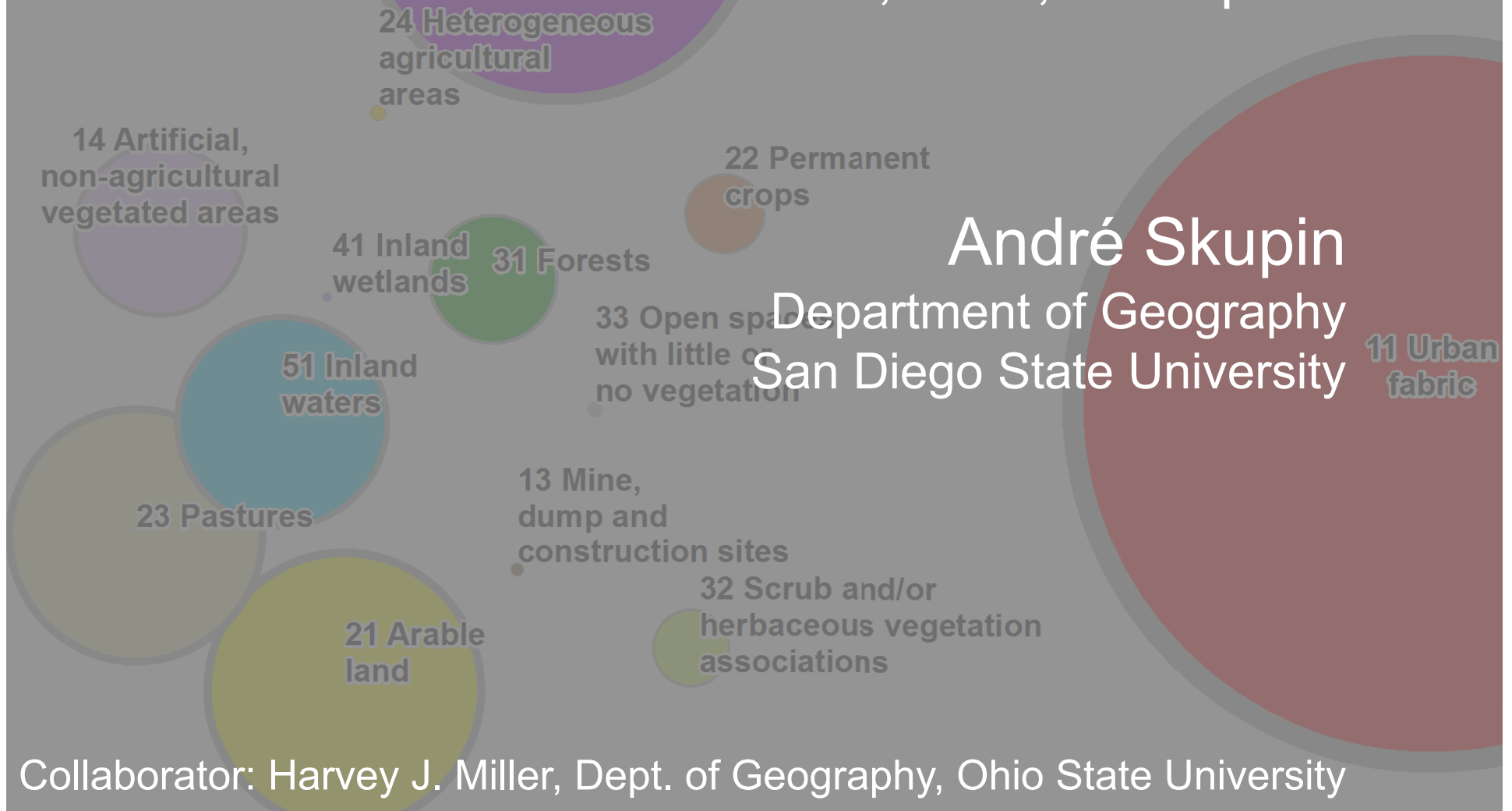


# Nokia MDC Atlas

## An Exploration of Mobile Phone Users, Land Cover, Time, and Space



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# Nokia Mobile Data Challenge (MDC)

- Data
  - 185 mobile phone users (Nokia N95)
  - October 2009 – March 2011
  - recorded: **GPS**, **WLAN**, accelerometer, Bluetooth, media use, phone call logs, SMS, application use
  - questionnaire: **age**, **gender**, **status**, **transportation**, ...
- MDC duration: January-April 2012
- Two types of contributions:
  - **Open Challenge**
    - **Free to be defined by researchers**
  - **Dedicated Challenge**
    - Semantic place prediction
    - Next place prediction
    - Demographic attribute prediction

# Nokia MDC Atlas

An Exploration of Mobile Phone Users, Land Cover, Time, and Space

- Data used
  - MDC Open Challenge data sets
    - demographic questionnaires for 29 users
    - 3.4 million location records for 38 users (GPS & WLAN)
  - CORINE-equivalent land cover
  - Microsoft Bing Maps
  - OpenStreetMap (OSM)
- Spaces addressed
  - Participants according to questionnaire (15 dims)
  - Participants according to land use types traversed (13 dims)
  - Geographic space with time-weighted density

