

Towards Characterizing Cities with Social Media Images

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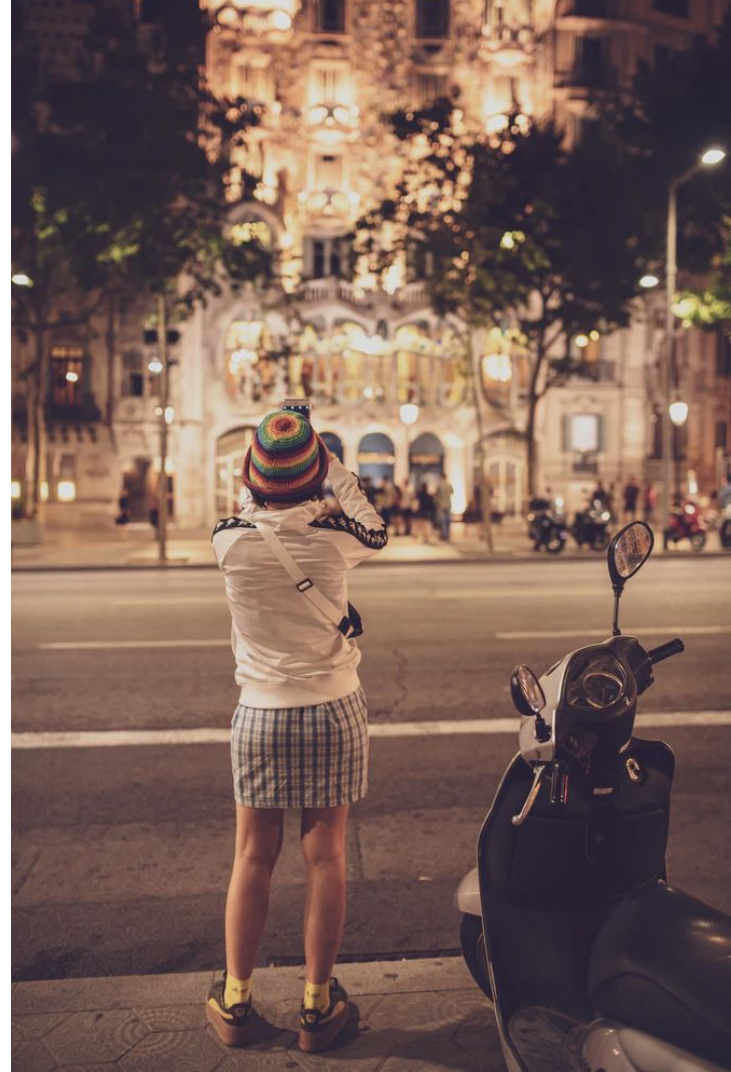
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I(mages) ♥ Cities

Images are at the heart of the digital life, registering **what**, **where**, and **when** people do activities.



Can we use images to study cities?

Their rich visual information may allow to **characterize cities** at different spatial granularities.



How can
we extract
activities
from
images?



Situations (Imsitu)



CLIPPING			
ROLE	VALUE	ROLE	VALUE
AGENT	MAN	AGENT	VET
SOURCE	SHEEP	SOURCE	DOG
TOOL	SHEARS	TOOL	CLIPPER
ITEM	WOOL	ITEM	CLAW
PLACE	FIELD	PLACE	ROOM



JUMPING			
ROLE	VALUE	ROLE	VALUE
AGENT	BOY	AGENT	BEAR
SOURCE	CLIFF	SOURCE	ICEBERG
OBSTACLE	-	OBSTACLE	WATER
DESTINATION	WATER	DESTINATION	ICEBERG
PLACE	LAKE	PLACE	OUTDOOR



SPRAYING			
ROLE	VALUE	ROLE	VALUE
AGENT	MAN	AGENT	FIREMAN
SOURCE	SPRAY CAN	SOURCE	HOSE
SUBSTANCE	PAINT	SUBSTANCE	WATER
DESTINATION	WALL	DESTINATION	FIRE
PLACE	ALLEYWAY	PLACE	OUTSIDE



resnet-101 base network

Situation: concise summary of an activity (Yatskar et al. 2016)

How can we
characterize
places
according to
their
activities?

