Institute of
Pervasive Computing

Introduction

Algorithms and Data Structures 2, 340300
Lecture – 2023W
Univ.-Prof. Dr. Alois Ferscha, teaching@pervasive.jku.at

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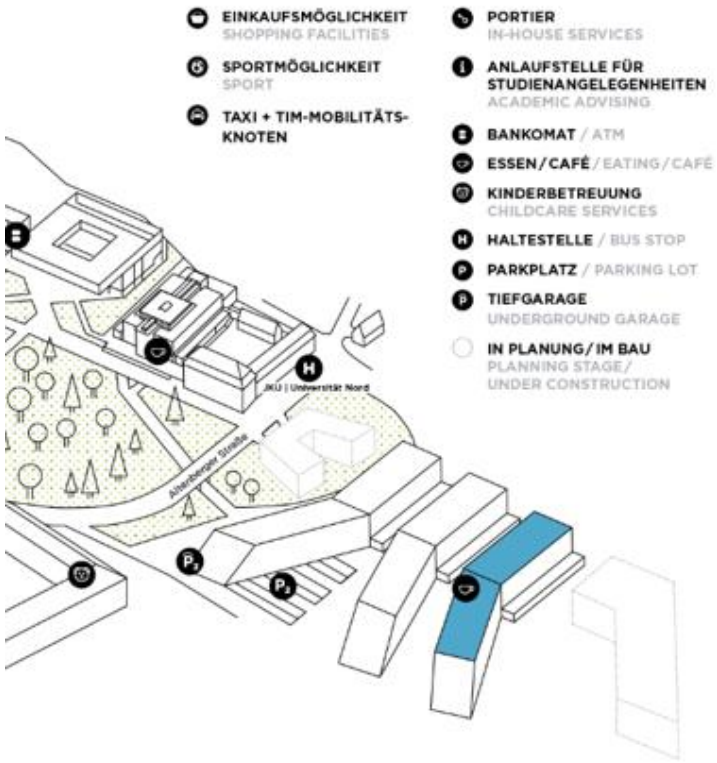
Contact Details



Lecture Univ.-Prof. Dr. Alois Ferscha

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Science Park 3, 6th floor

Contact **teaching@pervasive.jku.at**
Please always mention your student id (8 digits) and the course id (6 digits) in the subject line!

Course Details

Course	VL Algorithms and Data Structures 2, 340300
Workload	3 ECTS, 2 hpw
Original study plan	Bachelor's programme Computer Science (UK 033/521)
Education level	B2 – Bachelor‘s programme, 2. year
Language	English; Programming language is Java (34031x) or Python (34032x)
Study material	Slides and recordings in Moodle
Evaluation	Examination at end of term

https://studienhandbuch.jku.at/125317

Course Details :: 2023W

How is the content provided?

- Physical Presence in Linz + Live-Stream to Vienna and Bregenz + Zoom
- Recordings in Moodle (for full semester)
- all material online in Moodle

Required days of **physical presence**: 1 (for the exam)

What are the evaluation criteria?

- final exam at the end of the term

Introduction	Mon, October 2, 2023
Time & Place	Mon, 13.45-15.15, HS 1
Exam	Mon, January 29, 2024, 13.45

Exam :: Moodle exams in lecture rooms

Exam dates

- Main date: Mon, January 29, 2024 13.45-15.15 in Linz/Vienna/Bregenz
- 1st Retry: planned for end of March in Linz/Vienna/Bregenz
- 2nd Retry: planned for mid-May Linz only

Registration

- **Registration** for the exam **in KUSSS** is required – please check the deadlines!