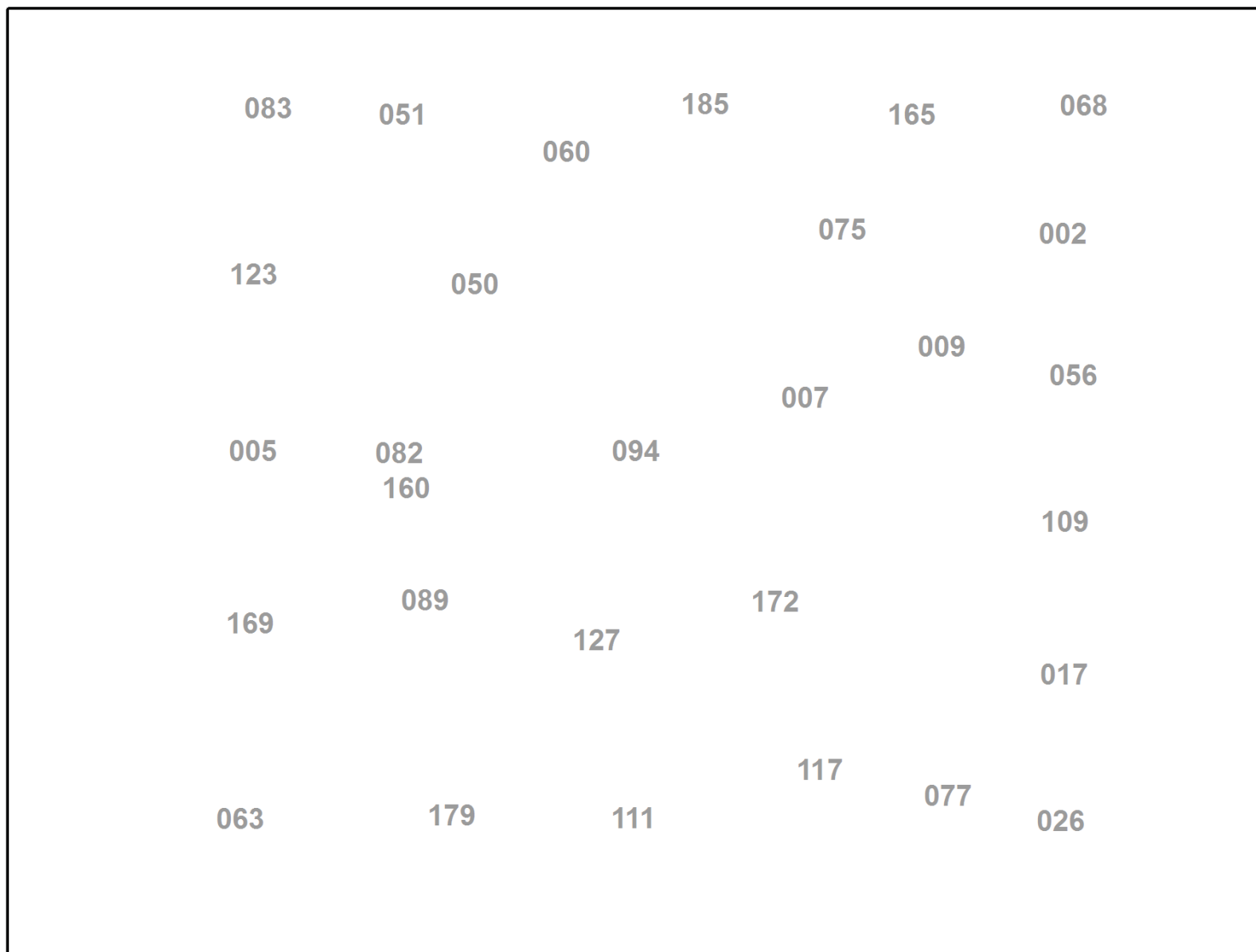
# Nokia MDC Atlas

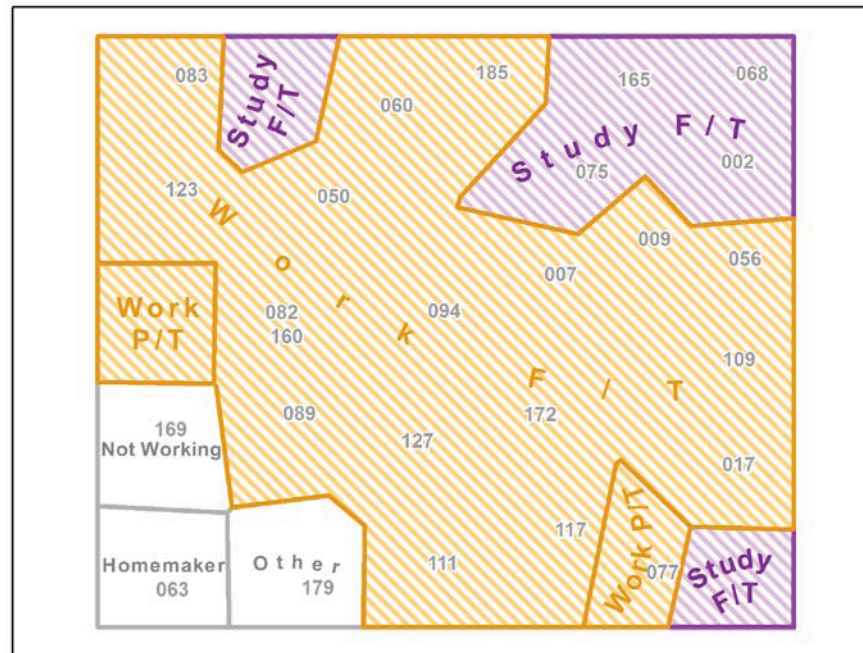
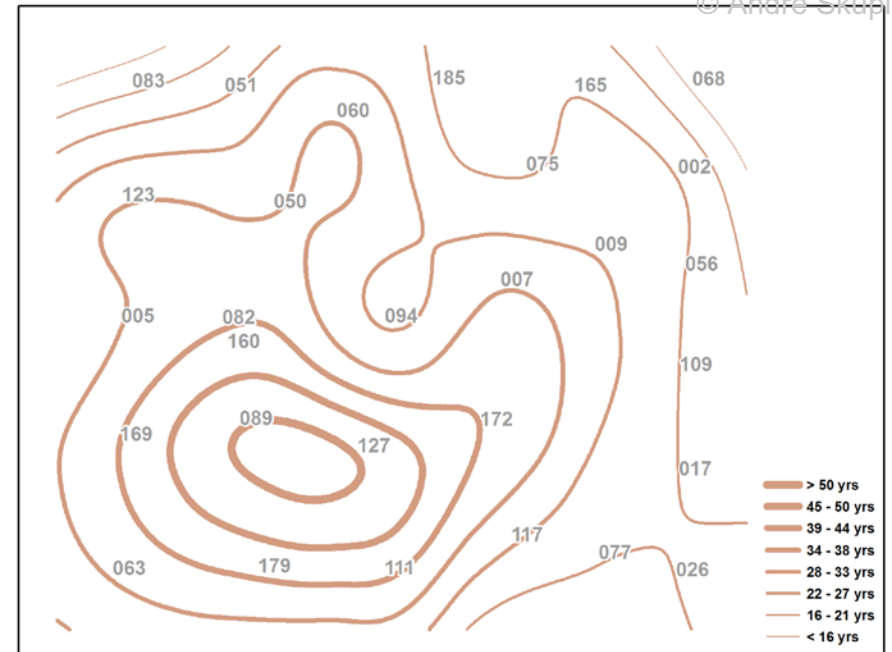
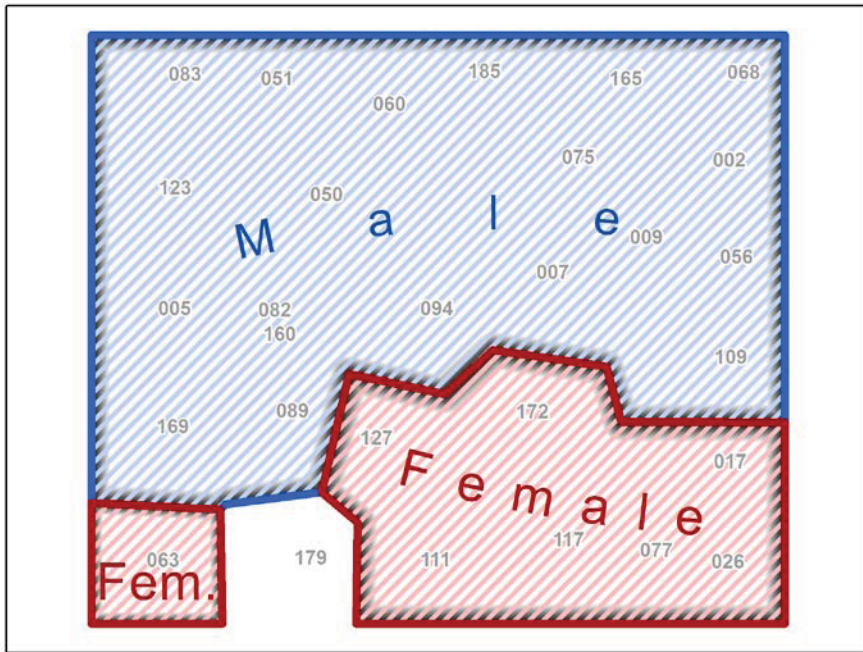
An Exploration of Mobile Phone Users, Land Cover, Time, and Space

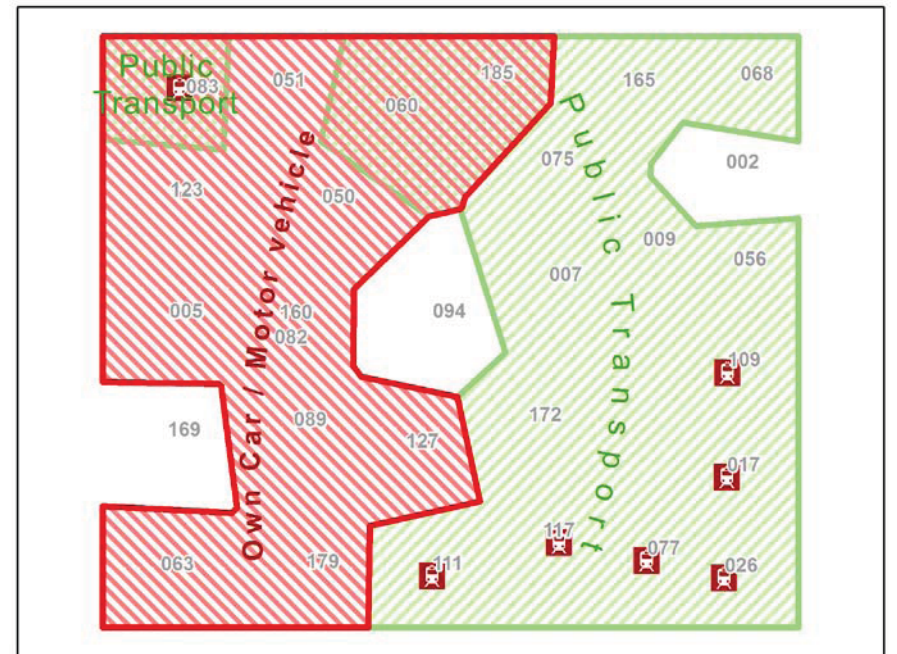
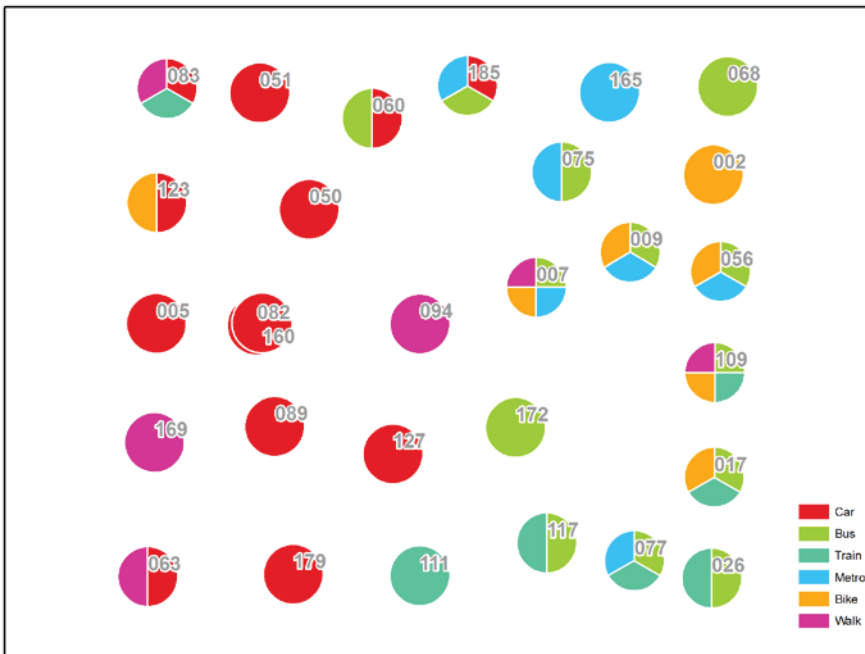
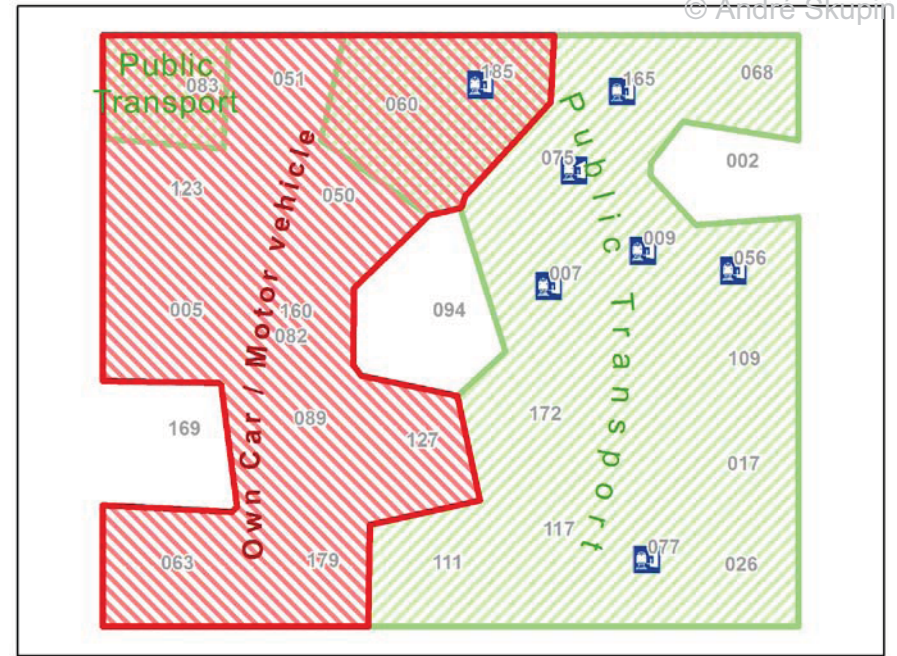
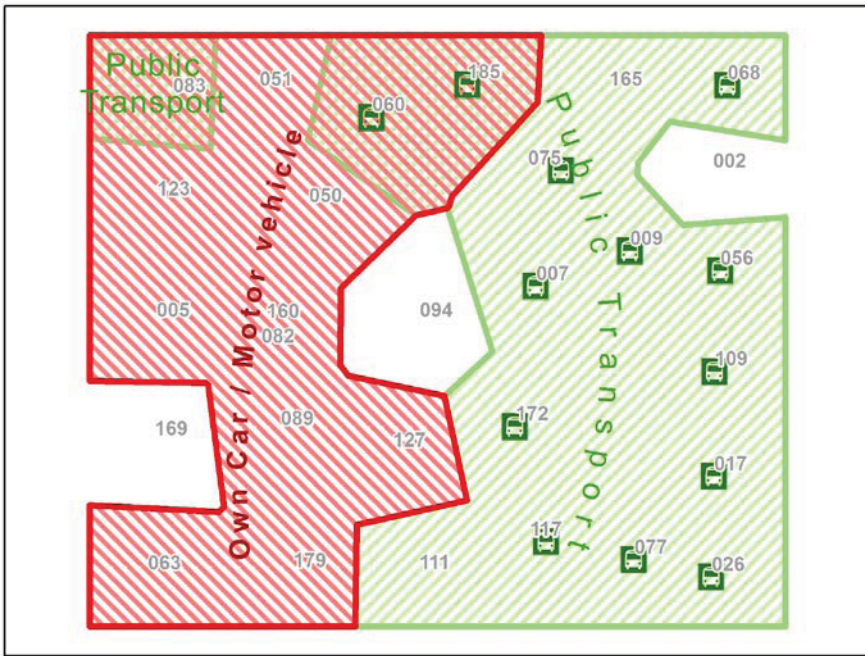
- Tools used
  - Various pre-processing steps: *Microsoft Office Excel*, *Processing* development environment  
(<http://processing.org/>)
  - Multidimensional scaling (MDS): *IBM SPSS Statistics*
  - Self-organizing map (SOM)  
preprocessing/postprocessing: *SOM Analyst*  
(<http://code.google.com/p/somanalyst/>)
  - SOM training: *SOM\_PAK*  
(modified after [http://www.cis.hut.fi/research/som\\_pak/](http://www.cis.hut.fi/research/som_pak/))
  - Visualization: *ESRI ArcGIS*  
(<http://www.esri.com/software/arcgis/>)



