Prediction of Depressive Tendency from Multidimensional Health Data Collected through Crowdsourcing

Shiori Yamaguchi\textsuperscript{1}, Hiroki Tanaka\textsuperscript{1}, Hayato Maki\textsuperscript{1}, Shigehiko Kanaya\textsuperscript{1,2}, Nobutaka Suzuki\textsuperscript{3}, Satoshi Nakamura\textsuperscript{1,2}

Nara Institute of Science and Technology, Japan 1
Data Science Center, Nara Institute of Science and Technology, Japan 2
Kanazawa University, Japan 3

**Introduction**

Over 300 million people suffer from depression in the world (5 million people in Japan).

Biological or physiological indicators have been unidentified → Diagnose with DSM-5, HAM-D

Suggested that some lifestyle habits are possible risk factors for depression

---

**Purpose**

1. To examine whether lifestyle habits & constitution can predict depressive tendency

2. To clarify important lifestyle habits & constitution for the prediction

<table>
<thead>
<tr>
<th>Categories</th>
<th>Predictive Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous studies</td>
<td>Unevaluated</td>
</tr>
<tr>
<td>Our research</td>
<td>Evaluated</td>
</tr>
<tr>
<td></td>
<td>Many</td>
</tr>
</tbody>
</table>

**Method**

935 participants (M:35.3± 9.3) recruited from crowdsourcing answered 253 questions regarding their depressive tendency (K6) & personal data

Communication | Interaction with neighbors
Exercise | Sleeping habits | Demographics
Personality | Dietary habits | Constitution
Smoking | Health condition & medical history

**Result**

Accuracy of Classification:
Random Forest (RF) based : 0.97
Logistic Regression (LR) based : 0.93

Misclassified Samples in Random Forest based
→2 participants
-False positives (K6 score 10)
-False negatives(K6 score 19)

Relatively Important questions for the prediction (RF)

**Constitution:**
Are you likely to be scared or anxiety? \textbf{High} > \textbf{Low}
Are you energetic?  \textbf{Low} > \textbf{High}
Are you likely to be tired?  \textbf{High} > \textbf{Low}

**Sleeping habits:**
During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done? \textbf{High} > \textbf{Low}

**Dietary habits:**
what time do you usually wake up? Late: \textbf{High} > \textbf{Low}

**Health Condition & Medical history:**
How is your health condition? Good: \textbf{Low} > \textbf{High}
Have you ever been to a clinic for infertility? \textbf{High} > \textbf{Low}

**Personality:**
I see myself as someone who gets nervous easily. \textbf{High} > \textbf{Low}
who is relaxed, handles stress well. \textbf{Low} > \textbf{High}

**Demographics:**
How old are you? Old: \textbf{Low} > \textbf{High}
How tall are you? Tall: \textbf{High} > \textbf{Low}