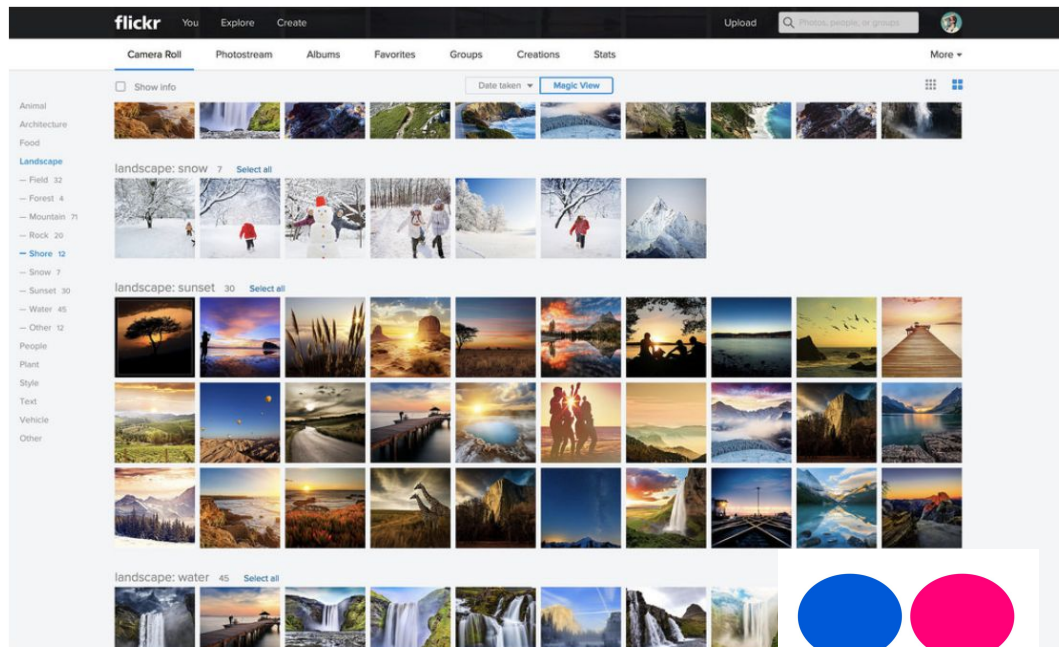


Data Set

YFCC100m

Yahoo Flickr Creative Commons 100 Million

- Contains 99.2 million photos and 0.8 million videos
- Images taken around the world and uploaded to Flickr between 2004 and 2014
- We select images with geographical coordinates in the city of interest