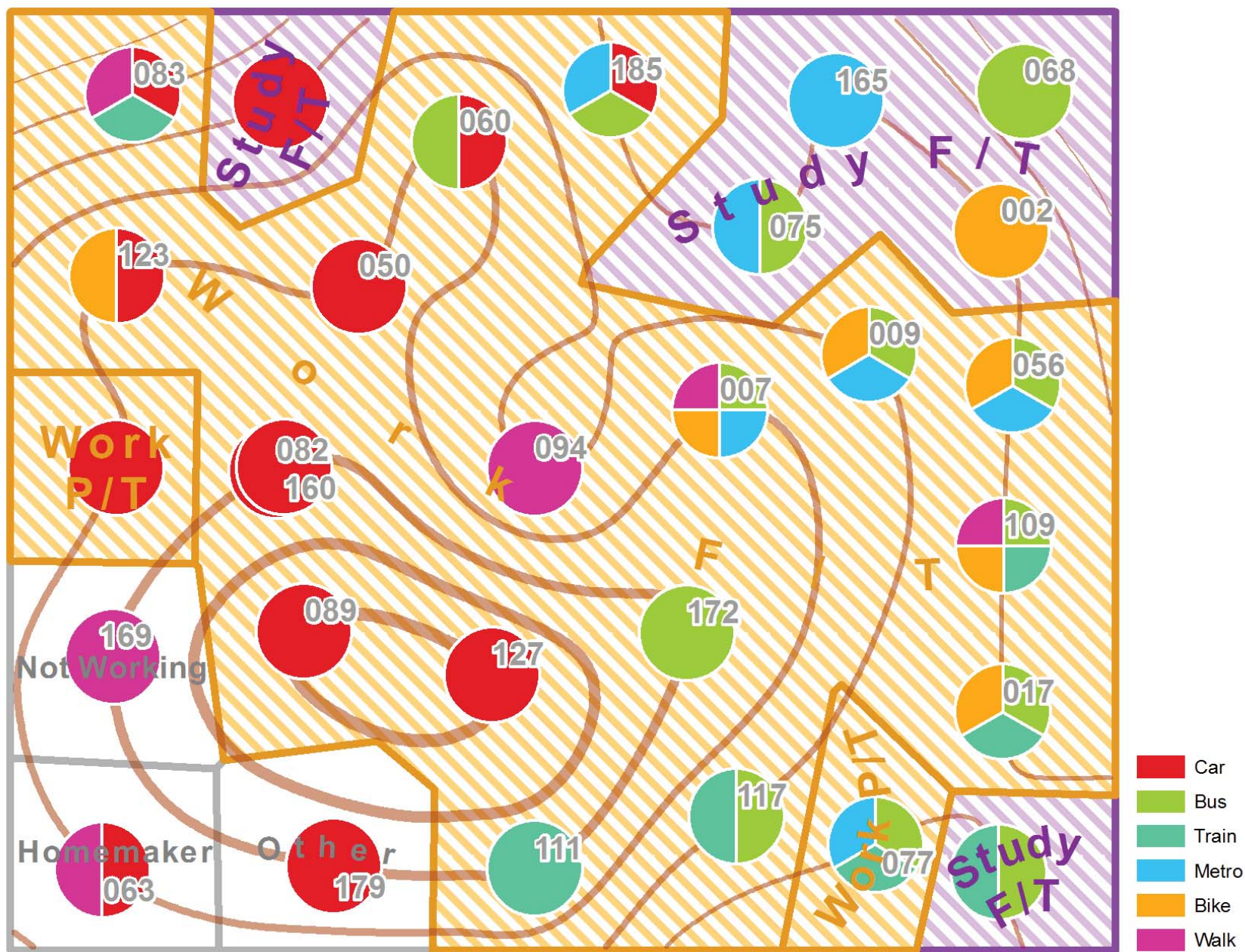
## Base Map of Study Participants Based On Questionnaire Similarity



