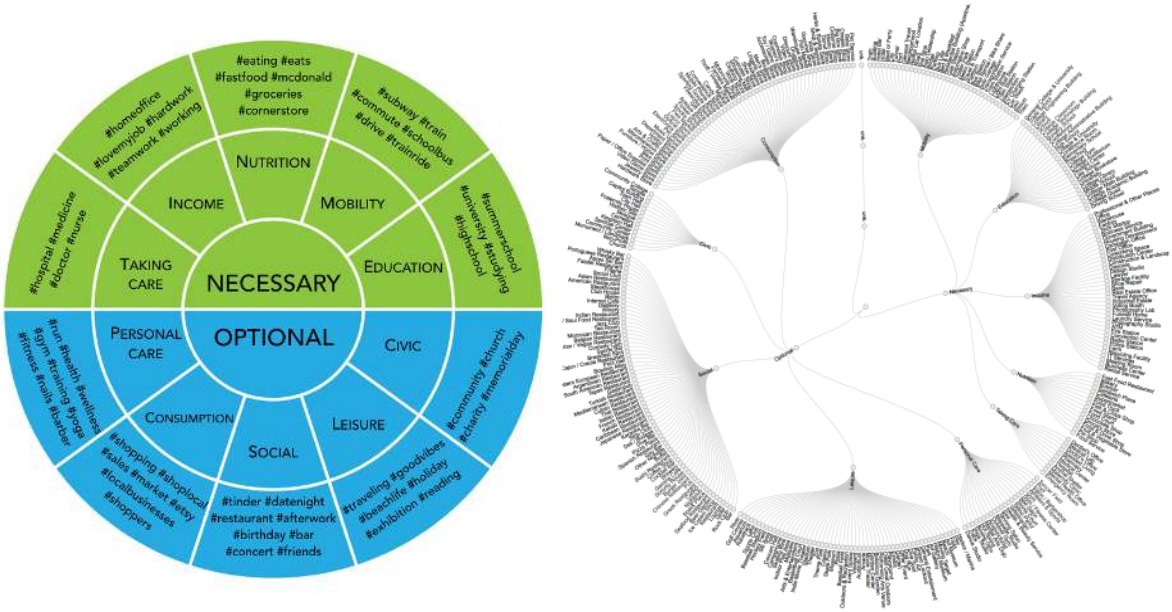
The geographic distribution of amenities is topical to the definition of spatio-temporal patterns of urban and rural settlements. Numerous studies have revealed the spatial relations that govern the location choice of these establishments although it is primal to map and understand these relations in their socio-cultural context [19], [20]. In particular we are going to focus on clustering and dispersal phenomena to learn how the spatial relations between socio-economic establishments are typical to the urban and regional contexts of one city.

In this context, we may understand Social activities as a part of those performed when one has free time, so we included them into the category Optional. Thus, we firstly divide all activities in these two major groups, Necessary and Optional.

In order to be able to operate with categories in a more detailed way and define uses, it is needed to define activity types more accurately, but at the same time to let these new categories be flexible enough to include all kind of Foursquare venues in them. To do so we use the SPIN Unit Urban activity Wheel [22]. The novelty of this approach is the classification of amenities not by type or function but according to the spectrum of human activities they can host. In this way we are going to perform an indirect observation of activity patterns that can be scaled from local to regional scale - something that is traditionally performed with long terms and micro-scale only surveys a field observations.

