Geo-localised data is the majority of data generated today. Their constant inflow for use in empirical research creates incentives for developing a methodology for their analysis and creating economic theories based on new insights. This project answers these research needs.

From a methodological perspective, the analysis of point geo-localised data requires specific quantitative methods taking into account proximity and location, as well as being scalable to big data. Classical spatial econometrics methods, which accounted for spatial autocorrelation (similarity to neighbours) and were designed for regions, cannot be easily implemented for point data, the grid data or satellite images data due to the limitation of scalability and the required stability of the spatial weight matrix. There appear attempts to use machine learning methods, although these are still a-spatial applications that do not consider spatial autocorrelation. The modelling challenge is the point data that exhibit very diverse spatial density, variable location and large volume.

From the theoretical perspective, the differentiated relative spatial density of phenomena, mainly the location of companies, is poorly studied and is still not a factor explaining economic processes. This project hypothesises that the economies of density can effectively explain companies' location decisions from various sectors, mainly in the core-periphery setting. It is necessary to verify this hypothesis empirically, which may shed new light on the mechanisms of economic and decision-making processes of enterprises on a micro-scale and develop a suitable method of detecting a potential favourable location for new companies from the selected sector.

This project assumes comprehensive research on the diverse density of company locations as part of three tasks: 1) methodological works, 2) theoretical works, and 3) empirical works. Assumed contribution of the project to the development of science:

- in the field of quantitative methods methodology: creating the concept of a spatial switching model, allowing for modelling spatial endogeneity resulting from the allocation of points to clusters of different densities, improvement of the scalability of econometric methods and better adjustment of the model in the situation of spatial heterogeneity. It is an intermediate approach between the global model with one factor and the model with individual factors for each observation (GWR, *Geographically Weighted Regression*). A switching model is an approach similar to the frequently used partitioning of large data sets to parallelise calculations and allows for a significant increase in the scalability of calculations while maintaining the feasibility of estimation on office equipment and in typical software for spatial analysis.

- in the field of quantitative methodology: developing a methodology integrating supervised and unsupervised spatial machine learning and spatial econometrics to auto-classify new points to clusters and predict the area's location potential, improve the quality of forecasts and model self-learning

- the scope of economic theory: development of the theory of economies of density, previously used mainly in logistics, in connection with theories of firms' location choice and the economies of agglomeration, urbanisation, concentration

- in the field of empirical research: development of a pilot model for detecting the potential location of companies from selected sectors and forecasting the location potential of a given territory

The project results can be used in research on the location of companies, urban and spatial organisation, territorial cohesion, agglomeration problems, congestion, external effects, including environmental effects, settlement preferences, in geo-marketing, designing catchment areas or modelling the mobility registered in mobile phones data.