



The European Colloquium on Theoretical
and Quantitative Geography

7-11 September 2017.
York, UK

Retail Activity and the City

Contributions from the Analysis of Urban Fabrics

Alessandro ARALDI, Giovanni FUSCO
Université Côte d'Azur, CNRS, ESPACE, France



Retail activities in cities: *the 3 revolutions* (Desse et 2017)

Technology

Changement in social habits

Impact on retails

End 1800

After



Where?



It's not a substitution rather a coexistence of different forms of commerce

The buying experience

In the last decades, traditional shopping has evolved:
it's not just the act of buying a good....

...there something more: cultural and historical landscape,
landmarks, urban spaces....



Same evolution for big commercial surfaces....



The buying experience => the urban experience

Urban Fabric

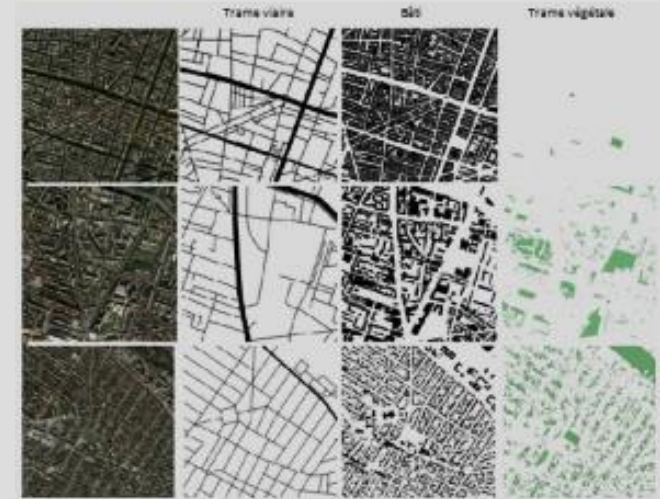
The **finest scale of analysis of urban form** (city block, neighborhood).

Classical schools of urban morphology (Italy, France, UK): typical relations between elements of urban form revealing an urban culture

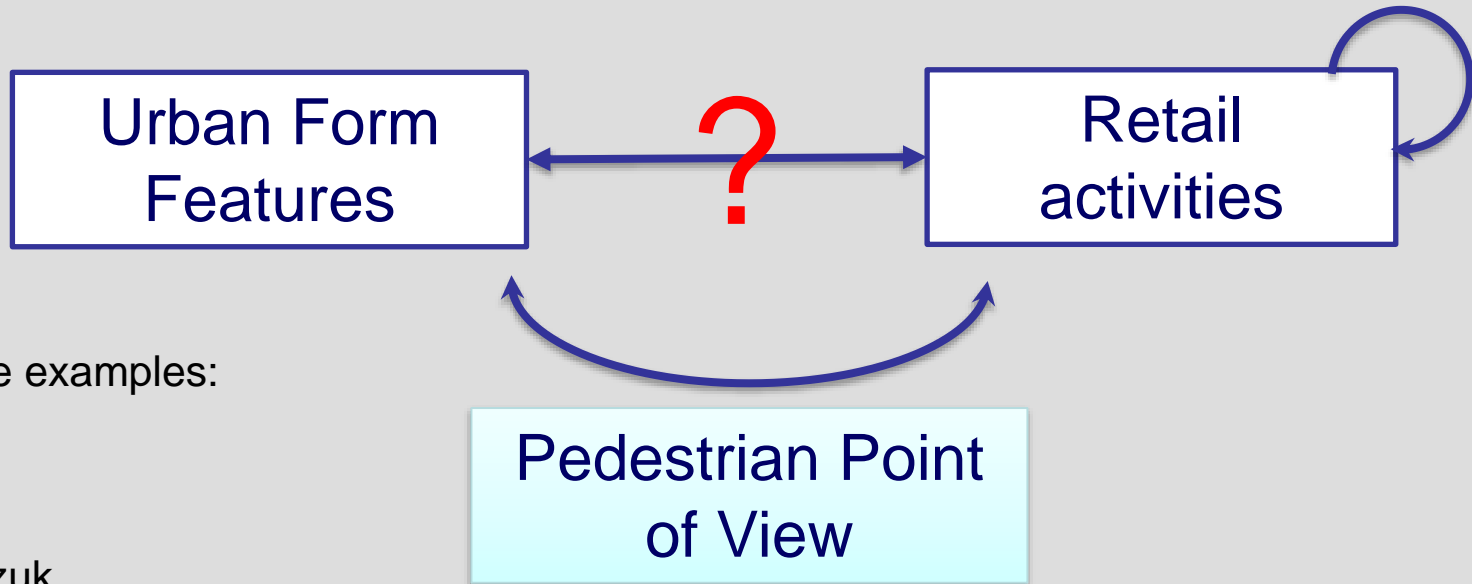
Focus of traditional urban morphology:

