The long way home
Learning from the temporal structuring of touristic visits

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Bamberg University
Geographic recommender services

<table>
<thead>
<tr>
<th>CPV</th>
<th>images</th>
<th>user IDs</th>
<th>popularity</th>
<th>example image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Hall</td>
<td>111</td>
<td>59</td>
<td>68.5</td>
<td><img src="image" alt="Town Hall" /></td>
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<tr>
<td>Little Venice</td>
<td>19</td>
<td>18</td>
<td>18.3</td>
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<tr>
<td>Cathedral</td>
<td>22</td>
<td>14</td>
<td>16.0</td>
<td><img src="image" alt="Cathedral" /></td>
</tr>
</tbody>
</table>

The three most popular sights of Bamberg
Schlieder & Matyas (2009)
Monitoring tourists

- Methodology
  - (digital) travel diaries: plans and individual decision making
  - Collective sensing: personalized GPS tracks (big data)
  - Close monitoring: personalized GPS tracks (dense data) + decision making

Girardin et al. 2008
Example: A data set from Bamberg

- **Participants**
  - 17 very small tourist groups (2-3 persons) volunteering to participate in the study

- **Instruction**
  - „Explore the city in whatever way you like and for how long as it pleases you."
Close monitoring

- **pre-visit interview**
- **GPS tracks**
- **photo sequence**
- **post-visit interview**
## Time-based vs. image-based popularity

<table>
<thead>
<tr>
<th></th>
<th>Old Court</th>
<th>Old Townhall</th>
<th>Cathedral</th>
<th>Ge. Park</th>
<th>Ge. Castle</th>
<th>Little Venice</th>
<th>Mi. Park</th>
<th>Mi. Monastery</th>
<th>New Resid.</th>
<th>Upper Parish</th>
<th>Rose Garden</th>
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</thead>
<tbody>
<tr>
<td><strong>I. popularity</strong></td>
<td>16</td>
<td>29</td>
<td>33</td>
<td>8</td>
<td>6</td>
<td>26</td>
<td>15</td>
<td>16</td>
<td>24</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td><strong>Image rank</strong></td>
<td><strong>7</strong></td>
<td>2</td>
<td>1</td>
<td>9</td>
<td>11</td>
<td><strong>3</strong></td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td><strong>T. popularity</strong></td>
<td>42</td>
<td>52</td>
<td>46</td>
<td>23</td>
<td>12</td>
<td>25</td>
<td>18</td>
<td>21</td>
<td>43</td>
<td>15</td>
<td>37</td>
</tr>
<tr>
<td><strong>Time rank</strong></td>
<td><strong>4</strong></td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>11</td>
<td><strong>6</strong></td>
<td>9</td>
<td>8</td>
<td>3</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

\[
pop_{time}(p) = \sum_{x \in T_p} (1 + \log t(x)) = k + \sum_{x \in T_p} \log t(x)
\]
Time-based vs. image-based popularity

Little Venice (#115003)
image-based rank 3 →
time-based rank 6

Old court (#115013)
image-based rank 7 →
time-based rank 4
Time-geographic cone

Towards the end of the tour less photos and higher focus (= less detours)

### Spatial focusedness

<table>
<thead>
<tr>
<th>t (%)</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
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<td>40</td>
<td>42</td>
<td>43</td>
<td>46</td>
<td>54</td>
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### Photographic activity

<table>
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<tr>
<th>t (%)</th>
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<td>25</td>
<td>12</td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>
„2 hours left!“
“Cancel exploration”
“Only the museum!”
Recommendation proposal

- Collaborative filtering
  - Tourists are similar, if they spend similar amounts of time at similar places
  - Places are similar, if they have similar temporal popularity values

- Input
  - Place sequence traveled so far

![Diagram showing place popularity values]
Recommendation proposal

- **Background knowledge**
  - (Planned stay time)
  - (Planned places)
  - places already visited
  - Visiting behavior of other tourists

- **Triggered, if**
  a. there is still time, but no significant activity
  b. there are too many places in the queue

- **Strategies**
  a. recommend places of similar tourists
  b. less is more: recommend to select places similar to users spent most time on

- **Enhancement**
  - Filter for time-geographic cone (indicated by rapidly increasing focusedness)
Summary

„Deceleration“

Time geographic analysis

GPS data