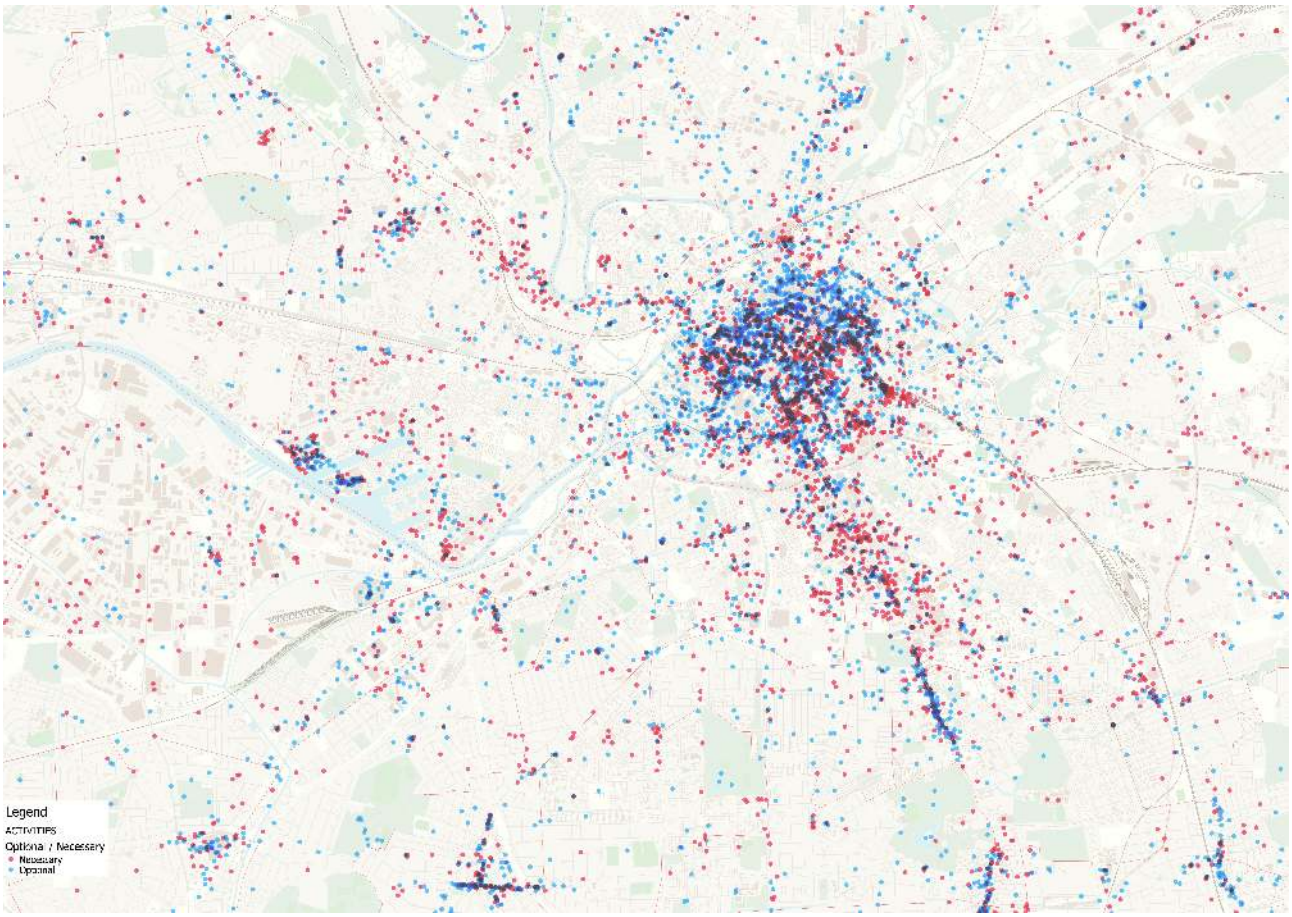
This classification method was created from empirical observations of people performing activities in public and private spaces to study the difference between what the city offers (Supply) through its amenities and what people do in the city (Demand). This method is designed to categorize Foursquare venues to map and measure the Supply and other datasets such as Instagram and Twitter to measure human activity patterns in the city (Demand). In this paper we reclassified Foursquare data only to measure the complexity of activity patterns offered by the city and study if their distribution has a clear relations to the perceived form of the city.



The more those activities are evenly distributed, the more social and economic opportunities one borough may offer. Therefore we count the amount of activities present in each borough and compare them with the following graph.

