



HEAD OF DEPARTMENT

## MSc Thesis Task Description

**Máté Nyikovics**

candidate for MSc degree in Computer Engineering

# Image Resolution Enhancement Using Multi-Step Reinforcement Learning

Enhancing image resolution is a class of techniques that applies a set of image processing actions on the image to obtain a higher resolution version of the image. To standardize the image enhancement process, a policy that defines which action is more suitable to which corresponding part of the image should be well established. The objective of Reinforcement Learning search for such a policy that appropriates for a specific image dataset.

This thesis aims to design and evaluate a deep neural network architecture that is capable of searching and learning such policy and is capable to perform image reconstruction and denoising tasks on unseen images as well. This thesis will experiment on multiple image datasets. One of them is a benchmark dataset and the others are automated driving datasets.

Tasks to be performed by the student will include:

- Prepare the datasets that will be worked on, which are; BSD68, MIT-Adobe FiveK Dataset, MS COCO, BDD100K, cityscapes dataset, and Kitti dataset.
- Design, train, and evaluate supervised Convolutional models for super resolution (Pre-Upsampling, Post-Upsampling, Progressive Upsampling, Iterative Up and Down Sampling).
- Design and train adversarial training for the above models.
- Design complex loss function and try it for all of the above models.
- Design, train and evaluate Reinforcement Learning model for policy search among multiple image filtering and processing.
- Combine the supervised Convolutional and Reinforcement Learning models.
- Use a Bayesian optimizer to fine-tune the parameters of each action that optimizes the policy search process.

**Supervisor at the department:** Khalid M. Kahloot, PhD student

Budapest, 18 February 2020

Dr. Hassan Charaf  
professor  
head of department