1. identification of urban fabric components (streets, buildings, parcels)
2. their geometrical description
3. analysis of their spatial relationships
4. study of the historic process behind the observed forms

Emphasis on urban form analyzed on plan.



How to cross analyse?

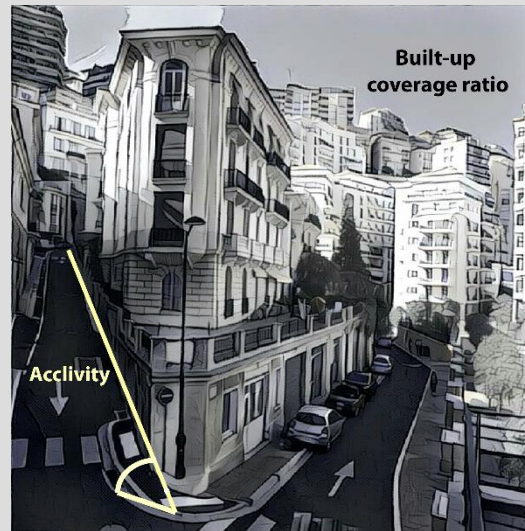
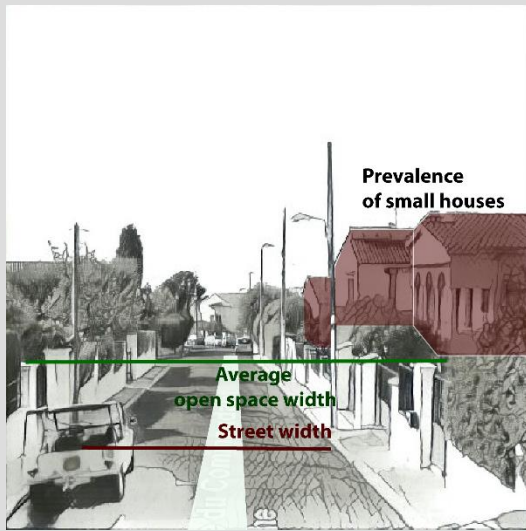


Some examples:

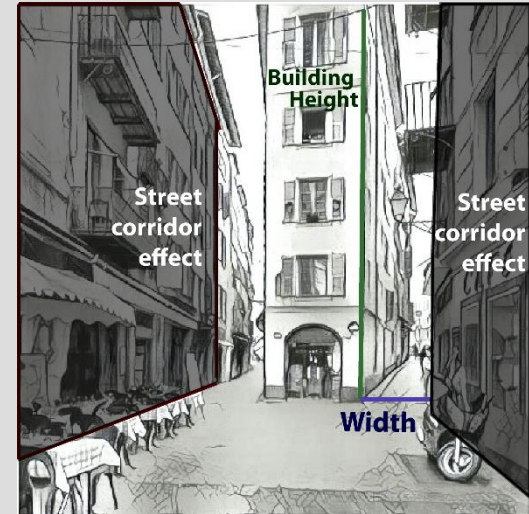
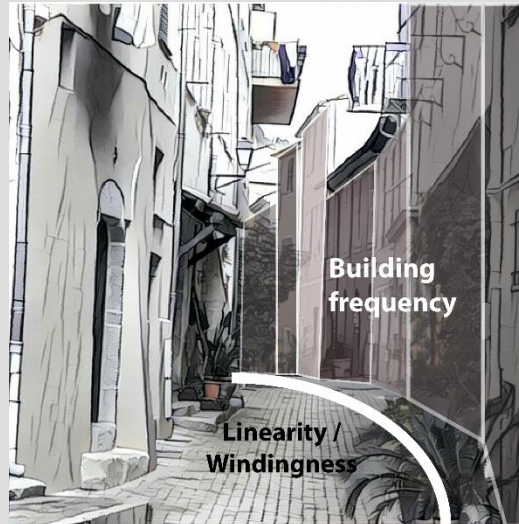
SSx
MCA
Svetzuk
Pepponis
.....