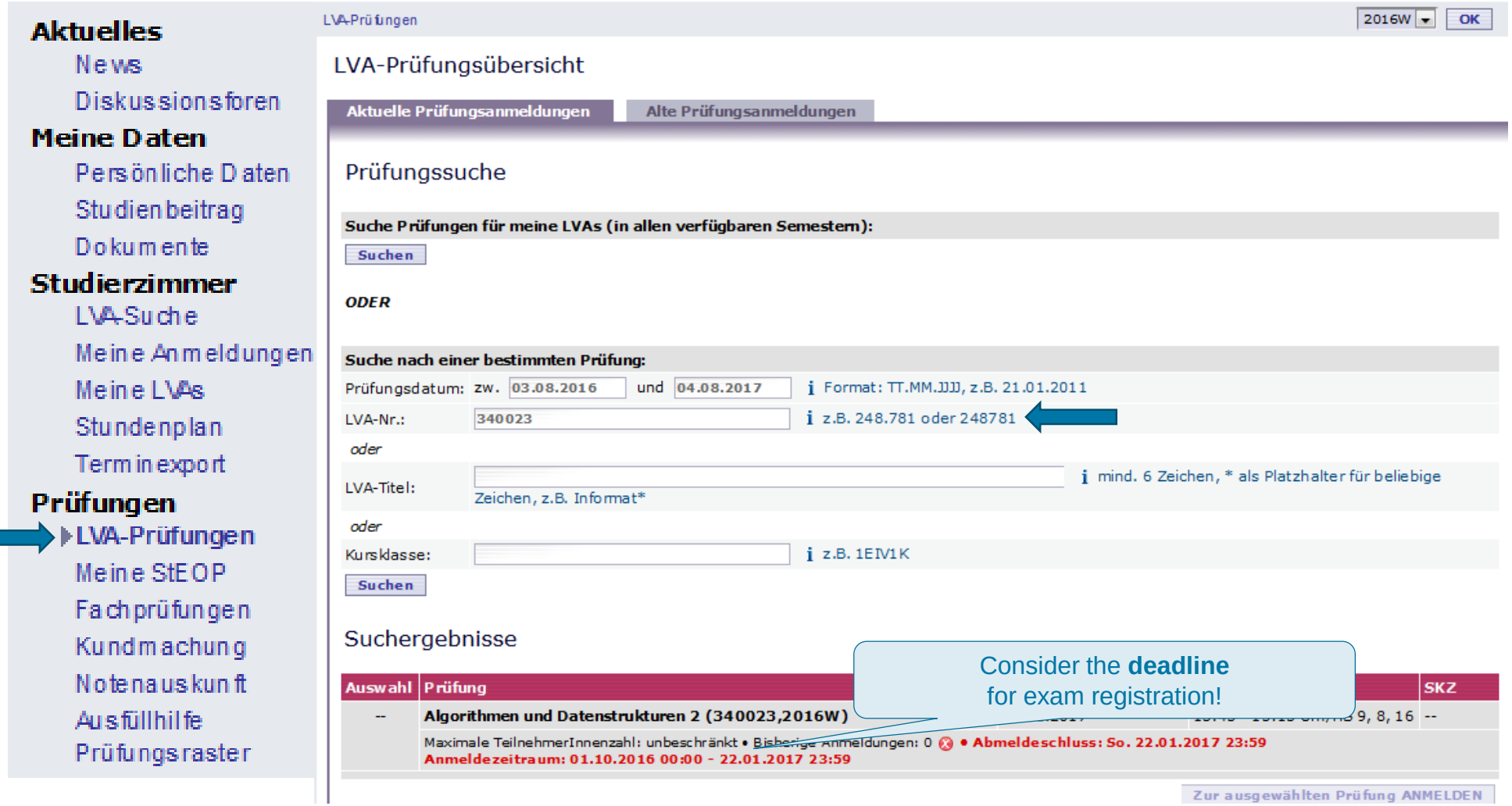
Presence exam

- Room allocation in Linz will be announced in Moodle 1 day before the exam.
- Do not forget your **JKU card**! You have to present it in the lecture hall.
- Make sure to **sign the participation list** during the exam.
- You will need **your own Laptop** and ensure a **working internet connection** (eduroam, JKU WiFi, hotspot...).

Allowed Material

- Slides and supplementary material that has been presented in lecture and exercise (printed or pdf).