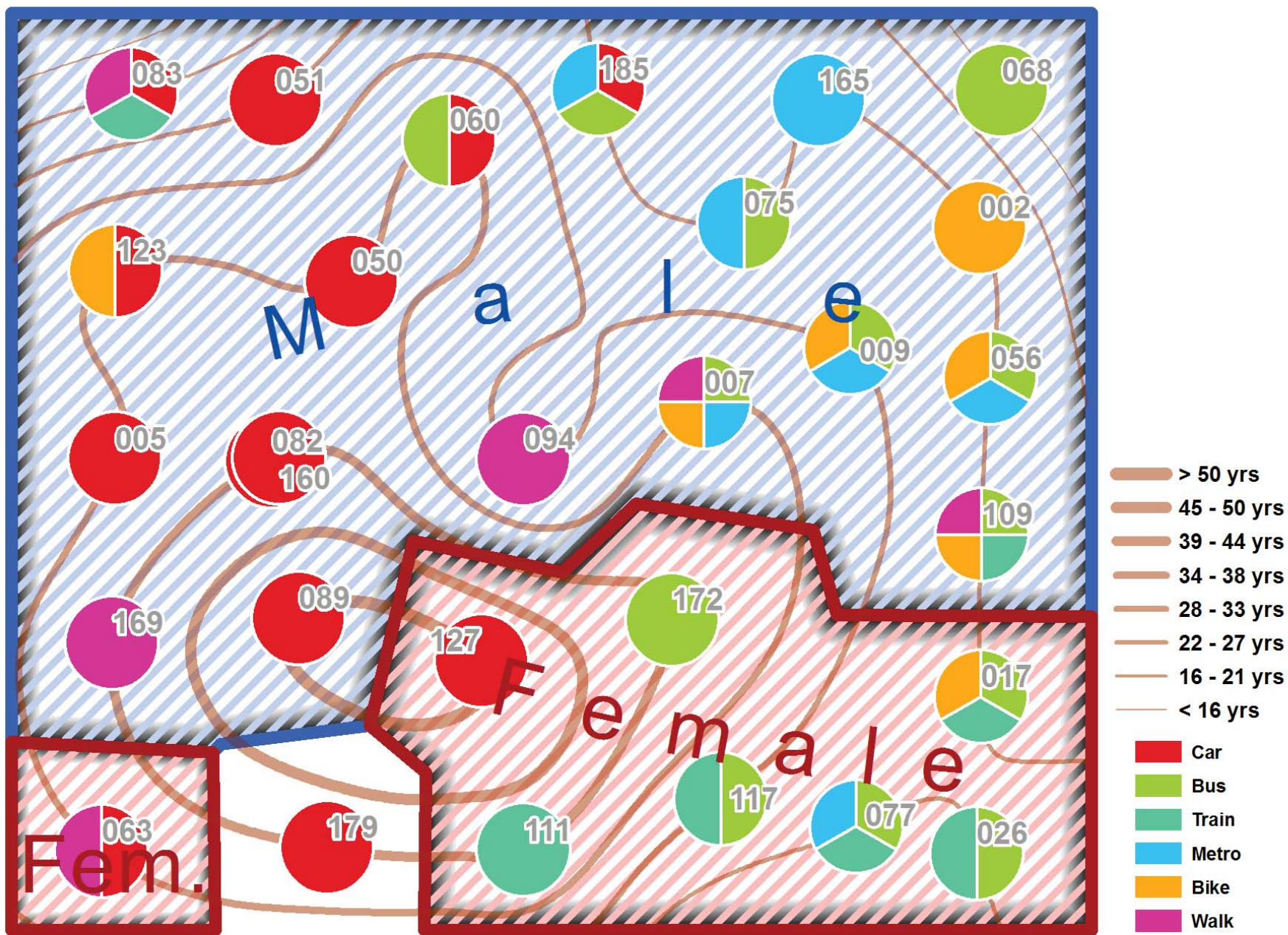






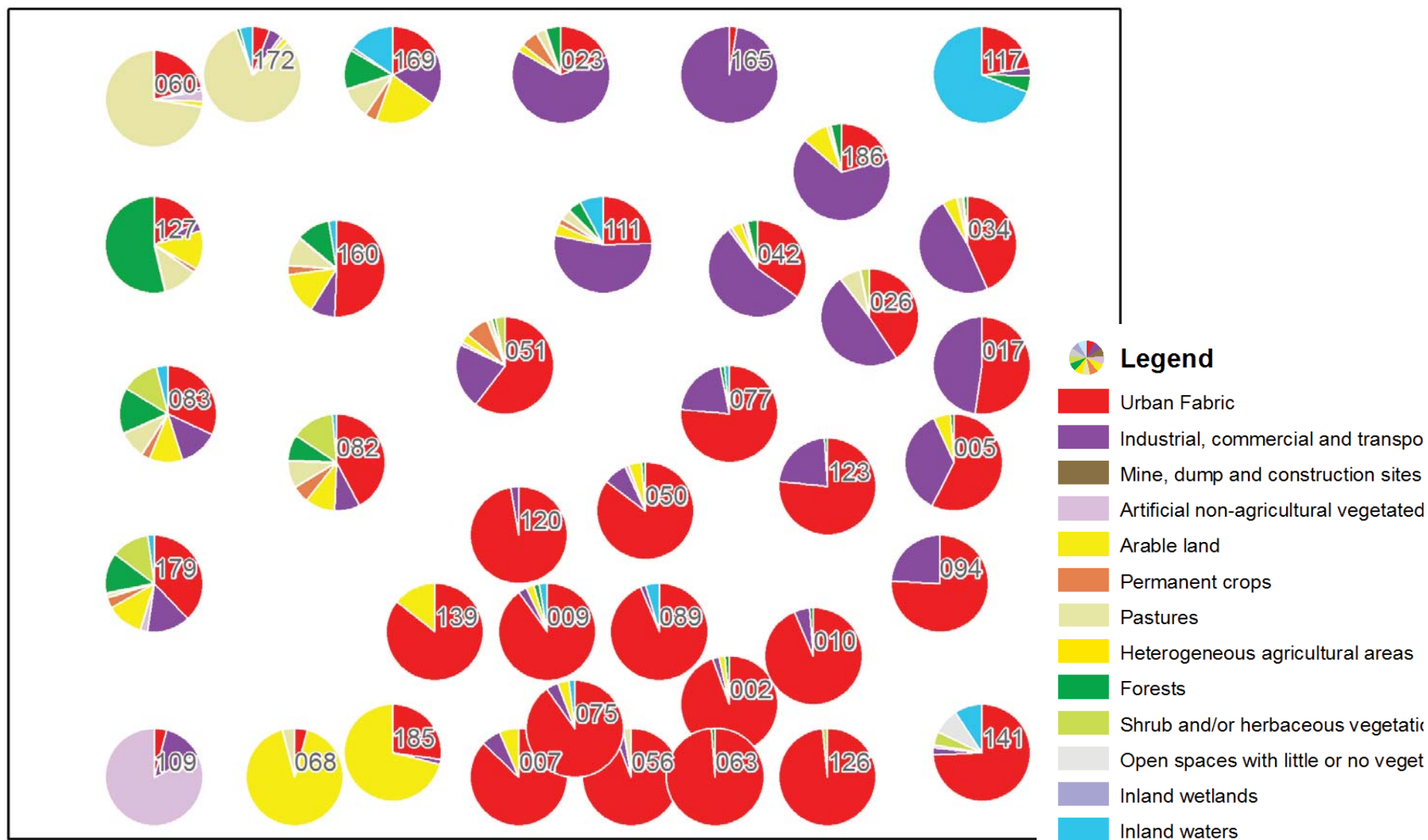






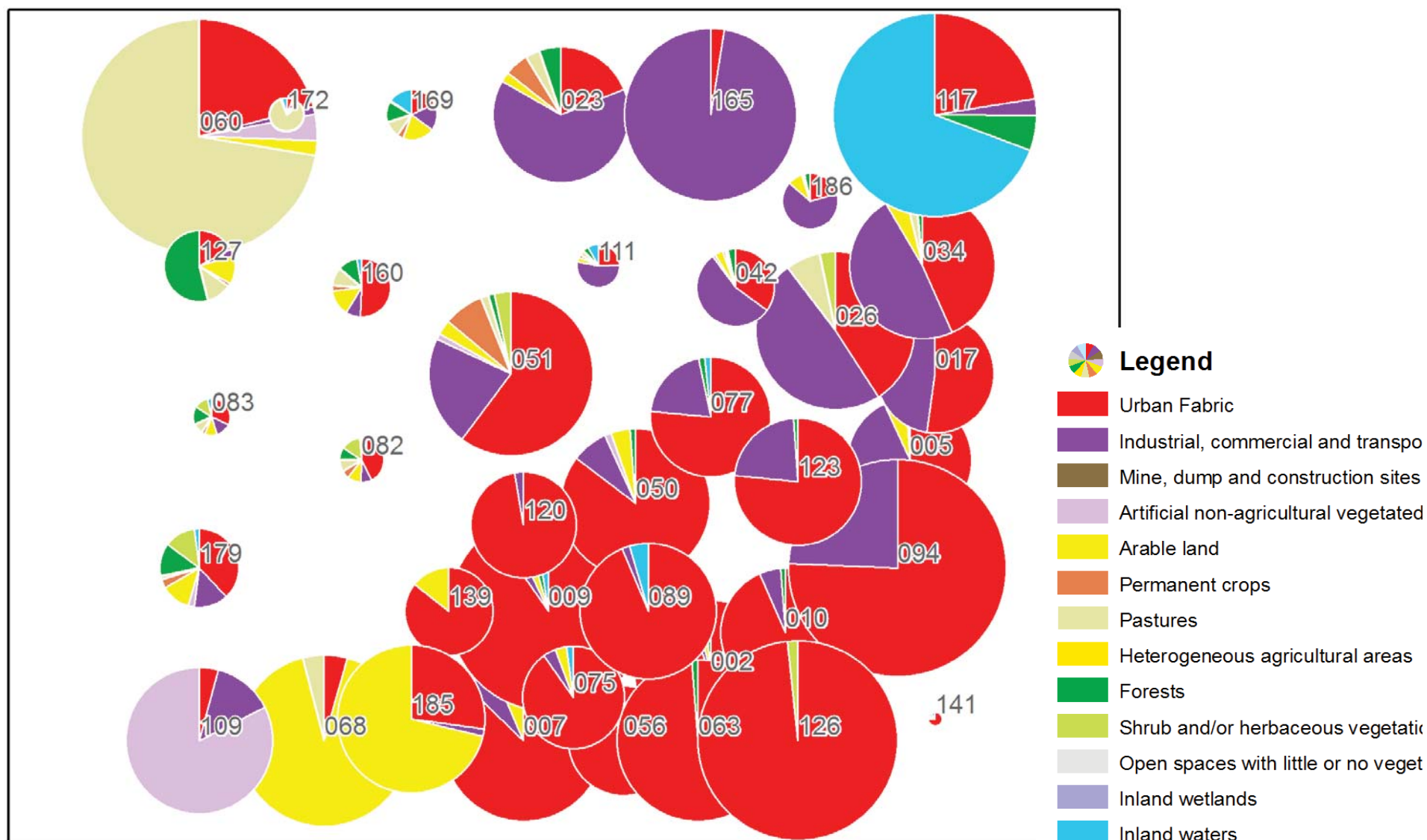
Skupin, A. (2013) A Visual exploration of mobile phone users, land cover, time, and space. *Pervasive and Mobile Computing*.