Objective of this study:

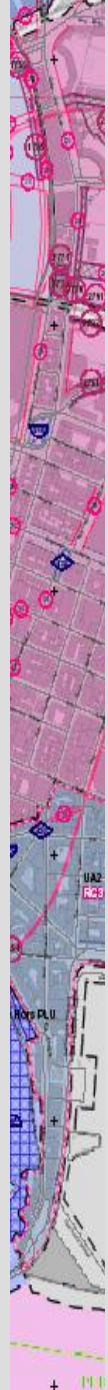
How to analyse the spatial relation between urban form and retail distribution...
...through the pedestrian point of view
...with a spatial statistic approach
...from a qualitative to a quantitative and extensive approach



Morphological indicators from pedestrian point of view



Tomorrow's presentation « » we will discuss about these indicators, how to obtain them and how we used in order to classify urban fabrics

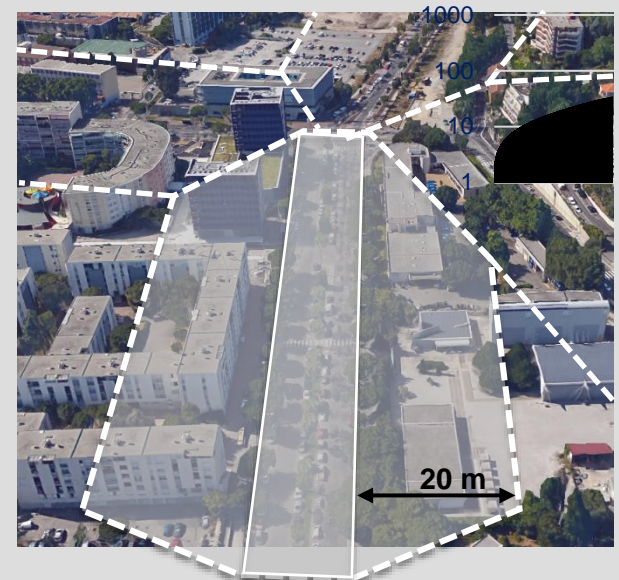
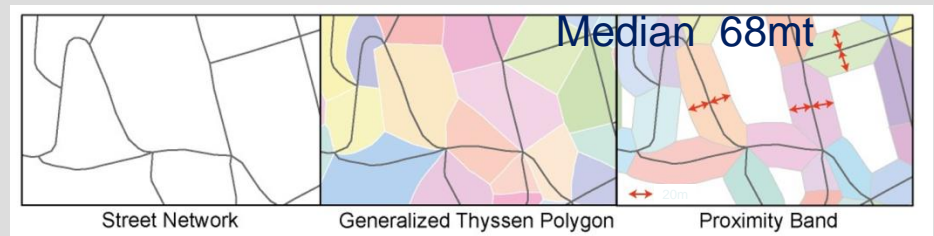


Spatial Unit Definition

Street proximity bands: the pedestrian point of view of urban fabric.

100k segments/PB
Mean 112mt
Median 68mt

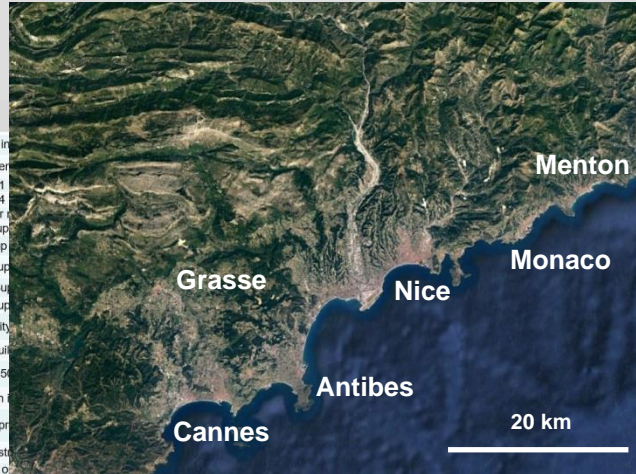
Partition of the planar urban space into regions based on closeness to each network segment within a certain distance from the segment (10 m, 20 m, 50 m)