Exam Registration in KUSSS



Lecture Topics

Introduction

Trees

- Height-Balanced Trees
- Weight-Balanced Trees
- Randomized Treaps

Hashing

Double Hashing

Monte Carlo Tree Search

Graphs

- Structure
- Flows

Social Graphs

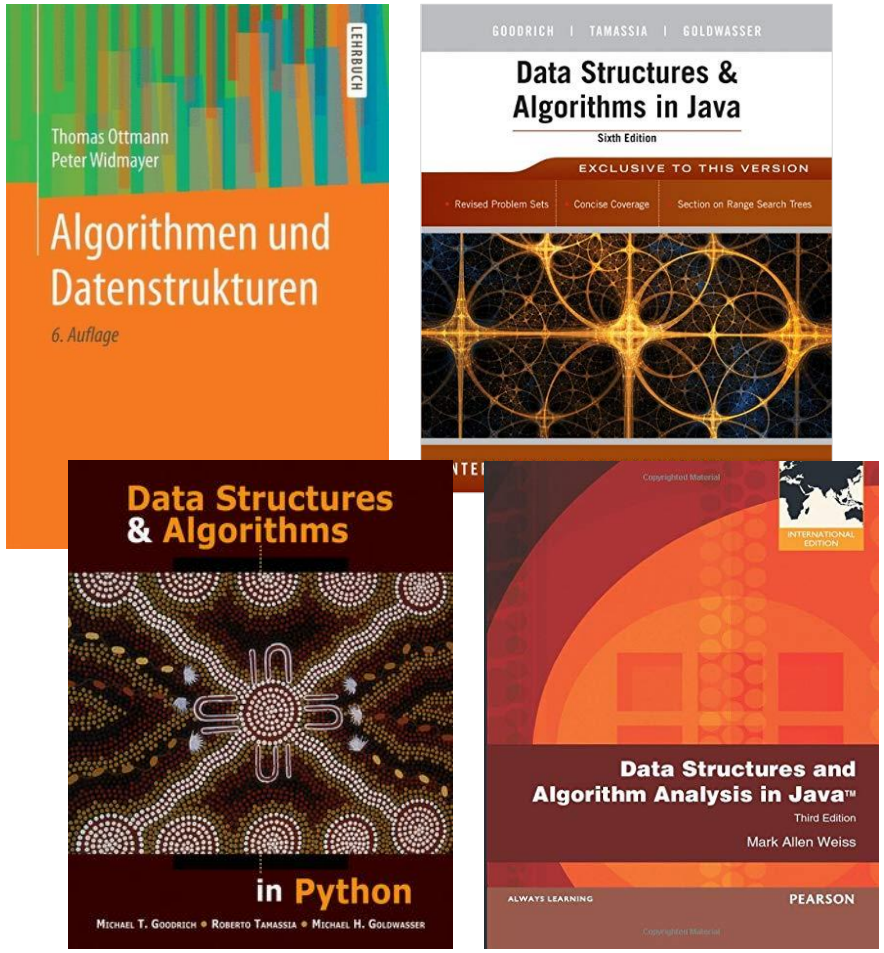
Community Analysis

PRAM Algorithms

Lecture Schedule

Date	Topic
Mo. 02.10.2023	Introduction + Trees: Height-Balanced I
Mo. 09.10.2023	Trees: Height-Balanced II
Mo. 16.10.2023	Trees: Weight-Balanced I
Mo. 23.10.2023	Trees: Weight-Balanced II
Mo. 30.10.2023	Randomized Treaps
Mo. 06.11.2023	Hashing
Mo. 13.11.2023	Double Hashing
Mo. 20.11.2023	Monte Carlo Tree Search
Mo. 27.11.2023	Graphs: Structure I
Mo. 04.12.2023	Graphs: Structure II & Graphs: Flows I
Mo. 11.12.2023	Graphs Flows II
Mo. 08.01.2024	Social Graphs
Mo. 15.01.2024	Community Analysis
Mo. 22.01.2024	PRAM Algorithms
Mo. 29.01.2024	Moodle Exam (Linz/Wien/Bregenz)

