Introduction ○

Theoretical overview ○

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Using shape, proximity and functionality to define neighborhoods with morphologically similar buildings

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Urban Patterns session
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UNIL | Université de Lausanne
Institut de géographie
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Luxembourg

Introduction

Theoretical overview

Urban Morphology

Building shapes

Methodology

Case study

Data used

Process overview

Results

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References

What, how, and why ?

- ▶ Trying to cluster morphologically similar buildings in an urban context

- ▶ Using features derived from simple building representations

- ▶ Clustering using a geo-constrained Self-Organizing Map (geo-SOM)

- ▶ Find (in-)homogeneous places in cities, compare internal morphologies of cities, etc.
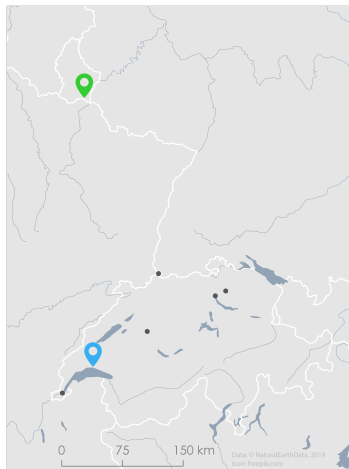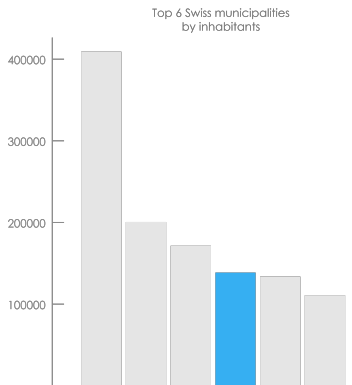
Multiple definitions

- Definitions
- Situation de la recherche en cours

Similar works

- ► Schirmer

- ► Steiniger

- ► Fan, Zipf, Fu

Case study

Lausanne, Switzerland

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Case study

Lausanne Municipality

Carte des bâtiments avec quartiers et secteurs statistiques

OpenStreetMap data - Gathering footprints

- Open data generated by multiple contributors

- Available on a global scale but unevenly distributed

- Quality depending on several factors (available imagery, familiarity of the cartographer, etc.)

Stats sur données OSM

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Data used

OpenStreetMap data - Gathering footprints

- Open data generated by multiple contributors

- Available on a global scale but unevenly distributed

- Quality depending on several factors (available imagery, familiarity of the cartographer, etc.)

- Limits: High geometrical variability, features of interest not sufficiently filled

Swisstopo data - Computing height

- Digital Elevation Model, 2016, 2m resolution, 0.5m accuracy

- Digital Surface Model, 2016, 2m resolution, 0.5m accuracy

- Compute the difference and assign mean value of cells intersecting each building

Buildings and housing registry - Retrieving categories

- ▶ Central registry maintained by the Federal Statistical Office

- ▶ Data input by the municipalities

- ▶ General categories (6) and specific classes (26) adapted from EUROSTAT

- ▶ Quality assurance ?

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Data used

Indicators derived - Feature creation

- Features based on the footprint geometry and the height

- Inspired by Schirmer and Axhausen (2015) with several additions (oriented envelope, compactness)

- Quite redundant and how to determine which are the most suitable ?

General intended pipeline

Contenu

Feature selection

NON

- ▶ Difficultés d'un choix non supervisé

- ▶ Réduction en fonction de ce qu'elles distinguent

- ▶ Distinction parmi les variables similaires

Clustering based on features

NON

- ▶ Pourquoi ?

- ▶ Qualité

- ▶ Interprétations

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Process overview

Model-based clustering

- ▶ Each cluster can be modeled as a multivariate Gaussian density

- ▶ En fonction du modèle permet de trier les variables dans différents sets SRUW

- ▶ Interprétations

Geo-SOM and clustering

- Principe de fonctionnement
- Paramètres influençables
- Clustering basé sur la geosom

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Future works

▶ Monitor the development of ML (Mapillary) and gamification solutions (StreetComplete) in the completion of height and number of stories

Future works

▶

Thanks for your attention

Slides, routines (and more) are available on *GitHub*
https://github.com/Raphbub/

For any further questions, remarks or suggestions
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