Santiago, Chile



338 census districts in
Santiago

Total
population of 7
million

28.748 images

Santiago, Chile

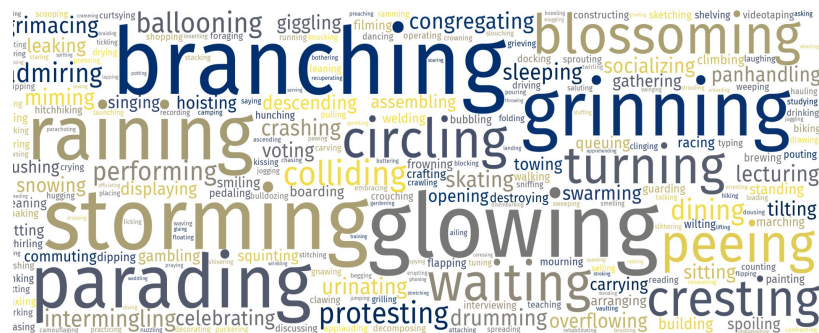


Fig. 1 Santiago Activities Word Cloud

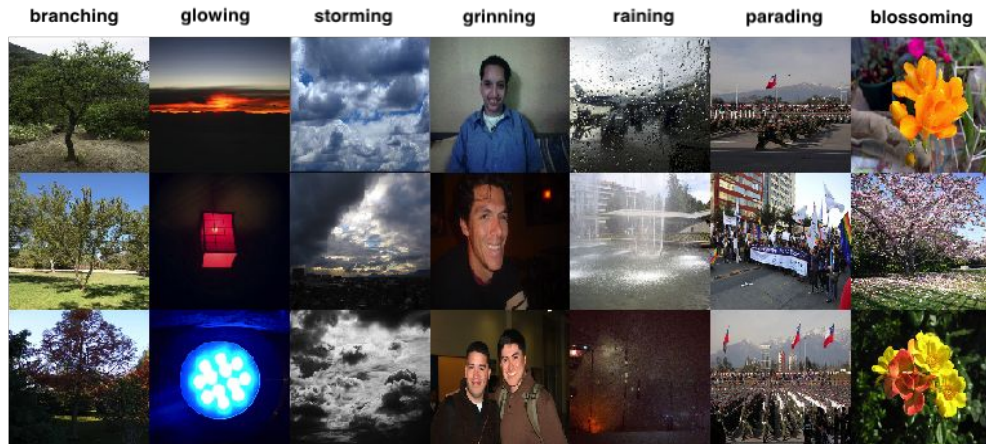


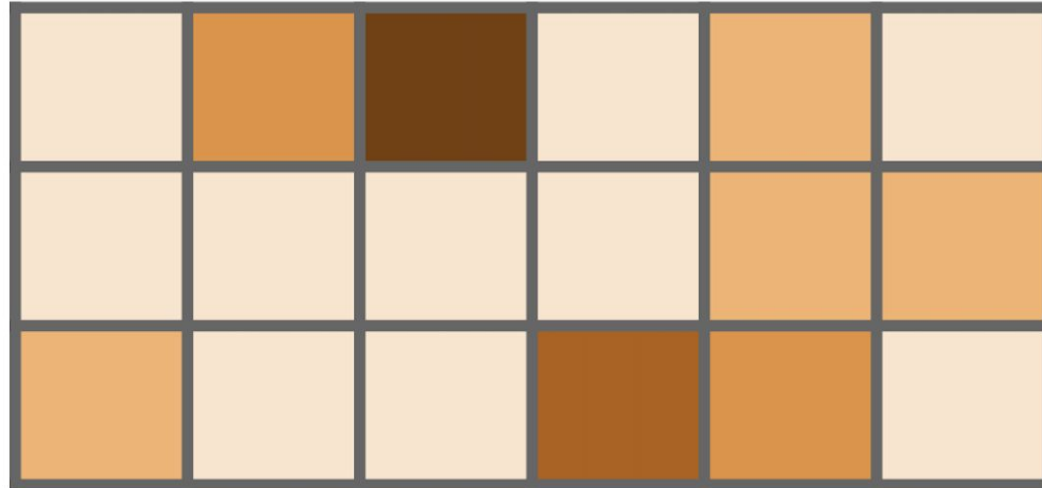
