Course title: Graph Neural Networks with Applications	Neptun code: GEIAL427-a

Course coordinator: Dr. László József Kovács, PhD, dr. habil., professor

type of lesson and number of lessons: **lecture (2)**

method of evaluation: colloquium

curriculum location of the subject: (autumn/spring semester): autumn and spring

pre-study conditions *(if any)*: GEIAL417-a Theory and Practice of Data-Mining

The task and purpose of the subject:

The aim of the course is to show the operating model of neural networks; Presentation of graph neural networks (GNN) ; how to use GNN for handling graph-based objects, Students practice the main steps of GNN development and usage.

Course description:

The main types of neural networks, the operational models of MLP and CNN, RNN networks. Management of graph-structured objects. The purpose of GNN networks its structure; parameters of GNN; message passing mechanism; convolutional GNN, application areas of GNN, programming of GNN networks, development and testing of GNN-based applications in the Keras/Tensorflow environment and Pytorch environment.

Required literature:

1. W. Hamilton: Graph Representation Learning, Morgan and Claypool, 2020

2. C. Aggarwal: Neural Networks and Deep Learning: A Textbook, Springer, 2017

3. L. Wu, P. Cui, J. Pei: Graph Neural Networks Foundations, Frontiers, and Applications, Springer, 2022

Recommended literature:

1. K. Broadwater: Graph Neural Networks in Action, Manning , 2021,

2. D Larose, C. Larose: Data Mining and Predictive Analytics, Wiley, 2015