BACHELOR‘S THESIS ASSIGNMENT

I. Personal and study details

Student's name: **Kubov Yevhenii** Personal ID number: **492322**

Faculty / Institute: **Faculty of Electrical Engineering**

Department / Institute: **Department of Cybernetics**

Study program: **Cybernetics and Robotics**

II. Bachelor’s thesis details

Bachelor’s thesis title in English:

Implementation of a Neural Network for Autonomous Trail Following

Bachelor’s thesis title in Czech:

Implementace neuronové sítě pro autonomní sledování cesty

Guidelines:

Implement a neural network for autonomous trail following using data from RGB cameras placed onboard a flying micro aerial vehicle (MAV). The network should output the direction of the trail in the image to be used for navigation of the MAV so that it may follow the trail. The implementation should be able to run on the onboard computer of the MAV in ROS.
Evaluate performance of the neural network using standard evaluation metrics.
Evaluate robustness of the resulting navigation system in realistic simulations. The task is motivated by our research in swarm robotics (see http://mrs.felk.cvut.cz/research/swarm-robotics) and by search & rescue operations.

Bibliography / sources:

[1] A. Giusti et al., "A Machine Learning Approach to the Visual Perception of Forest Trails for Mobile Robots," ICRA, 2016.
[2] Seungho Back, Gangik Cho, Jinwoo Oh, Xuan-Toa Tran and Hyondong Oh , "Autonomous UAV Trail Navigation with Obstacle Avoidance Using Deep Neural Networks," JIRS, 2020.
[3] N. Smolyanskiy, A. Kamenev, J. Smith and S. Birchfield, "Toward low-flying autonomous MAV trail navigation using deep neural networks for environmental awareness," IROS, 2017.
[4] Bruna G. Maciel-Pearson, Patrice Carbonneau, Toby P. Breckon, "Extending Deep Neural Network Trail Navigation for Unmanned Aerial Vehicle Operation Within the Forest Canopy," TAROS, 2018.

Name and workplace of bachelor’s thesis supervisor:

Ing. Matouš Vrba Department of Cybernetics FEE

Name and workplace of second bachelor’s thesis supervisor or consultant:

Date of bachelor’s thesis assignment: **06.01.2022** Deadline for bachelor thesis submission: **20.05.2022**

Assignment valid until: **30.09.2023**

Ing. Matouš Vrba	prof. Ing. Tomáš Svoboda, Ph.D.	prof. Mgr. Petr Páta, Ph.D.
Supervisor’s signature	Head of department’s signature	Dean’s signature

III. Assignment receipt

The student acknowledges that the bachelor’s thesis is an individual work. The student must produce his thesis without the assistance of others, with the exception of provided consultations. Within the bachelor’s thesis, the author must state the names of consultants and include a list of references.

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Date of assignment receipt

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Student’s signature