Fig.2 Santiago Activities from Imsitu

Santiago, Chile

d_1 d_2 d_3 d_4 ... d_n



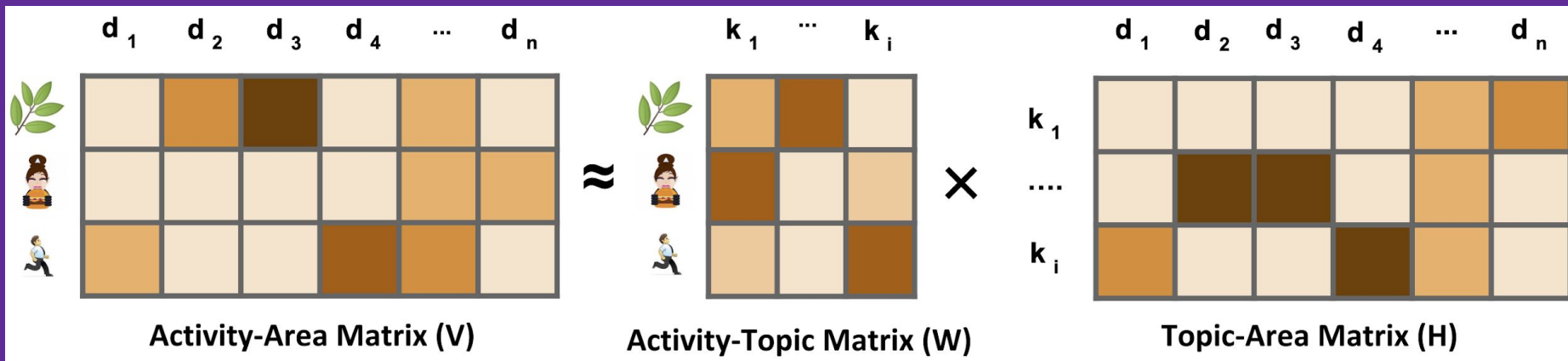
494
activities



n=districts

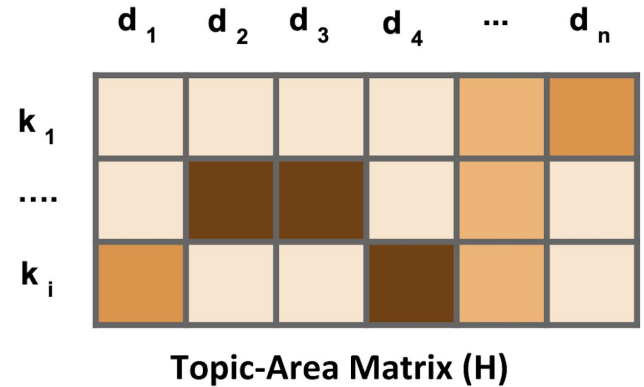
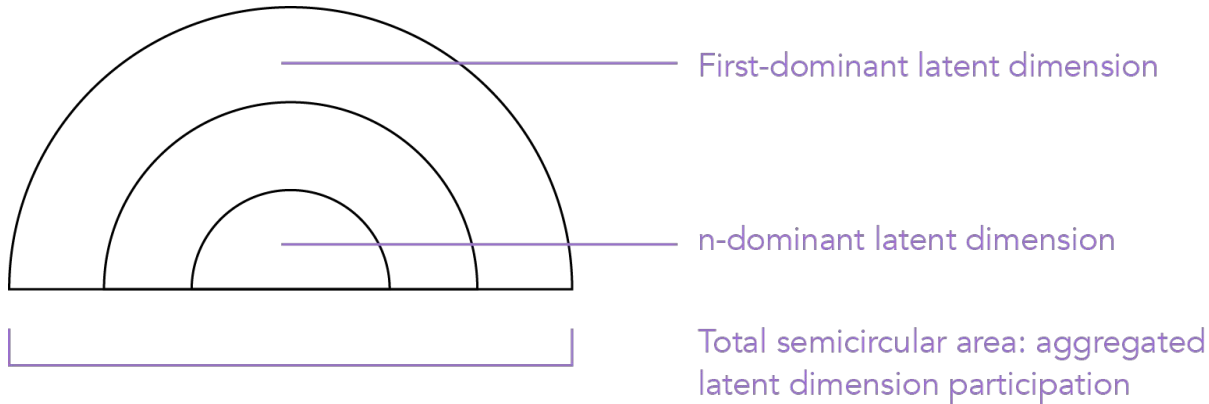
Activity-Area Matrix (V)

