated to indicate the variable rates at which the control levels of patients may increase with therapy.

♦ The android application is generated in a directly executable form and published on Google play.
FUTURE WORKS

✦ Cooperate with psychology and psychotherapy professionals to ready the App for trials with real patients.

✦ Further enhance performance of the neural networks as well as the therapeutic conversation

✦ Automatic training and updating the neural network is required

✦ Improving the user interface to support the inexperienced user/patient

✦ Achieve all core quality test procedure from Google Play
THANK YOU

Q & A