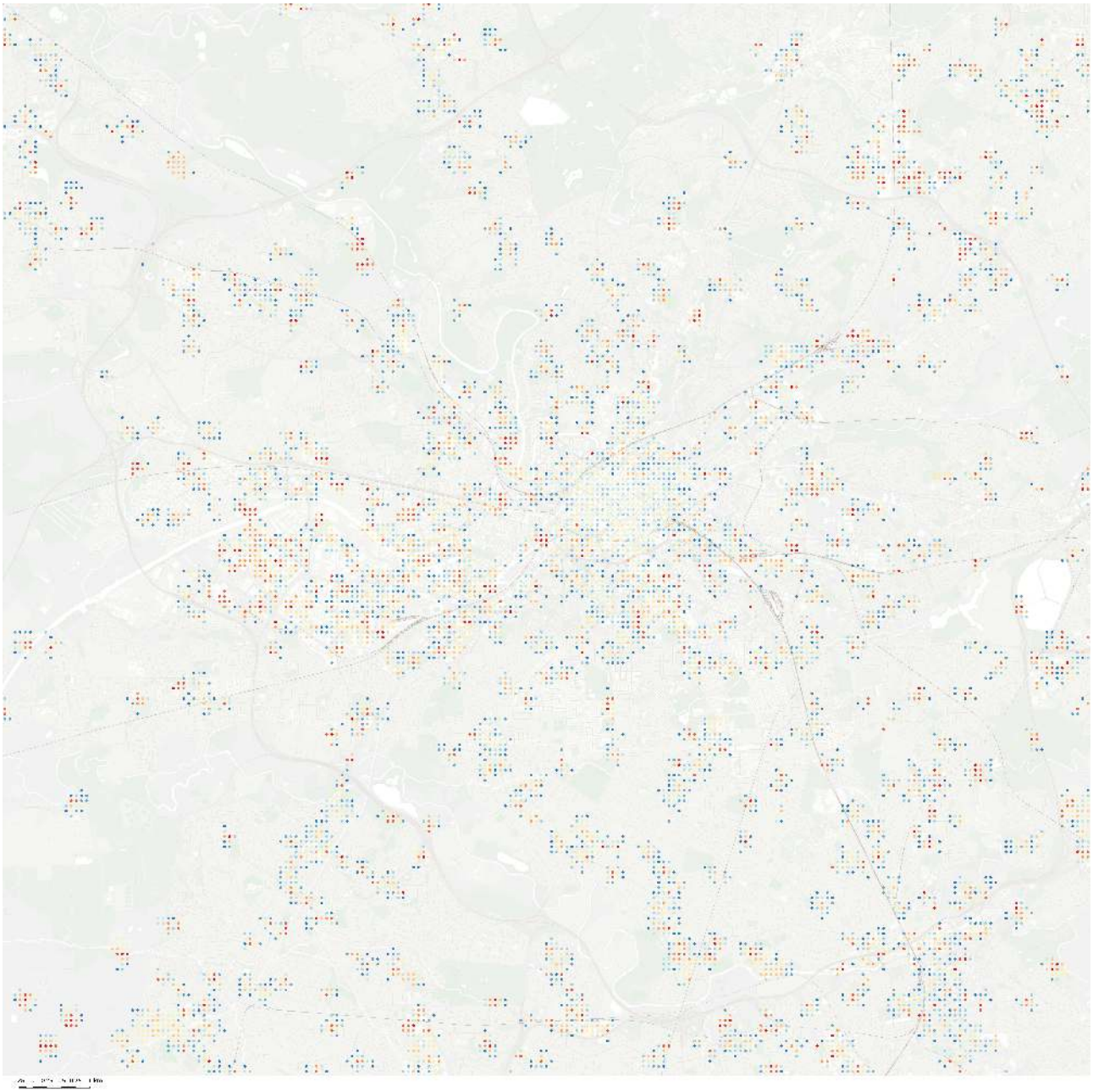
Further it is possible to focus on our area of interest and measure not only how many places (activities) are present but also measuring how popular they are. To do so we count how many users have visited one activity and how many check-ins registered.

Activities are then mapped to learn where they cluster and where an actual fixity is present in the city.