NMF



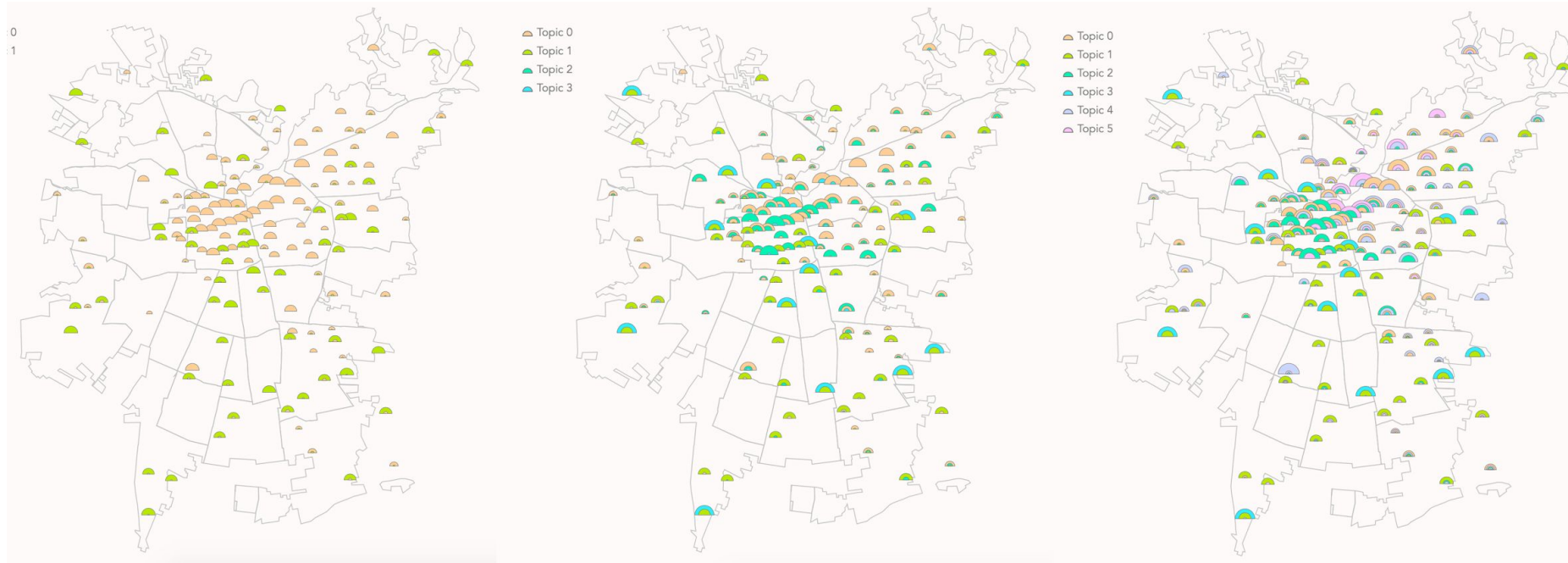
How many topics (k)?