## Participants according to similarity in the relative time spent per land cover type



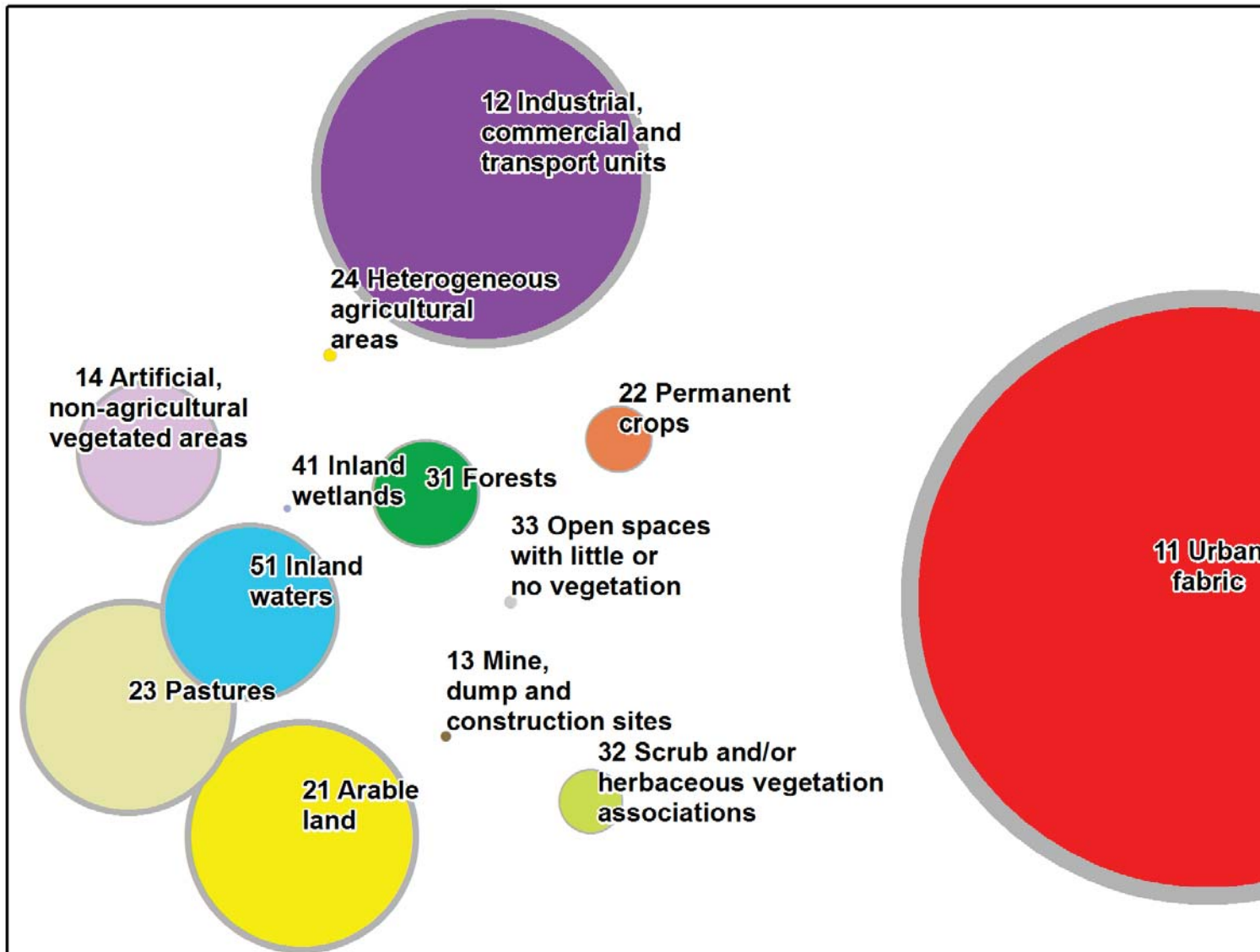


## Participants according to similarity in the relative time spent per land cover type



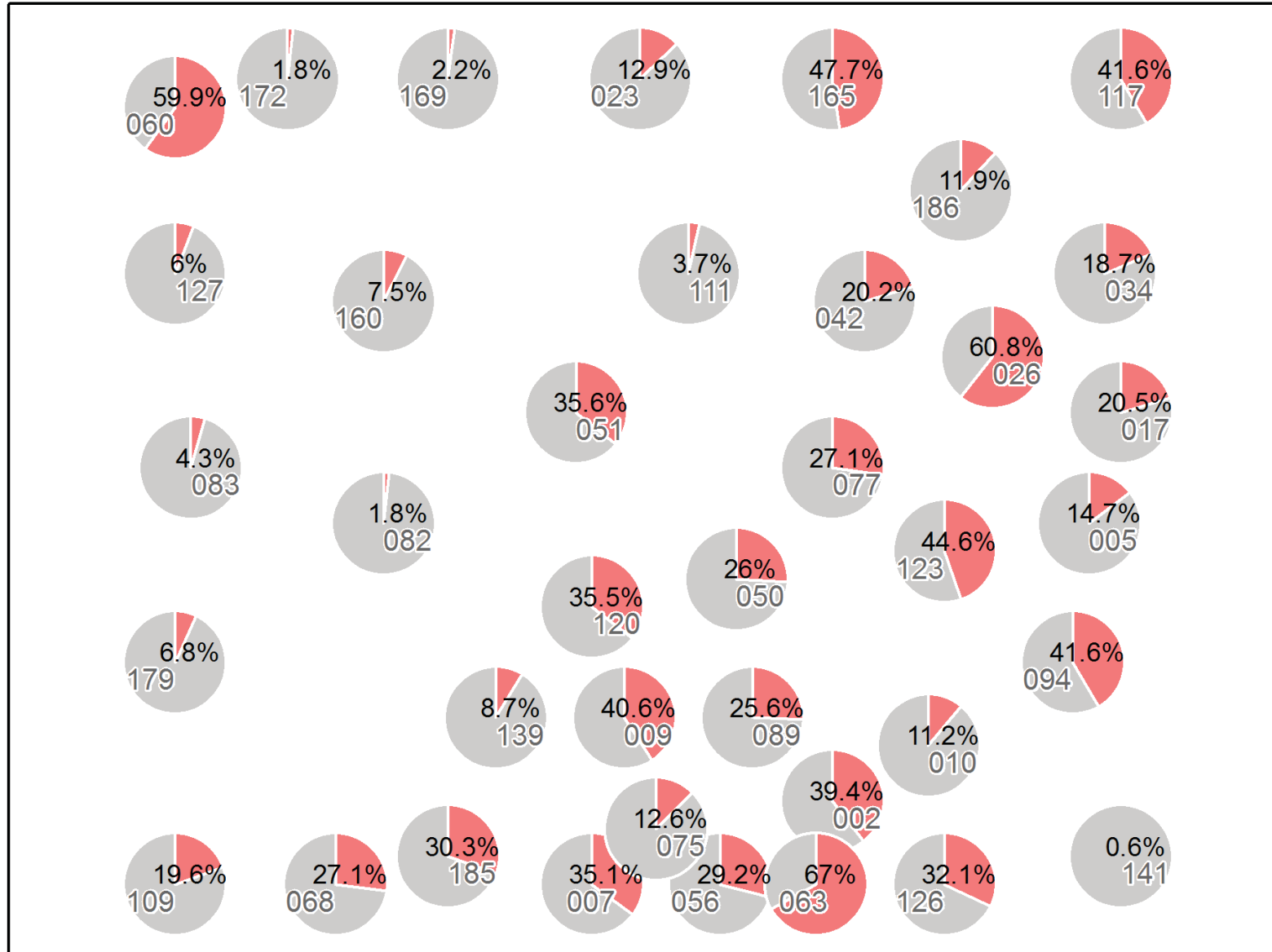
# Land cover types according to similarity in how relative time spent was distributed across 38 participants