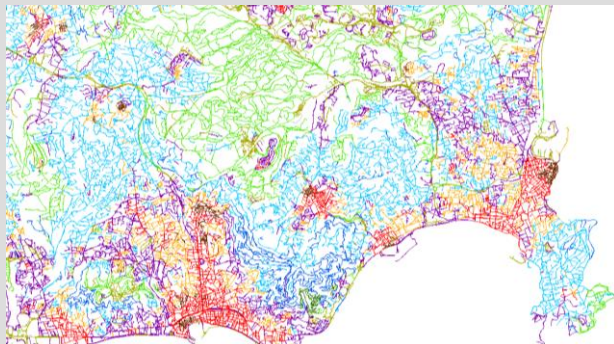
Street L

Urban Form and Retail Distribution

Urban Fabric Component	Indicator	Definition
Network Morphology	Street Length	Network length of the street segments between two intersections
	Linearity/ Windingness	Ratio between Euclidean distance and segment length
	Local connectivity	Average presence nodes of degree 4
Built-up Morphology	Prevalence of Building type	Average presence nodes of degree 3, 5 or 6
		Ratio between 0-125 m ² building surf. and total built-up
		Ratio betw. 125-250 m ² building surf. and total built-up
		Ratio betw. 250-1000 m ² building surf. and total built-up
Network-Building Relationship	Proximity band coverage ratio	Ratio betw. 1000-4000 m ² building surf. and total built-up
	Building Contiguity	Ratio between >4000 m ² building surf. and total built-up
	Specialization of Building Types	Building coverage ratio on the 50 m proximity band
Network-Parcels Relationship	Street corridor effect	Weighted average of buildings frequency on building types
	Proximity band building height	Ratio between specialized building footprint and 50 m proximity band
	Open Space Width	Ratio between parallel façades and street length
	Height/Width Ratio	Ratio between building vol. and surf. inside 20 m proximity band
Network-Site Relationship	Building frequency along street network	Ratio between open space within 20m PB and street length
	Plot fragmentation along street network	Ratio between average building height and average open space width within the 20m PB
Site Morphology	Surface slope	Ratio between number of buildings in 20m PB and street length
Network-Site Relationship	Street acclivity	Ratio between number of parcels in 20m PB and street length
		Computed as segment average of arctan(slope)



Indicators of retail densities



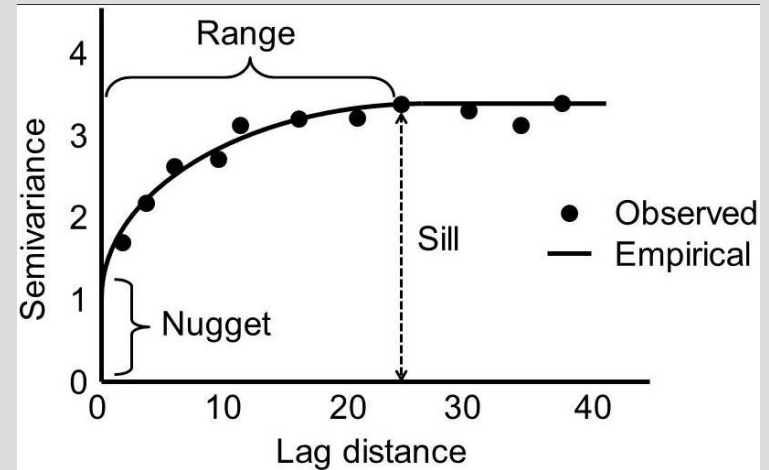
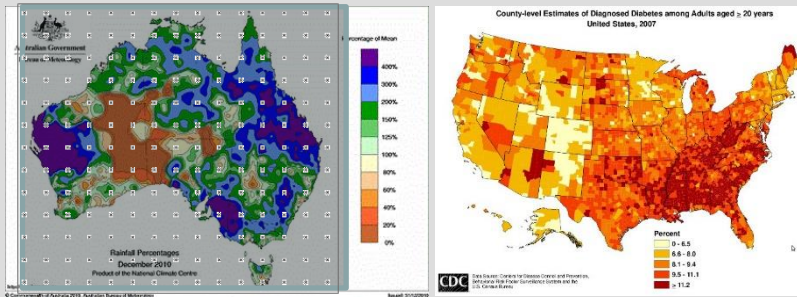
Which characteristics of the urban form have a positive/negative influence on the presence of retail activities

