Out-of-home activity recognition from GPS data in schizophrenic patients

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According to NHS in England, schizophrenia has a prevalence of 1%.

It is characterized by repeated psychotic episodes.

Social functioning, or out-of-home activities, it is a common measure to monitor the risk of psychotic relapse.

Monitoring of out-of-home activities usually relies on infrequent clinic visits, limiting the capacity to detect sudden changes.

Routinely collected GPS data from smartphones introduce novel opportunities to implement real-time monitoring of out-of-home activities.

### Background

- **Risk of first relapse over 24 months**: 54%
- **Risk of first relapse over 5 years**: 82%
- **Risk of second relapse over 5 years**: 78%
Methods

1. We conducted a pilot study with 5 schizophrenic patients to assess the feasibility of this approach.
2. We implemented two pipelines to infer out-of-home activities from raw GPS data.

1. Raw GPS data

2. Detection of geolocation visited

3. Geolocations visited

4. Identification of places visited

5. Places visited

6. Type of places and activities recognition

7. Out-of-home activities
## Results

### Data summary

<table>
<thead>
<tr>
<th></th>
<th>Total number of days</th>
<th>Total number of hours</th>
<th>Total number of SFD activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>20</td>
<td>396.6</td>
<td>35</td>
</tr>
<tr>
<td><strong>Mean (SD)</strong></td>
<td>4 (1)</td>
<td>79.3 (30.6)</td>
<td>7 (2.9)</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>3 - 5</td>
<td>36.8 - 109.9</td>
<td>3 - 11</td>
</tr>
</tbody>
</table>

### Recall and precision

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Recall</th>
<th>Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-based</td>
<td>0.600 (0.163)</td>
<td>0.909 (0.096)</td>
</tr>
<tr>
<td>Density-based</td>
<td>0.714 (0.168)</td>
<td>0.714 (0.157)</td>
</tr>
</tbody>
</table>
• We demonstrated the feasibility to assess out-of-home activities from geolocation data that is routinely collected with smartphones.
• This provides novel opportunities for early detection of relapse in schizophrenic patients.
• In the future, we will investigate more sophisticated analytical methods to obtain better performance.

Thank you.

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