

General information on the Lecture Graph Based Pattern Recognition (GBPR)

Spring Semester 2023

Curriculum

Pattern recognition emerged to an important and active discipline in computer science. The overall aim of pattern recognition is to develop and research methods that are able to (partially) imitate the human capacity of perception and intelligence. The question how to represent the underlying data in a formal way such that it can be automatically processed by machine is a key issue in pattern recognition and related fields. The present lecture is concerned with graph-based pattern representation. The field of graph-based pattern recognition has a long tradition and can roughly be subdivided into three main eras:

- First era: *Graph matching and graph clustering*
- Second era: *Graph kernels*
- Third era: *Graph neural networks*

The present lecture is structured along these three eras:

Preamble

1. Introduction

Part I: The Era of Graph Matching and Graph Clustering

2. Exact Graph Matching
3. Graph Edit Distance
4. Bipartite Graph Edit Distance
5. Other Graph Matching Paradigms
6. Matching Special Types of Graphs
7. Graph Clustering

Part II: The Era of Graph Kernels

- 8. Graph Kernels (Part I/II)
- 9. Graph Kernels (Part II/II)
- 10. Graph Embedding

Part III: The Era of Graph Neural Networks

- 11. Graph Neural Networks (Part I/II)
- 12. Graph Neural Networks (Part II/II)

Team

Lecturer:

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Assistant and Responsible for the Exercises:

- Anthony Gillioz (anthony.gillioz@unibe.ch)

Consultation Hour

- By appointment (for concerns ≥ 10 minutes) or
- After the classroom session (for concerns < 10 minutes).

Material

We maintain an ILIAS website for the lecture with

- lecture notes with illustrations
- repetition slides
- exercise sheets and exercise materials
- mailing list and forum
- Schedule and important dates

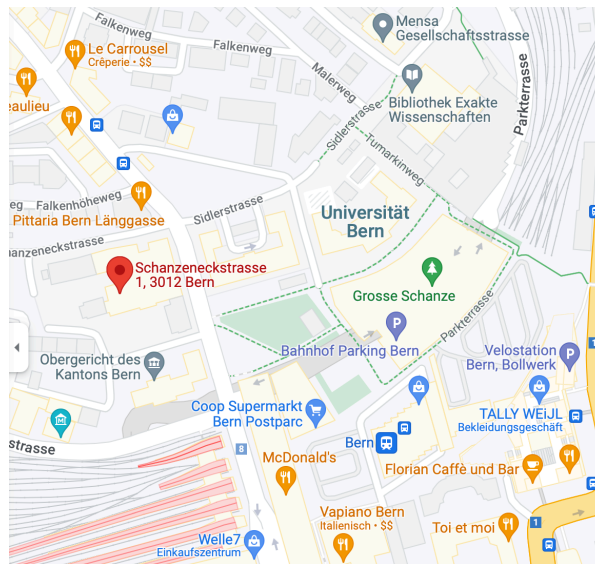
Register for the ILIAS course so you do not miss any important information.

Registration

A registration for the lecture via JMCS-Academia is mandatory (also for non-JMCS students).

Time and Room

The classroom sessions will be held on Wednesdays 9 to 12 in the Seminarraum S101 (first floor), UniS, Schanzeneckstrasse 1 3012 Bern:



Organization

The classroom session is composed of two parts:

- **Lecture (Wednesday, 9 to 11)** In the lecture, usually one chapter of the lecture notes is discussed per week. Moreover, we offer a short repetition summarizing the content of the last week. In addition, there is the possibility to discuss questions about the *lecture* directly with the lecturer.
- **Exercise (Wednesday, 11 to 12):** During the exercise, the new exercise series are usually presented and the previous exercise series are discussed. In addition, there is the possibility to discuss questions about the *exercises* directly with the assistant.