The third step of this process is to measure how accessible are those activities. To do so we analyse the distances between each point of the city and each category of activity for radiuses of 400, 600, 1200 and 6000m - distances are calculated along the street network. This measure that we call

In this map is possible see the places from where more activities of one kind can be reached

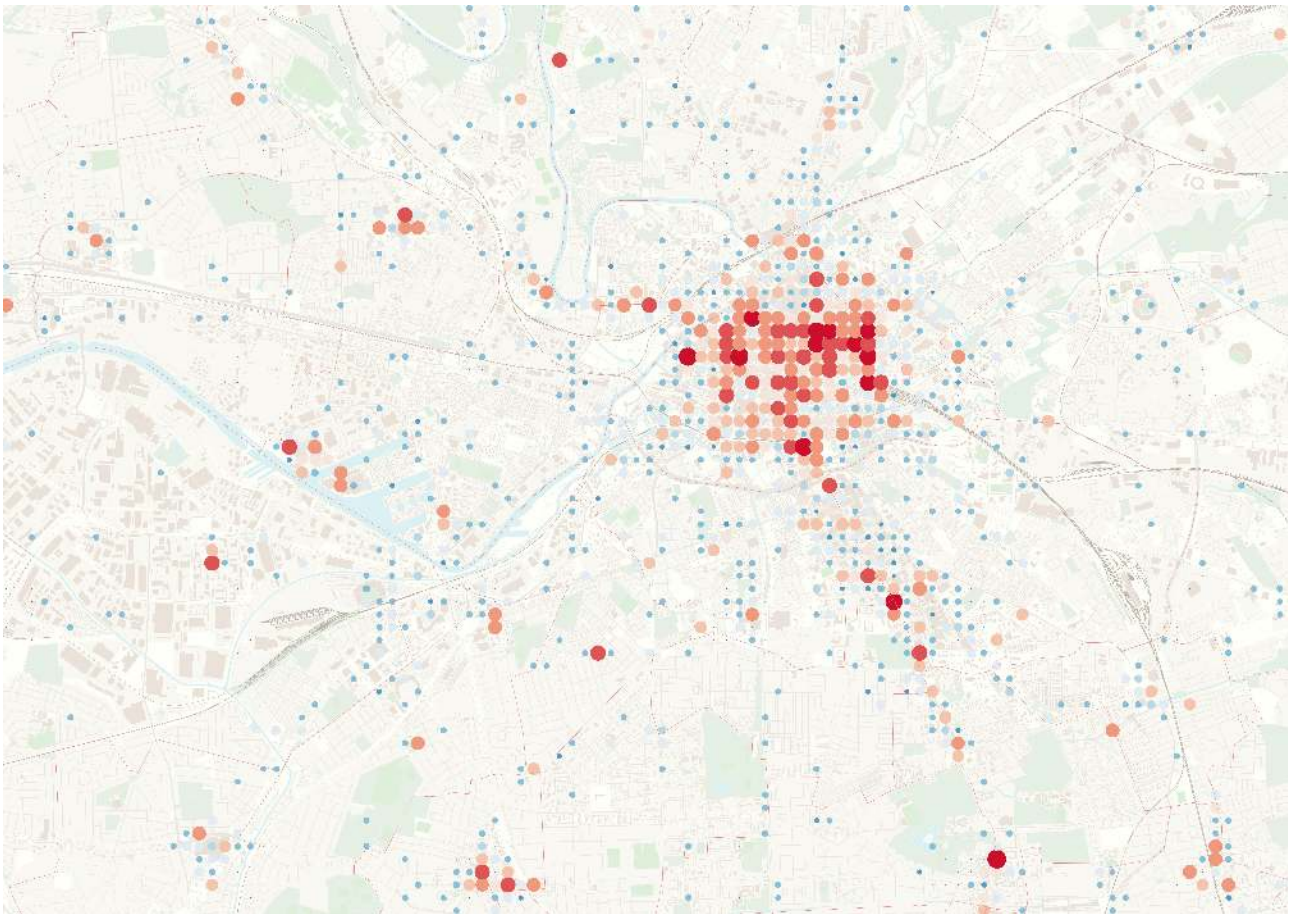


The last part of the process is to calculate the complexity of those activities. The higher the complexity value the more diverse are the activities that can be found in one place.