Circle size proportional to total time spent by participants

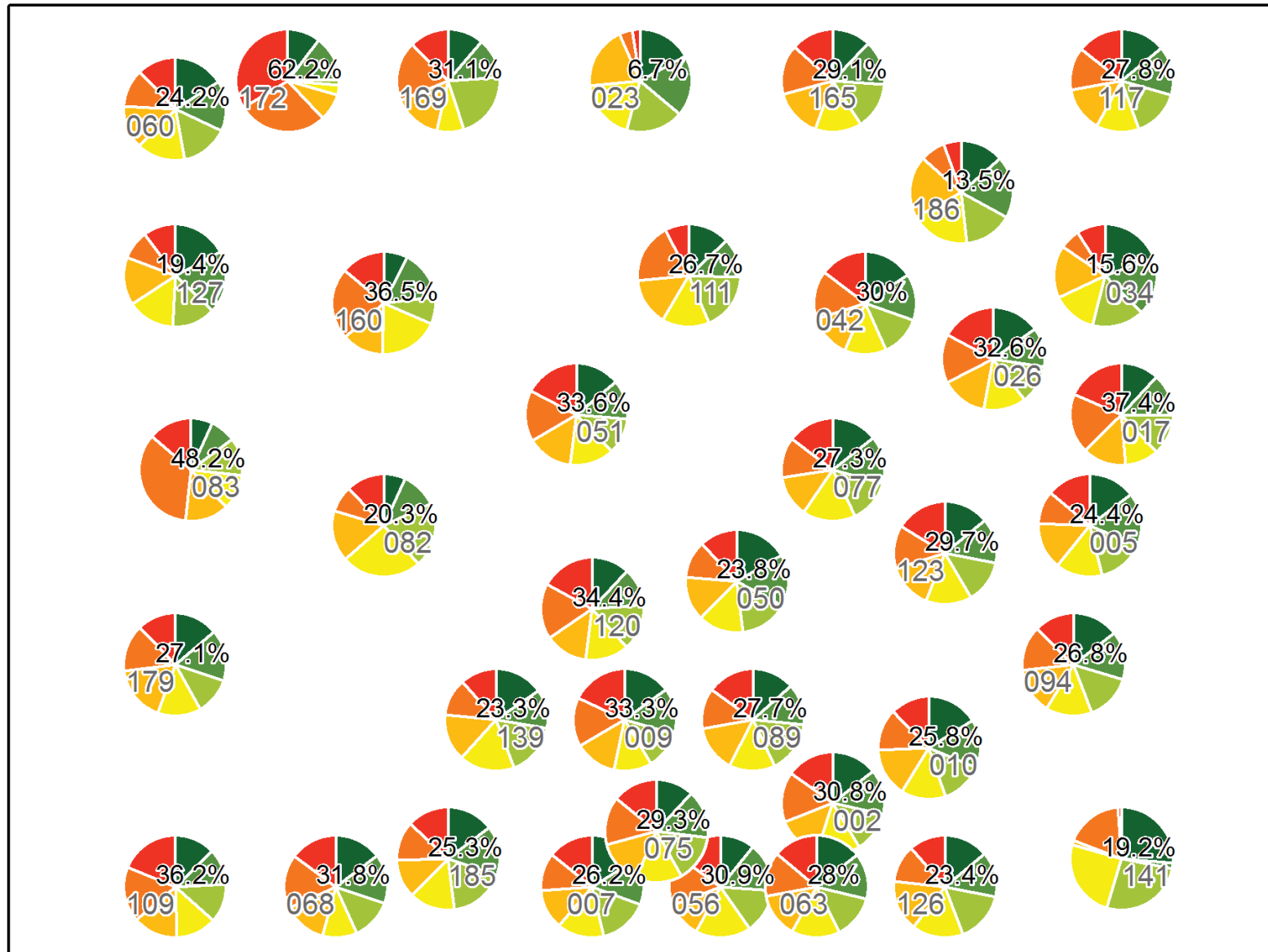




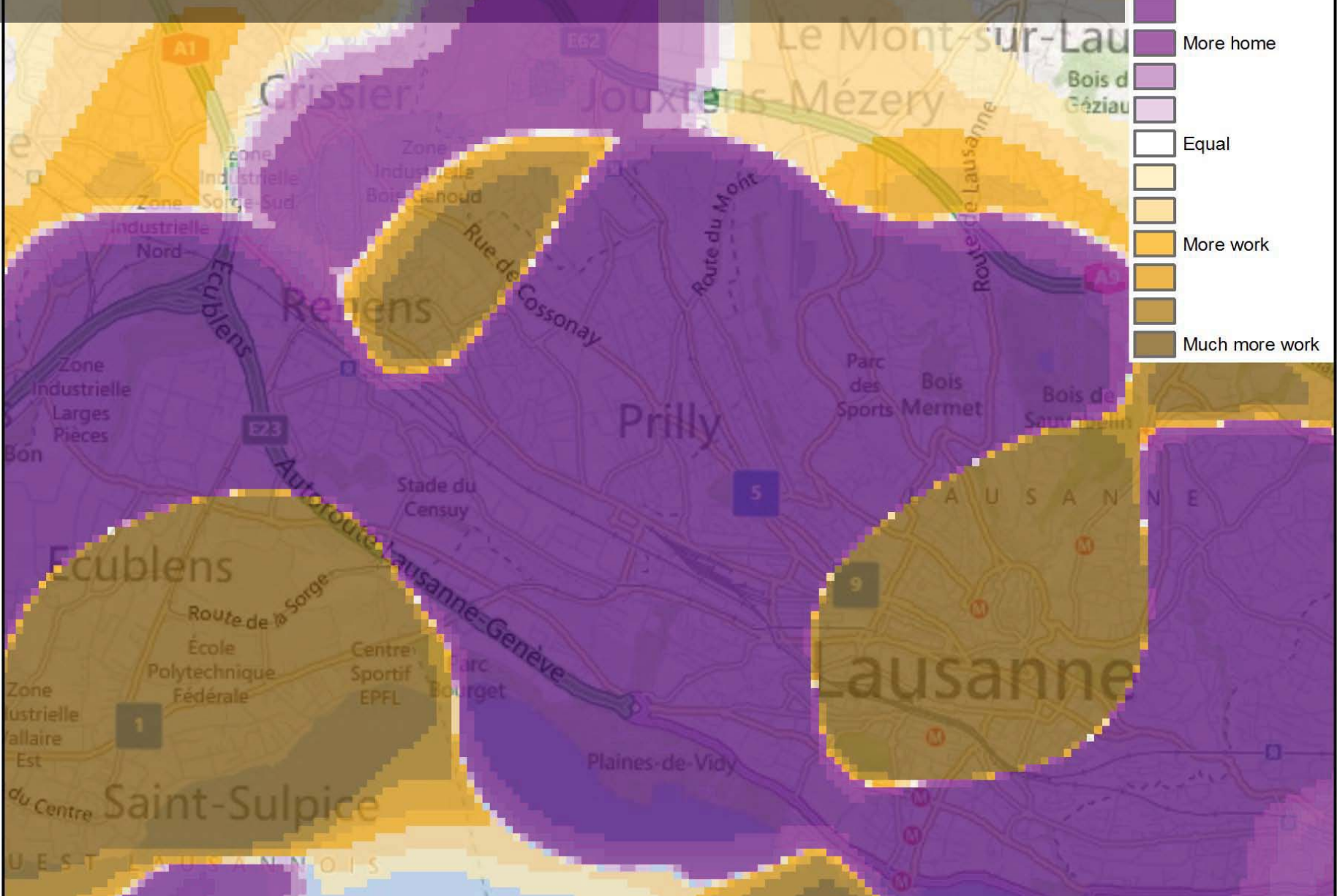
**Geometry:** Participants according to similarity in the relative time spent per land cover type  
**Symbology:** Time spent in location capture mode relative to total time passed between first and last location capture



**Geometry:** Participants according to similarity in the relative time spent per land cover type  
**Symbology:** Relative time spent in location capture mode on different days of the week

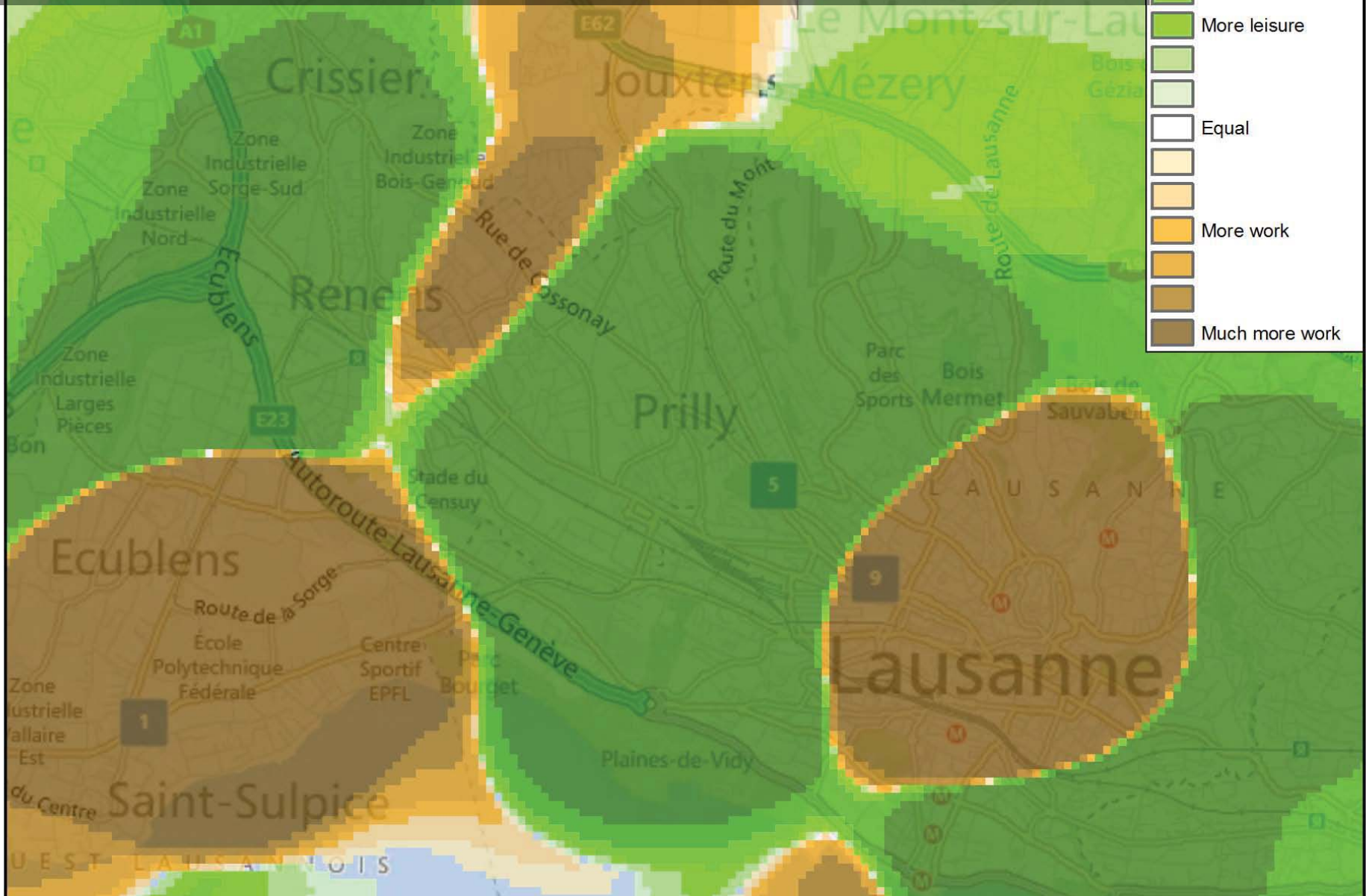


Relative time spent in location capture mode during typical work hours (Mo-Th 11:00-12:00) as compared to home (Mo-Thu 3:00-4:00)