Schedule

Schedule JMCS Lecture							
Graph Based Pattern Recognition							
Date	Chapter	Part	Lecture (09.15 - 11.00) Content	Exercise (11.15 - 12.00) BriefingSubmission*Debriefing			Remarks
22.02.23	1		Introduction	General information about the exercises as well as introduction to the programming framework in Python (Exercise 0)			Exercise lesson as videolecture on ILIAS
01.03.23	2	I	Exact Graph Matching	Exercise 1 on Ch. 1 and 2	Exercise 0	Exercise 0	
08.03.23	3		Graph Edit Distance	-	-	-	No exercise lesson
15.03.23	4		Bipartite Graph Edit Distance	Exercise 2 on Ch. 3 and 4	Exercise 1	Exercise 1	
22.03.23	5		Other Graph Matching Paradigms	-	-	-	No exercise lesson
29.03.23	6		Matching Special Types of Graphs	Exercise 3 on Ch. 5 and 6	Exercise 2	Exercise 2	
05.04.23	7		Graph Clustering	Exercise 4 on Ch. 7	-	-	
12.04.23	Easter Vacation (no lecture and exercise lesson)						
19.04.23	8	II	Graph Kernels (Part I/II)	-	Exercise 3	Exercise 3	
26.04.23	9		Graph Kernels (Part II/II)	Exercise 5 on Ch. 8 and 9	Exercise 4	Exercise 4	
03.05.23	10		Graph Embedding	Exercise 6 on Ch. 10	-	-	
10.05.23	11	III	Graph Neural Networks (Part I/II)	-	Exercise 5	Exercise 5	
17.05.23	12		Graph Neural Networks (Part II/II)	Exercise 7 on Ch. 11 and 12	Exercise 6	Exercise 6	
24.05.23	A		Repetition	-	Exercise 7	Exercise 7	Exercise lesson as videolecture on ILIAS
31.05.23	Optional Q&A session (no lecture and exercise lesson)						
				*Deadline for exercise submissions on ILIAS is at 11.00 at the respective date			

Exercises and Exam Admission

- In total there will be eight exercise series (Series 0 to Series 7).
- We allow individual submissions or submissions of teams of two. Teams of two should remain in place during the semester – new teams may be formed only in exceptional cases.
- We grade the submitted series with *accepted* or *not accepted*, respectively. A series is graded as *not accepted* if at least one of the following situations occurs:
 - the series is submitted after deadline
 - the submitted series has serious deficiencies and/or severe mistakes
 - obviously too little time and effort has been invested in editing the submitted series
 - plagiarism is clearly identified in the submitted series
- In case of
 - illness or accident

- military service (or similar),
- training at the level of a national team or Swiss Olympics

the student can be dispensed from a series submission. In this case, the student must contact the assistant in a timely manner and justify his or her non-submission in writing with an appropriate confirmation (e.g., with a medical certificate, “Marschbefehl”, or similar). In justified cases, the series of the corresponding week is then considered both *submitted* and *accepted*.

- You are admitted to the exam if the following two conditions are both met:
 1. You have submitted at least 7 of the 8 series in due time.
 2. At least 6 of the submitted series are evaluated by us with *accepted*.

Exam

- **Admission:** At least seven series submitted on the due dates, six of which have been accepted. See information above.
- **Date:** June 2023 (definite date and time will be published on JMCS-Academia).
- **Location:** Will be published on JMCS-Academia
- **Registration:** A registration via JMCS-Academia is required.
- **Procedure:** Written exam during 60 minutes (the examination will *not* take place on the computer). All candidates must be present in the assigned room no later than 15 minutes before the start of the exam. Please bring your *Unicard* or other identification, and writing materials.
- **Exam material:** Contents of the entire lecture and all exercise lessons.
- **Allowed resources:** Printed lecture notes, exercises, documents of the lecture, own notes
- **Not allowed:** Books, notebook or other electronic devices (smartphone, tablet, calculator, etc.)
- **Re-examination:** The re-examination will take place *during* the autumn semester 2023. The date and modalities will be communicated on JMCS-Academia and ILIAS.

Only students who were registered on JMCS-Academia for the first exam and are in exactly one of the following three situations will be admitted to the re-examination:

- Achieved an insufficient grade → re-examination counts as second (and therefore last) attempt.
- Absent without reason (grade 1.0) → re-examination counts as second (and therefore last) attempt.
- Unable to take the first exam due to force majeure (e.g. illness or accident) → re-examination counts as first attempt.