From a pragmatic point of view, Rueda [26] refers to complexity as "*the measure of the degree of organization of the urban system*" in terms of "*the diversity of the mix of uses and services*" [9, p. 5]. Complexity defined as the set of relations between all elements that constitute the city, the "complex self-regulating system" shows the ecosystemic nature of the same. For this reason Rueda [26] states that this degree of complexity can be obtained through the application of the equation corresponding to the Shannon-Wiener complexity index developed to measure the degree of entropy of an ecosystem [27].

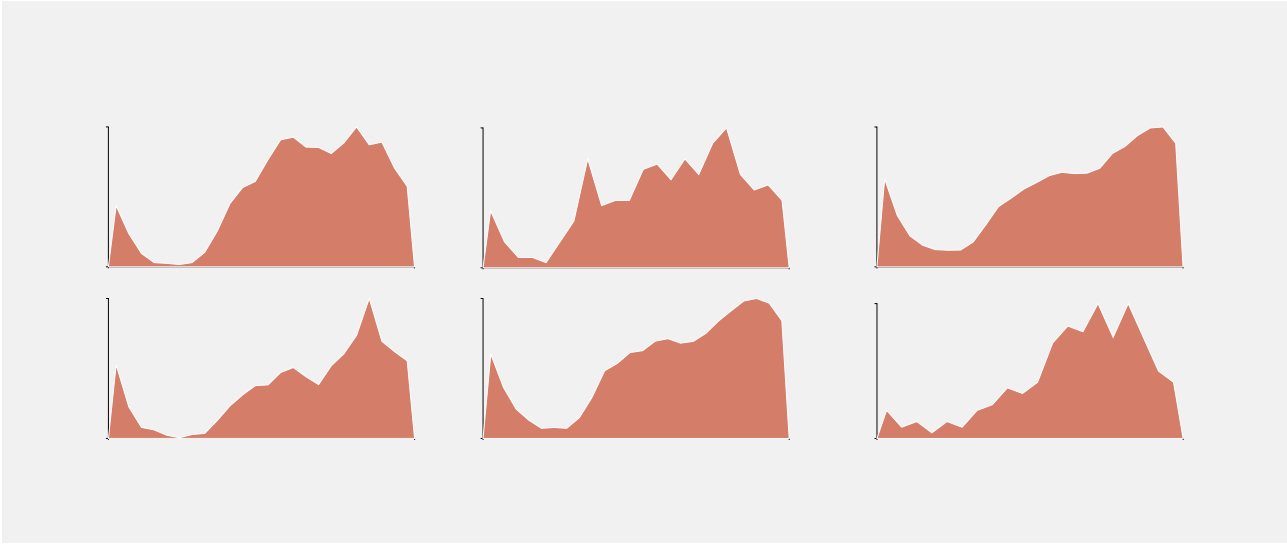
Within the field of urban studies and in relation to social networks and web services, Nolasco-Cirugeda and García-Mayor [4] use data collected from Google Places to evaluate the functional urban complexity of economic activities that directly affect urban space [4, p. 4]. They concluded that the functional appeal linked to the tourism experience and indicators of sustainability in its case study – Benidorm, Spain - is proportional to the degree of complexity through the application of the Shannon-Wiener index. Therefore, they also corroborate the possibility of applying this index as a truthful indicator of urban complexity.

Therefore, we could define of urban complexity as a simultaneous measure of both the density and diversity of economic activities in a given urban space, which is directly related to spatial experience and can be measured quantitatively through the application of the Shannon-Wiener diversity index.



Those analysis give an overview of Manchester from the city's perspective but we have run a different set of analysis using Instagram data to measure how users use and value the area. By looking at 9 200 of Instagram pictures, our researchers have classified the activities that people carry out in the area, using the same classification for the amenities. Further studies may also reveal the gap between users' activities and available activities to better understand use and misuse of public and semi-private space.

Instagram picture were also used to reveal temporal patterns in our AOI



Twitter was also used to reveal temporal patter in our AOI but due to the very short period of this project, only the summer period was charted.