# EÖTVÖS LORÁND UNIVERSITY
## FACULTY OF INFORMATICS

# Thesis Registration Form

**Student's Data:**
   **Student's Name:** Kuknyó Dániel
   **Student's Neptun code:** Y80L35

**Course Data:**
   **Student's Major:**        autonómrendszer-informatikus, mesterképzés (MA/MSc)

I have an internal supervisor

*Internal Supervisor's Name:*  *Lőrincz András*
   *Supervisor's Home Institution:*        **Department of Artificial Intelligence**
   *Address of Supervisor's Home Institution:*  **1117, Budapest, Pázmány Péter sétány 1/C.**
   *Supervisor's Position and Degree:*        *Dr.*

**Thesis Title:** Traffic Control and Infrastructure Organization Using Reinforcement Learning

**Topic of the Thesis:**
*(Upon consulting with your supervisor, give a 150-300-word-long synopsis os your planned thesis. )*

**My plan is to build an interface that models traffic flow in a graph-based structure, then train a reinforcement learning algorithm to find the optimal configuration of the roads in order to transport the most cars in the most effective way possible. Here's when the urban design principles come in: one can easily observe that the most effective way to transport as many cars as possible is if all roads are 8-lane highways. However it's also easy to see that it's miserable to live in a city where there are no quiet, auto-low streets and only 8-lane highways. This might be the best configuration for cars, but it would make the life of people living in the city absolutely horrible. The rewarding system of the reinforcement learning environment will be designed in order to reflect these principles: building cost, traffic light/roundabout tradeoffs, how humans would feel living next to the road. The agent will have to decide where to build, destruct, or make roads 1-way to make the city's transportation flow dynamic but also make it livable for humans. The rewarding scheme will reflect the principles laid down by Strong Towns and other urban planning organizations significant in the field like Happy Cities: Transforming Our Lives through urban design.**
**The developed software will provide an interface where the user can make a graph, describing the intersections (nodes) and roads (edges) of the city in question. This for example can be done in GeoGebra and exported into a construction protocol in order to work as an input for the model.**

**The interface will read a construction protocol, construct a graph and all the possible pathways from it. And create a starting configuration with 2-way roads between all the nodes of the graph. The vehicle rate and distribution can be controlled before starting the simulation.**

**The vehicles are passing from one entry point to another, without necessarily choosing the shortest path, or being evenly distributed among all the roads, just as one would find in real life. The drivers' model will incorporate an intelligent behavior, like slowing down after the car in front is slowing down or gradually speeding up after a light has turned green with a comfortable acceleration parameter.**

**The road configuration will be examined with multiple methodologies like how many steps does it take for the roads to transport 100 cars or how much the road infrastructure would cost. If the agent is handed a road configuration it will be able to find the optimal one, with the least cost, least unnecessary roads and fastest transportation for a given amount of cars.**

Budapest, 2022. 11. 29.