

# **Title: Virtual On-Demand Volunteer System Based on Delaunay Triangulation**

## **Abstract:**

The unprecedented events of 2020, including the COVID-19 pandemic and the ongoing conflict in Ukraine that started at the end of 2021, exposed the vulnerability of communities and the urgent need for accessible, efficient, and localized support systems. Elderly and physically challenged individuals faced significant challenges in performing basic tasks like grocery shopping due to the fear of infection, while others displaced by the war sought safe-havens. Although many people offered assistance, connecting those in need with available volunteers remained a complex issue.

In response to these challenges, this thesis proposes the development of a dedicated, on-demand volunteer platform that will enable direct connections between those seeking help and volunteers offering their services without the involvement of intermediary organizations. The platform will allow users in need to search for volunteers in their area who can assist them with various tasks such as shopping or wheelchair use. In return, volunteers can proactively post their availability and the distance they are willing to travel.

To achieve this, a novel volunteer matching system combines the power of Delaunay triangulation, bipartite graphs, clustering techniques, and spatial analysis to optimize the matching process based on proximity and availability. Through this innovative approach, the solution aims to streamline the process of connecting volunteers and individuals in need, ultimately fostering more robust and more resilient communities in times of crisis.

This thesis contributes to the growing research on community support systems by harnessing cutting-edge technology to address real-world problems. It demonstrates the potential of combining spatial and graph-based algorithms to create impactful, scalable, and efficient solutions for the greater good.