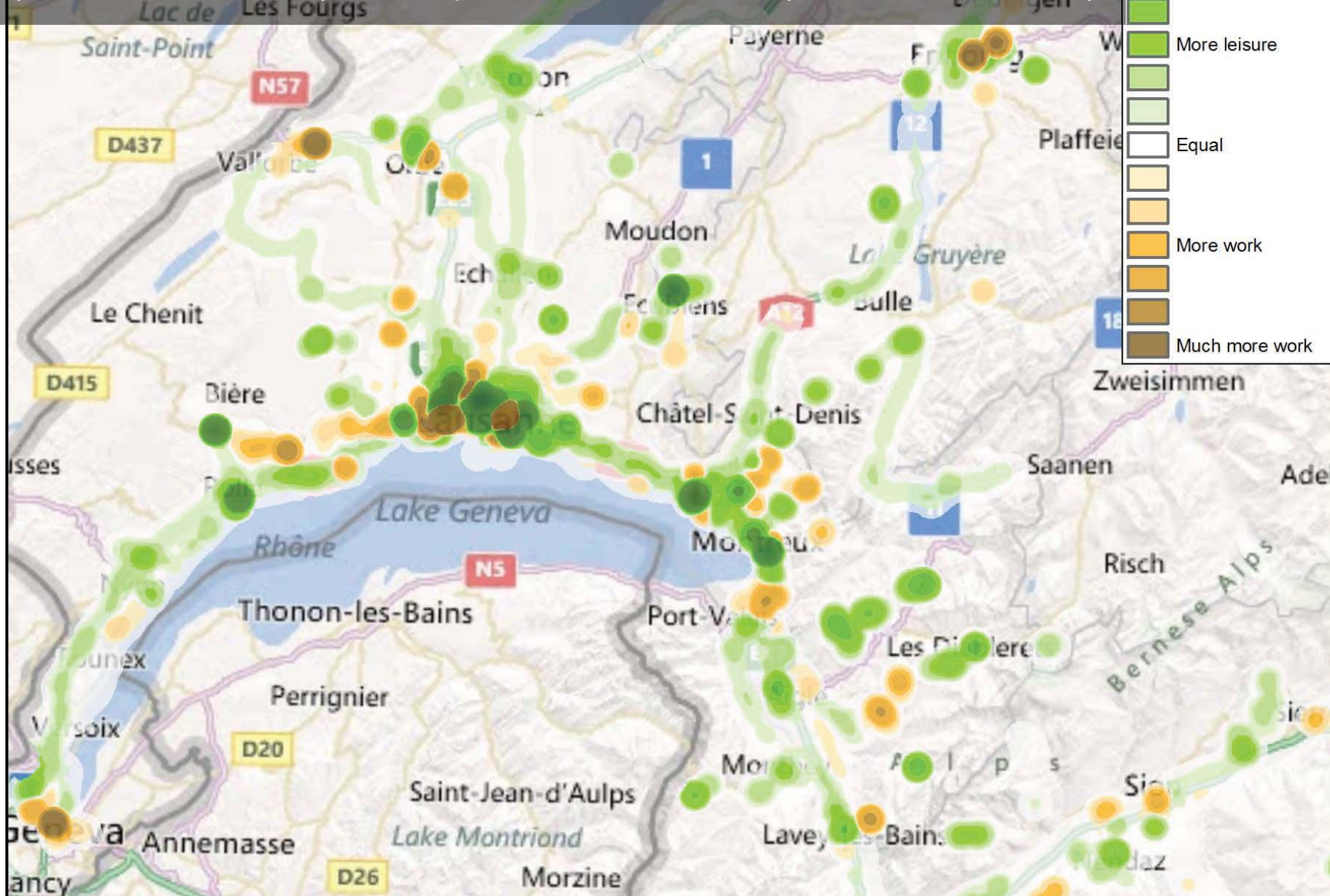




Relative time spent in location capture mode during typical work hours (Mo-Th 11:00-12:00) as compared to leisure time (Sa-Su 11:00-12:00)

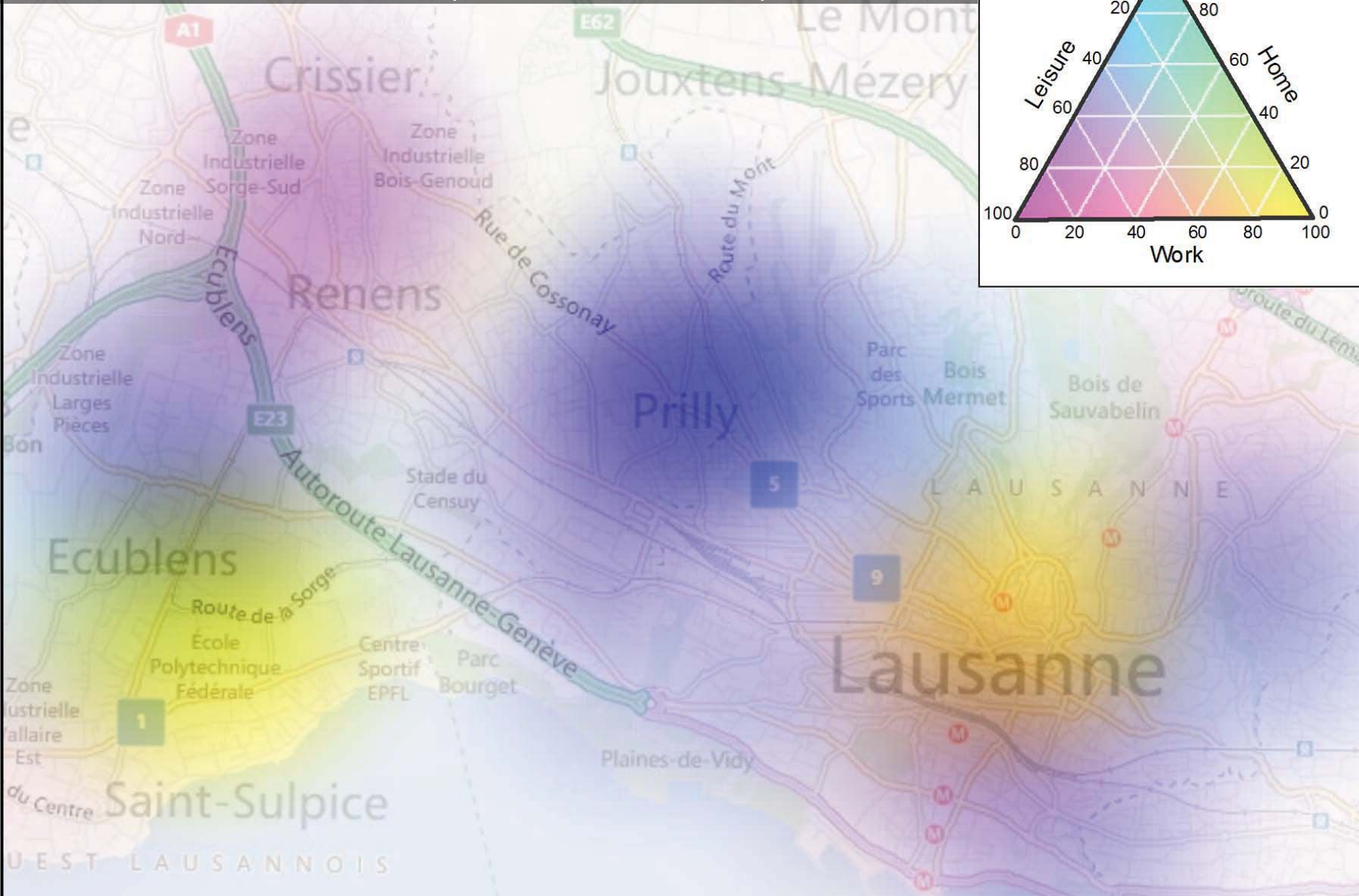
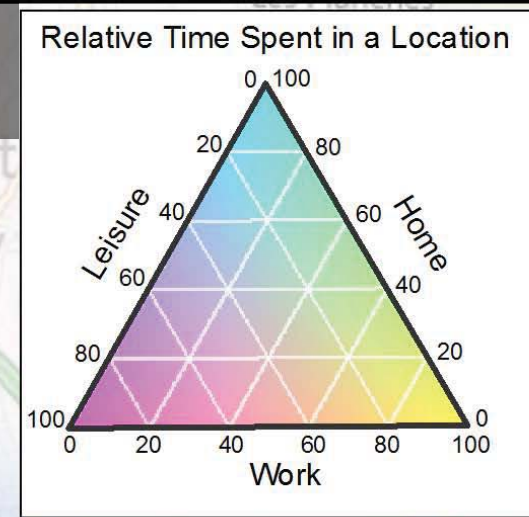


Relative time spent in location capture mode during typical work hours (Mo-Th 11:00-12:00) as compared to leisure time (Sa-Su 11:00-12:00)