Visualization



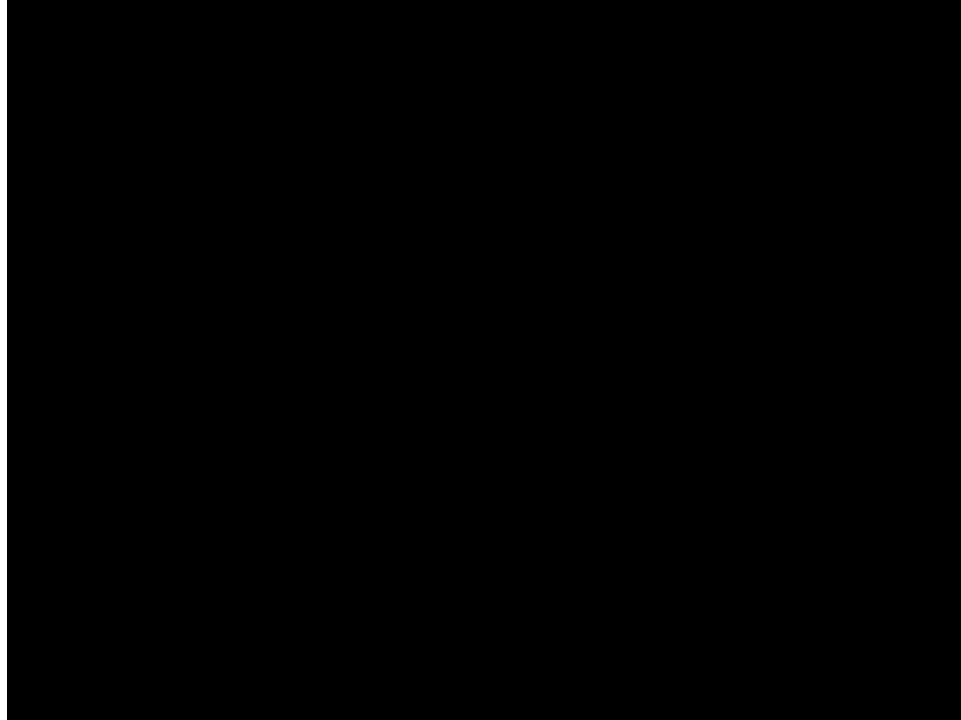
Visualization by Ignacio Perez-Messina

Santiago, Chile



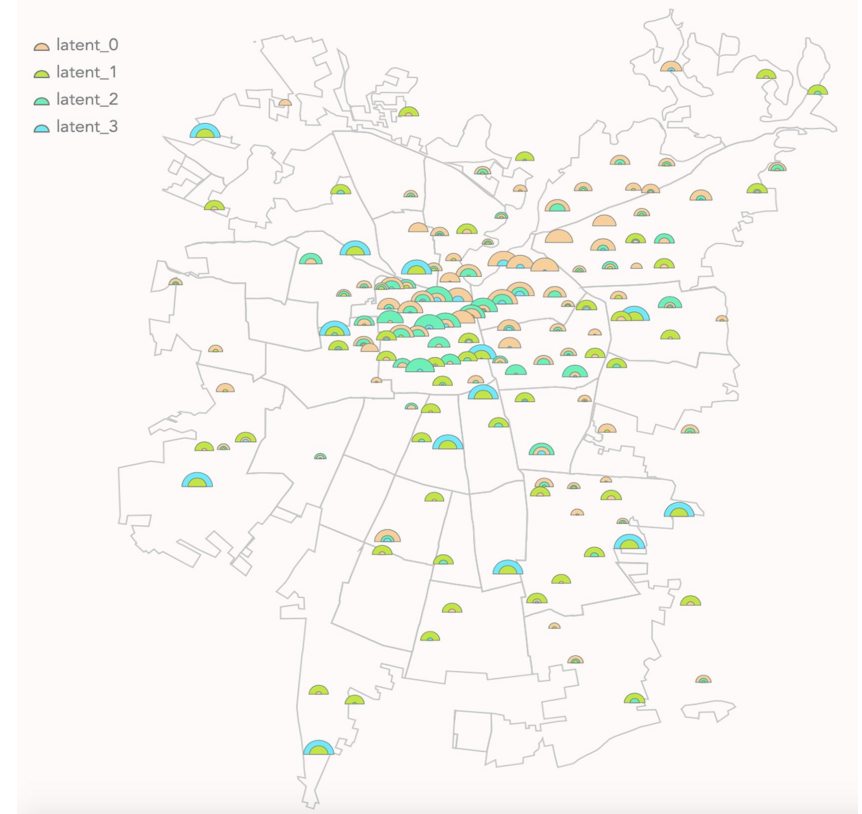
<http://flickering.baltazarperez.com/Hoods/>

