LifeLog Analyses:
Bridging Psychology and Physical World

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Overview

• LifeLog Analyses for Understanding Personality, Emotion and Sleeping Health

- Sleeping Quality
- Life Logs
  - Blood pressure
  - Heart beats
  - GSR
  - Photos (Food)
  - Locations (Movement)
  - Music
  - Big Five Personality
- Prediction and Intervention
- Emotion
  - Music Style and emotion detection
- Human Emotion Detection

NTCIR Lifelog-2 data + Extended data
Preliminary: *Thayer’s 2D Model of Mood*

- Applied in:
  - Big 5 personality detection
  - User mood detection
  - Music mood detection

Thayer’s 2D mood model:

Arousal (Energy)
- Angry
- Anxious
- Nervous
- Excited
- Happy
- Pleased

Valence (Stress)
- Sad
- Depressed
- Bored
- Relaxed
- Content
- Calm
Overview

• LifeLog Analyses for Understanding Personality, Emotion and Sleeping Health

Sleeping Quality

Life Logs

Sleeping Quality

Psychology

Big Five Personality

• Neuroticism
• Extraversion
• Openness
• Agreeableness
• Conscientiousness

Prediction and Intervention

Music Style and emotion detection

Emotion

Human Emotion Detection

Life Logs

Blood pressure

Heart beats

Exercises:

• Steps

Locations

• (Movement)

Music

Photos

• (Food)

• (Environment)

GSR

Blood glucose

......
Based on Lifelog instead of questionnaires

- **Big 5:** Openness to experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism

- **Self-collected Lifelog Data**
  - 40 participants: 3 days’ lifelog data for each
  - Label: NEO-FFI (traditional questionnaire-based test) results
  - Heart rate and Mood record
    - Nervous, Angry, Excited, Pleased, Relaxed, Calm, Sad and Bored
  - Panoramic images of office and bedroom everyday

<table>
<thead>
<tr>
<th>Features</th>
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<tbody>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Moody index</td>
</tr>
<tr>
<td>Optimistic index</td>
</tr>
<tr>
<td>Heart rate Stability</td>
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<tr>
<td>Room tidiness Index</td>
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<tr>
<td>Room decorative index</td>
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</tbody>
</table>

Image recog.
1. Big Five Personality Detection

Based on Lifelog instead of questionnaires

- 5 logistic regression models for 5 dimensions
- Training: 38 samples (20% Cross Validation)
- Test: 2 samples, Test Accuracy: 100% (small dataset)
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  - Emotion
  - …
  - Exercises:
    - Steps
  - Locations
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  - Music
- Human Emotion Detection
- Music Style and emotion detection
- Psycology
- Big Five Personality
2. Mood Prediction
*Based on Lifelog instead of self survey*

- **Data:**
  - 6 users, 256 days of data in total
  - Training: Test = 9:1

- **Models and Results**
  - Two Logistic Regressions for each Dimensions
  - Valence, Arousal

- **Test Accuracy**
  - Mood-Valence: 76%
  - Mood- Arousal: 73%
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Psychology
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Music Style and emotion detection
3. Music Mood and Style Detection
Based on Lifelog instead of lyrics or content

- Data:
  - 1 users, Music listening history of 763 songs in 45 days
  - Training: Test = 9: 1

- Labels: Retrieved from online resources

- Moods:
  - Pleased & relaxed: +valence
  - Nervous & sad: - valence
  - Bored & calm: -arousal
  - Angry & excited: +arousal
3. Music Mood and Style Detection

Based on Lifelog instead of lyrics or content

- Features
  - Activities, Biometrics, Time stamp
  - Data augmentation using retrieved music duration

- Model and Results
  - 2 AdaBoost.M1 + Decision Tree Models
  - Accuracy:
    - 85% (Music Mood)
    - 80% (Music Style)
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Emotion

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Psycology

Big Five Personality
4. Sleep Quality Prediction

*Based on Lifelog instead of signals during sleep or user survey*

- **Data:**
  - 7 users, 473 days of data in total
  - Training: Test = 9: 1

- **Sleep Quality Labels**
  - “Poor”, “Borderline” and “Good”.
  - Scoring data: 0-40: Poor; 41-80: Borderline; 81-100: Good

- **Model and Results:**
  - Linear regression
  - Sleep Quality Prediction of the day : 78%
Summary of current work

*Lifelog Analyses: More than what we’ve imagined*

- Novel methods to *psychologically understand the user and track user’s mental and sleeping health*

- Personality evaluations based on objective data
  - Time-saving, provide real-time evaluation

- Mood prediction *based on biometrics*
  - Using previous mood records of the user

- Determination of music mood and music style
  - Based on biometrics and physical activities of the audience

- Sleep quality prediction
  - Not based on sleep signals monitoring but on Lifelogs (before sleep)
  - Use time-aware features
Future work

A lot more to do: imagine, integration and innovation

- **Sleeping quality**: beyond prediction → intervention
  - Prompt feedback and instant results
  - Adaptive: different time slot with different suggestions
  - Personalized: night owl vs. keep early hours

- **Mental health**
  - Beyond mood detection → warning and suggestions

- Make use of more integrated information
  - **Food**: as features for detection, as suggestions for intervention, ...
  - **Environment**: cold, wet, pollution, ...
Future work

• **Next generation personalized recommendation**
  – Make use of **heterogeneous** data in one’s daily life
    • Online, Lifelog, Environment
  – Provide **real-time personalized** suggestions / interventions on
    • Emotion, Sleeping quality, ......
for Your Attention!

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