

## Seminar Description "Graph Neural Networks Decoder using Stochastic Processes (SP)"

GAIN - Graphs in Artificial Intelligence and Neural Networks

November 2021

Both mathematical problems and real-world applications from different fields can be modeled as graphs. A very promising direction of machine learning is the field of Graph Neural Networks (GNNs). Most GNNs can be divided into so-called encoders and decoders. There are many different ways to choose a suitable decoder, depending on the problem on the graph to be investigated. Decoders based on stochastic processes are helpful, especially for event predictions on the graph or time predictions of events. Most of these decoders differ, given the assumption about the prior knowledge of the data. This seminar paper aims to take a closer look at these differences and similarities and compare them. In addition, we also want a brief analysis of their advantages and disadvantages.

### 1 Goals

- Creation of an overview of similarities, differences, advantages and disadvantages of different SP which are used in GNNs.

### 2 Prerequisites

- Basic knowledge: stochastics, neural networks

### **3 Student's tasks**

- Survey different SP and GNNs using those.
- Write Seminar paper (suggested chapters: abstract, introduction, GNN decoder based on SPs, Different SPs, discussion, conclusion)

### **4 Supervisor's tasks**

- Supervision online via zoom/dfn or in person if possible
- Short introduction
- Frequency: starting weekly, 1h, and then on demand (e.g., discussion, suggestions, evaluation, debugging)
- Provide a template for the seminar paper

### **5 Grading criteria**

- Academic approach: Literature review, approaches, review corrections, review of other students, etc...
- Seminar paper
- Seminar talk

### **6 Used Languages**

- Supervision: Deutsch/English
- Seminar Paper: Deutsch/English (In case you have no German skills please tell the seminar lecturer beforehand so that the groups can be divided properly)

### **7 Conditions**

- Credits: Depending on the examination regulations