Santiago, Chile



Discussion

- The topics obtained can characterize the urban space, as they exhibit spatial patterns that can be interpreted using visualization.
- Santiago, a highly segregated city, center-periphery and land-value spatial tensions were reproduced in the topic level.
- For the case of Santiago, $k = 4$ seems to offer a balanced number of topics in terms of diversity and possible interpretability.
- However, that the patterns we found need to be studied further, to include spatial autocorrelation into the analysis



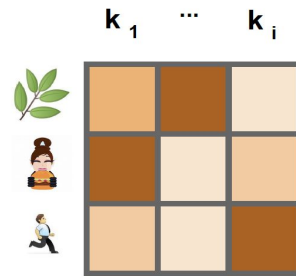
Discussion

k0: indoor activities (dining, shopping, etc)

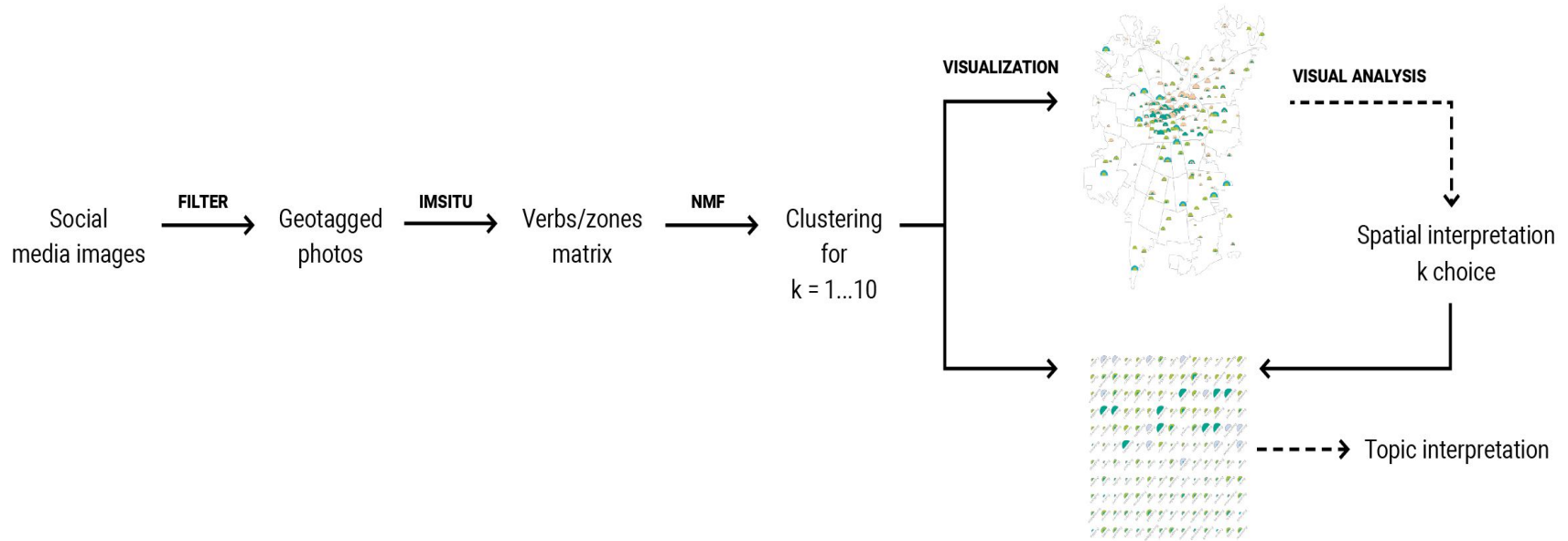
k1: garden or park activities

k2: social activities at public places

k3: outdoor



Methodology



Future Work

- Include more granular units, such as neighborhoods.
- Include other variables and data sets to enable new directions of analysis
- Study the evolution of topics in time. This would allow to study the dynamics of activities in areas.
- Evaluation of the visual design of the glyph and its effectiveness in portraying what characterizes the city .
- Consider other cv methods to extract activities.



Thank you!