9 families of urban fabrics

Variograms and Cross Variograms

Variogram

$$\gamma f(h) = \frac{1}{N} + \sum_{i=1}^N (f_{i+h} - f_i)^2$$



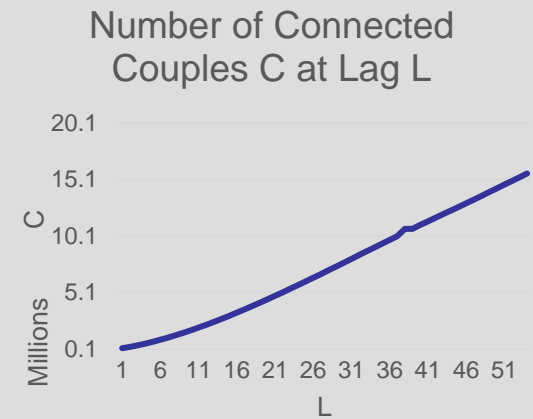
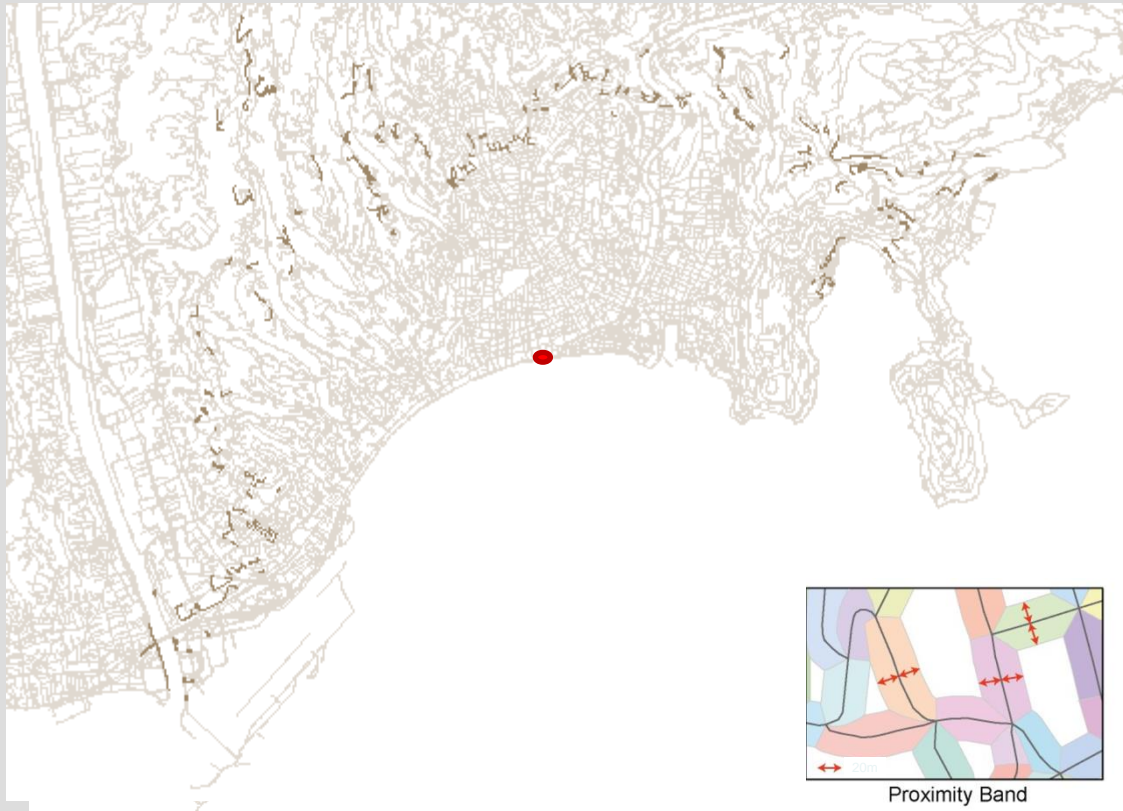
Cross Variogram

$$\gamma fg(h) = \frac{1}{N-h} + \sum_{i=1}^{N-h} (f_i - f_{i+h}) (g_i - g_{i+h})$$

- These techniques have been created in the mining field in order to study the spatial patterns of minerals
- Variograms tell us the spatial patterns of a distribution: the radius, directions,...
- How to apply this technique to our study case?