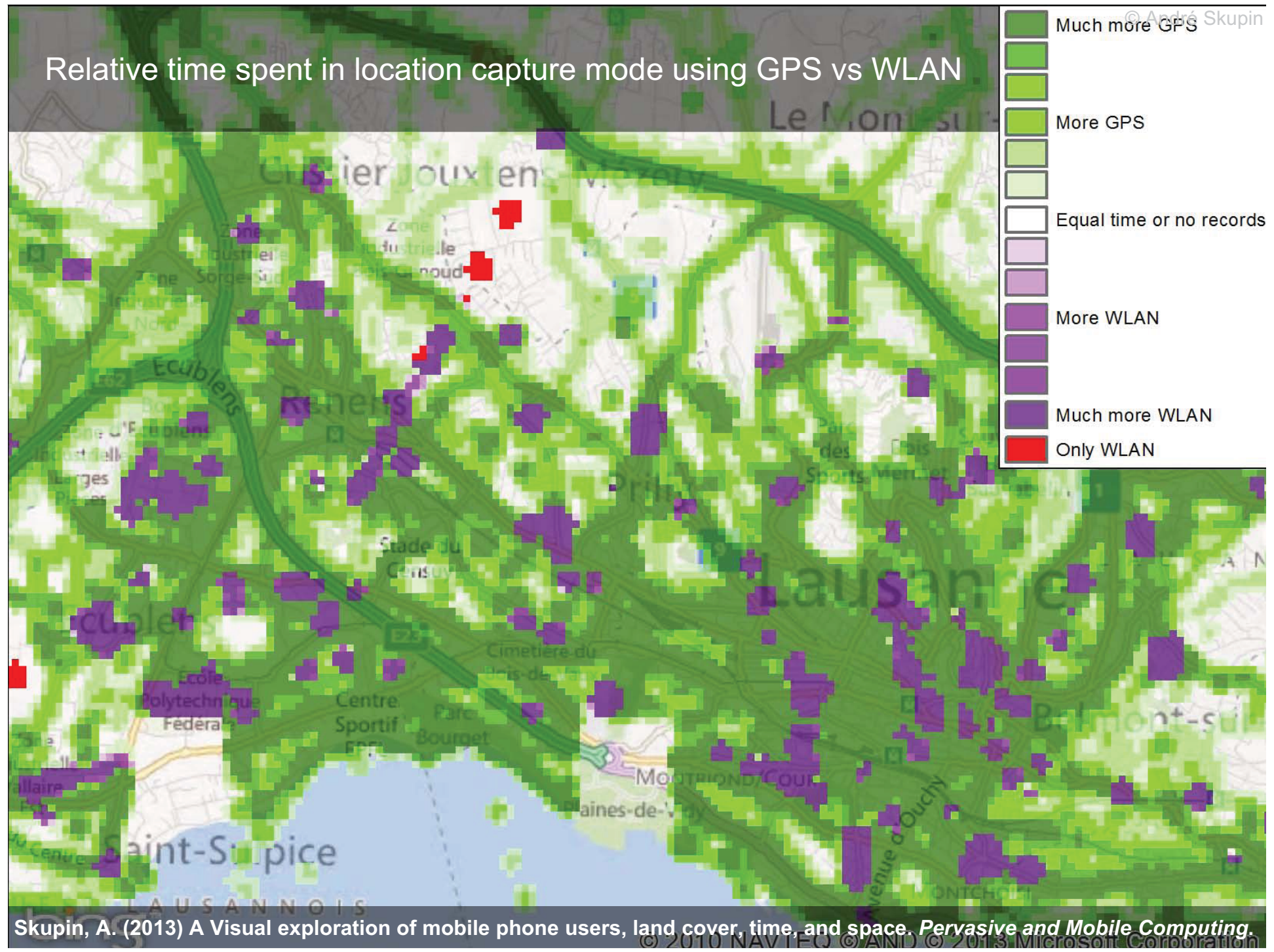


Relative time spent in location capture mode during typical work hours (Mo-Th 11:00-12:00), home (Mo-Th 3:00-4:00), and leisure time (Sa-Su 11:00-12:00)

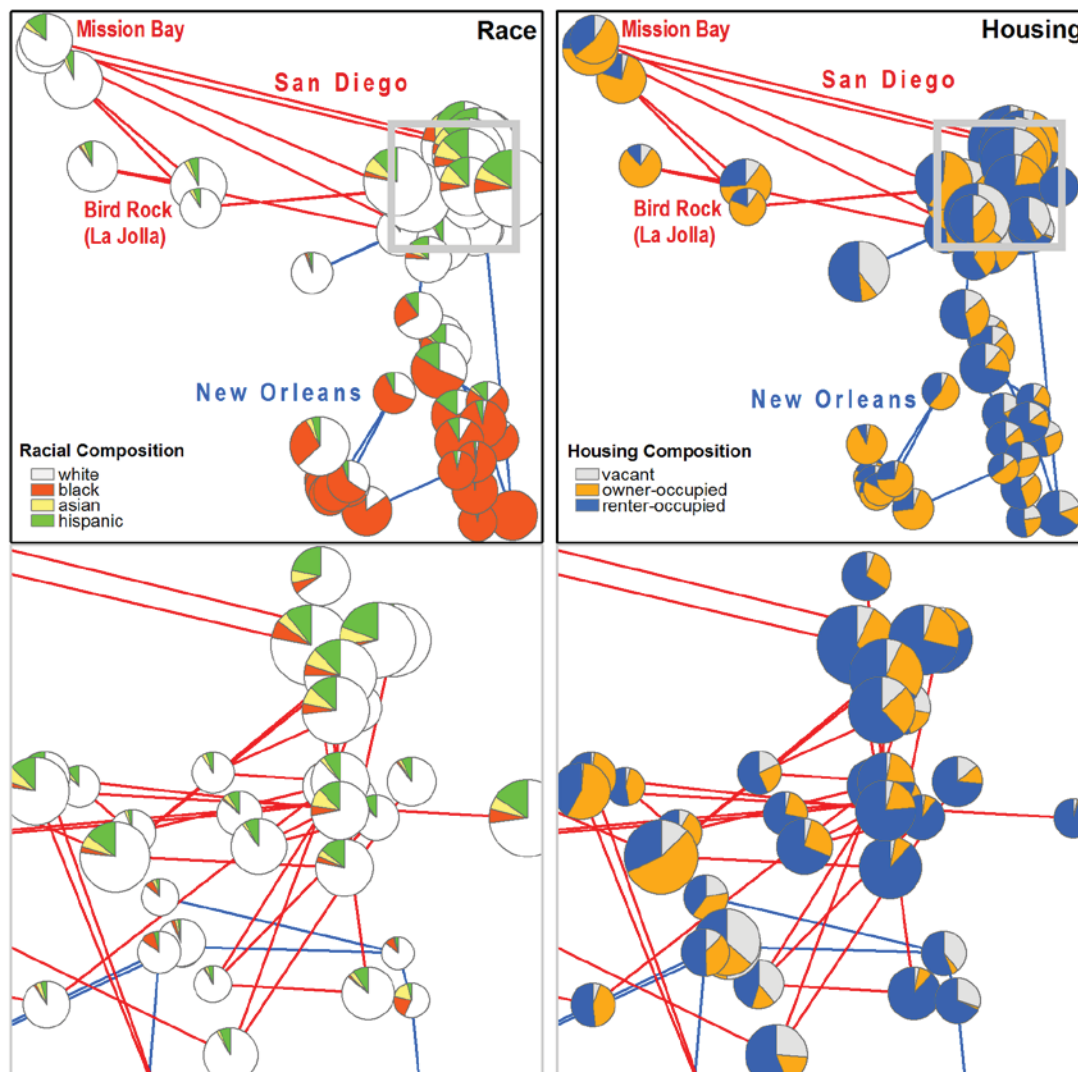
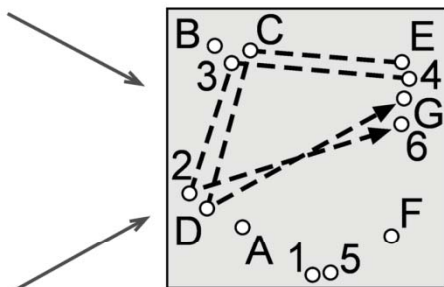
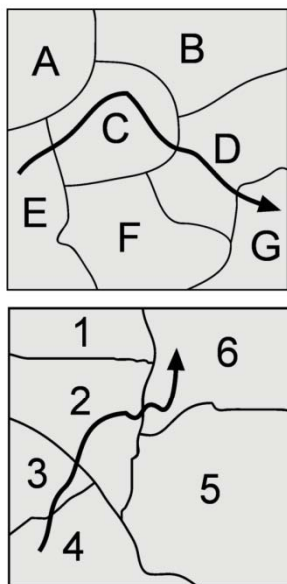




# Relative time spent in location capture mode using GPS vs WLAN



# Nokia MDC Atlas Future Work



Skupin, A. (2007) Where do you want to go today [in attribute space]? in: Miller, H. (Ed.) *Societies and Cities in the Age of Instant Access*. Springer. 133-149.



# Relevant Readings

- Skupin, A. (2013) A Visual Exploration of Mobile Phone Users, Land Cover, Time, and Space. ***Pervasive and Mobile Computing***. 9(6): 865-880.
- Burns, R. and Skupin, A. (2013) Towards Qualitative Geovisual Analytics: A Case Study Involving Places, People, and Mediated Experience. ***Cartographica***. 48(3): 157-176.
- Skupin, A. (2008) Visualizing Human Movement in Attribute Space. In: Agarwal, P., and Skupin, A. (Eds.) ***Self-Organising Maps: Applications in Geographic Information Science***, Chichester, England: John Wiley & Sons, Ltd. 121-135.
- Skupin, A. (2007) Where do you want to go today [in attribute space]? in: Miller, H. (Ed.) ***Societies and Cities in the Age of Instant Access***. Springer. 133-149.

# Questions?

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<http://geography.sdsu.edu/People/Pages/skupin/>