**Abstract: Automated Measurement of Cultural Cohesion Between Budapest Districts and Adjacent Municipalities Using Artificial Intelligence**

The aim of this research is to measure the cultural cohesion of Budapest's districts and the surrounding suburban municipalities using AI-based, objective modelling tools. The focus of the study is to examine which districts are culturally integrated into Budapest's urban structure and which peripheral settlements could potentially be annexed into the capital. One of the research's central questions is whether an automated system can be created that is capable of rethinking Budapest’s administrative spatial structure from a cultural perspective.

The methodology is based on time-series data from the Hungarian TEIR database, covering the period from 2011 to 2023. After manual relativization of the necessary data, two object-attribute matrices (OAMs) were created—one for Budapest’s districts and another for the municipalities in the agglomeration. A key innovation of this study is the introduction of the “statistical neuron” concept, which analyses the effect of the variance of individual territorial units on others. During data processing, models such as the COCO Y0 artificial intelligence engine were used to calculate cultural homogenization indices for both districts and municipalities. To measure the level of cultural cohesion, a multidimensional indicator system was applied, incorporating demographic, educational, economic, and social characteristics.

The results revealed several Budapest districts that, from a homogenization standpoint, are less integrated into the capital’s structure, as well as peripheral settlements whose integration into Budapest would be justified. Regional stability analyses also highlighted that the differences in homogenization between suburban towns bordering Budapest and its inner districts show diverse spatial and temporal patterns. Moreover, the research demonstrates that AI-based spatial modelling can effectively support long-term urban governance and decision-making.