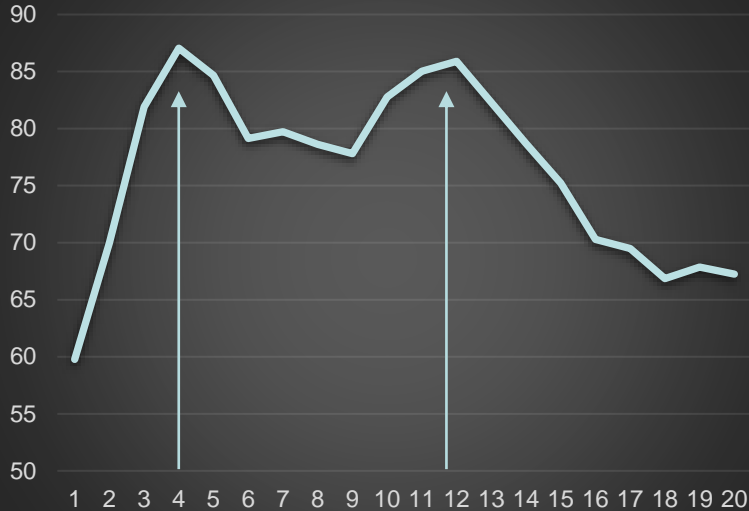
Variograms and CrossVariograms

Contiguity Variogram and Contiguity Cross Variogram,
based on a topological network structure

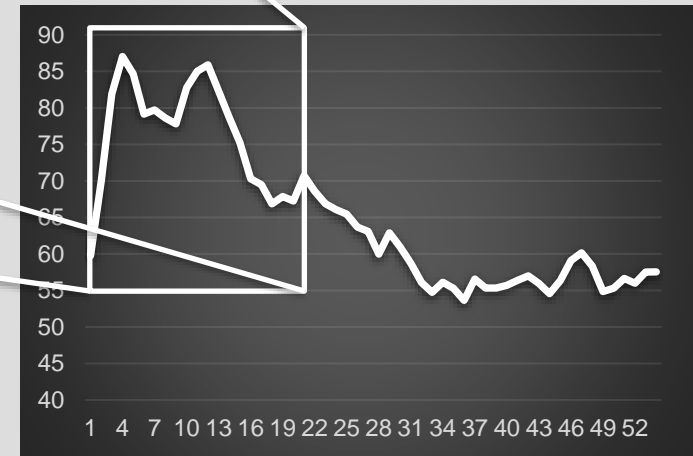


Topological Lag 16, 32, 55

Variogram Retail Surface Density



Contiguity variogram of the retail surface density on a network constrained space applied on all the study area

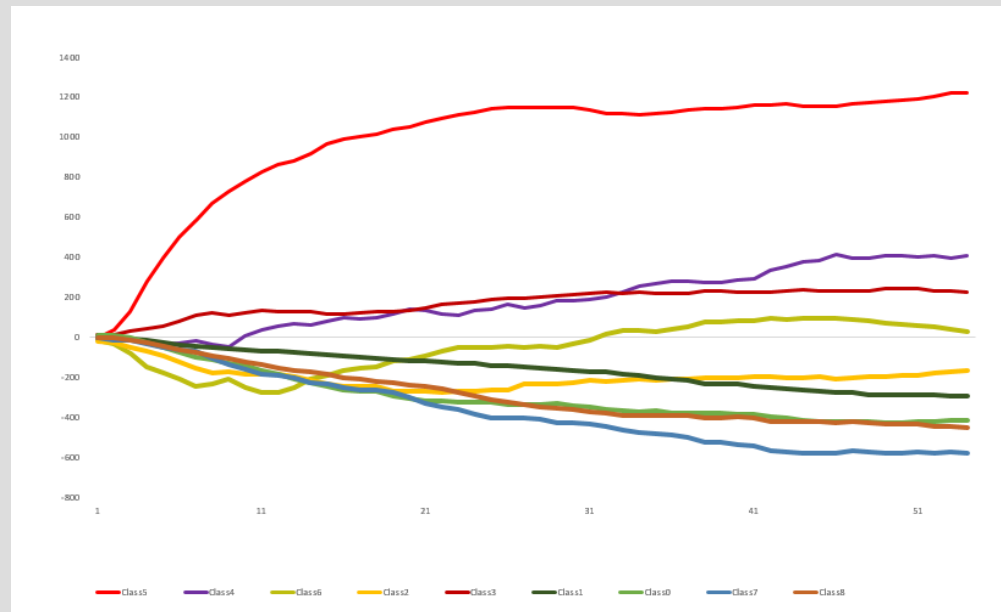


-Variogram of the retail distribution informs about its spatial organisation as well as intensity and topological extension of the autocorrelation:

-Nested structures (Serra J 1968)

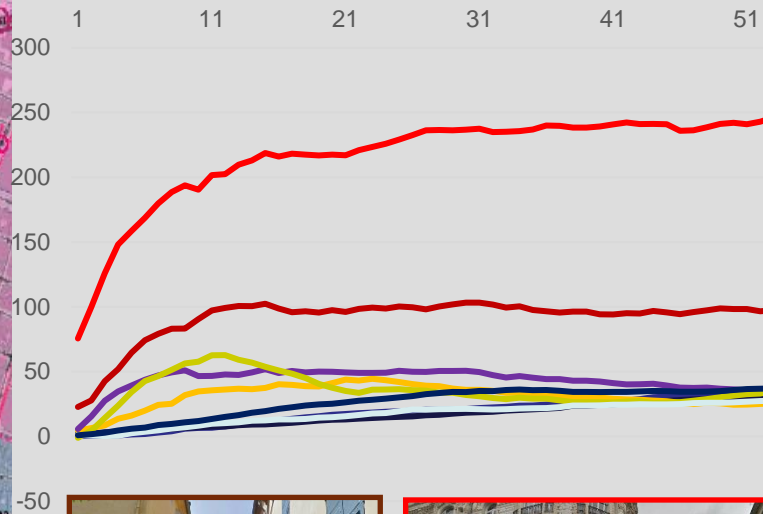
-Comparison between subspaces could reveal other spatial behaviour

Cross Variograms: Retail Density-Urban Fabrics Type

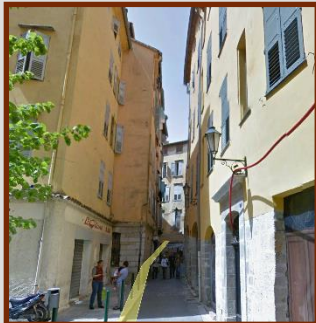
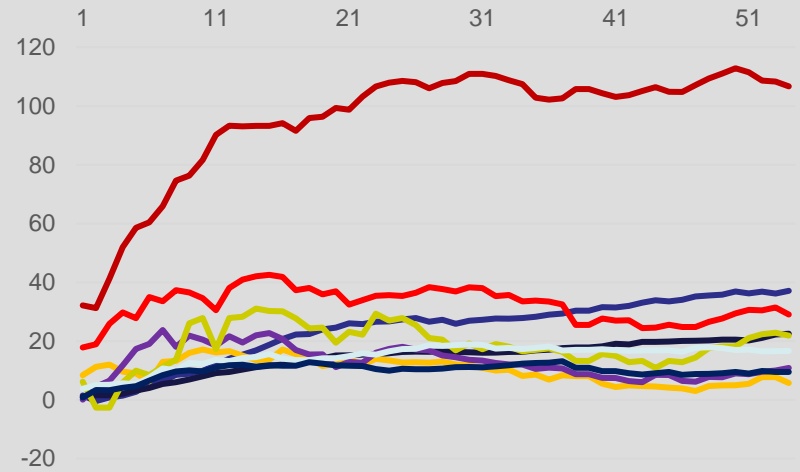


Cross Variograms: Retail Density-UF Indicators

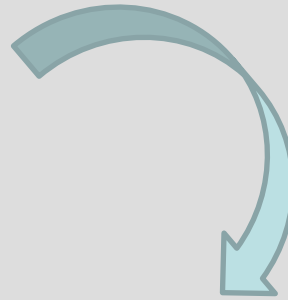
Parallel Facades



Parcel Frequency



How these analyses can be applied





Conclusions

A new geostatistical approach:

- Variography of socioeconomic phenomena within a street network taking into account the pedestrian point of view
- Cross analysis with urban form from pedestrian point of view
 - Cross-analysis with urban fabrics: relation between retail and overall urban form
 - Cross-analysis with individual indicators: role played by each morphological factor within a given urban form

Possible applications:

- Necessary step for understanding spatial structures and specific lags for parametrising spatial regressive/autoregressive models
- Method can be applied to other socio-economic function with a quantitative approach (crime, accidents, etc)



Thankyou for your attention

Credits :

G. Fusco – giovanni.fusco@unice.fr

A. Araldi – alessandro.araldi@unice.fr