Primary Literature



Ottmann, Thomas; Widmayer, Peter: Algorithmen und Datenstrukturen. Berlin/Heidelberg: Springer, 6. Auflage, 2017. ISBN: 9783662556504

- Behandelt sehr fachkundig und leicht verständlich den „klassischen“ Themenkern einer Standardvorlesung „Algorithmen und Datenstrukturen" (vom Suchen und Sortieren über Adressberechnungsmethoden und Listenstrukturen (Bäume aller Art) bis zu Geometrischen Algorithmen und Graphenalgorithmen.
- Auch in elektronischer Form verfügbar: https://lisss.jku.at/permalink/f/n2r1to/ULI_alma5155435650003340

Goodrich, Michael T.; Tamassia, Roberto; Goldwasser Michael H.: Data Structures and Algorithms in Python, Hoboken, N.J.: Wiley, 2013. ISBN: 9781118290279

Goodrich, Michael T.; Tamassia, Roberto; Goldwasser Michael H.: Data Structures and Algorithms in Java, Hoboken, N.J. [u.a.] : Wiley, 6. Auflage, 2014. ISBN 978-1-118-80836-8

Weiss, Mark Allen: Data Structures and Algorithm Analysis in Java, Harlow: Pearson, 3. Auflage, 2012. ISBN: 978-0-273-75211-0

Secondary Literature

R. Sedgewick: Algorithms in Java, Addison Wesley Professional, 2007.

T. Cormen, C. Leiserson, R. Rivest, C: Stein: Introduction to Algorithms, MIT Press, 3. Auflage, 2009.

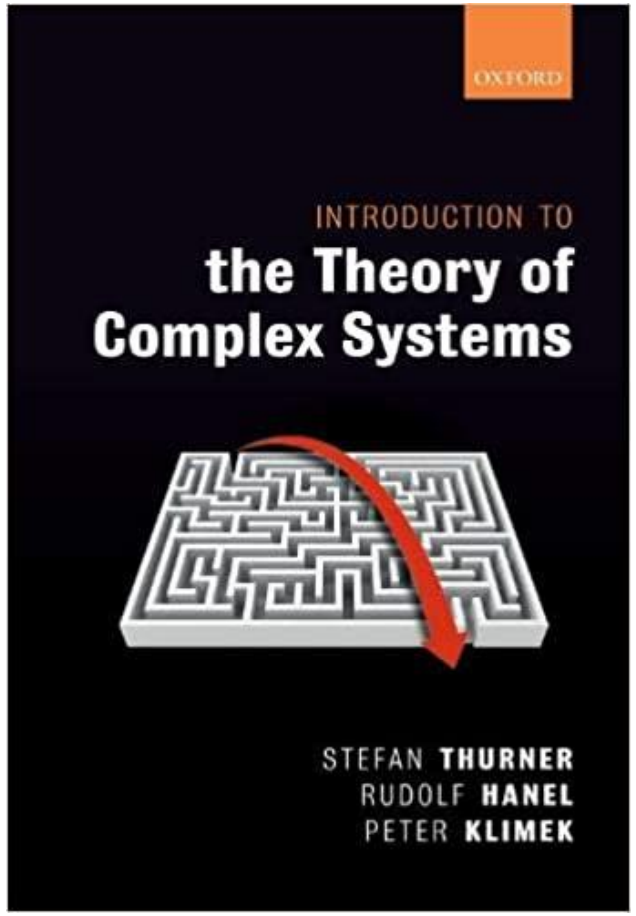
N. Wirth: Algorithmen und Datenstrukturen, Stuttgart, Teubner, 3. Auflage, 1991.

A.V. Aho, J.E. Hopcroft, J.D. Ullman: Data Structures and Algorithms, Addison Wesley, 1987.

Donald E. Knuth:
The Art of Computer Programming. Volume 1 / Fundamental Algorithms.
The Art of Computer Programming. Volume 2 / Seminumerical Algorithms.
Reading, Mass.: Addison Wesley Longman, 1997.

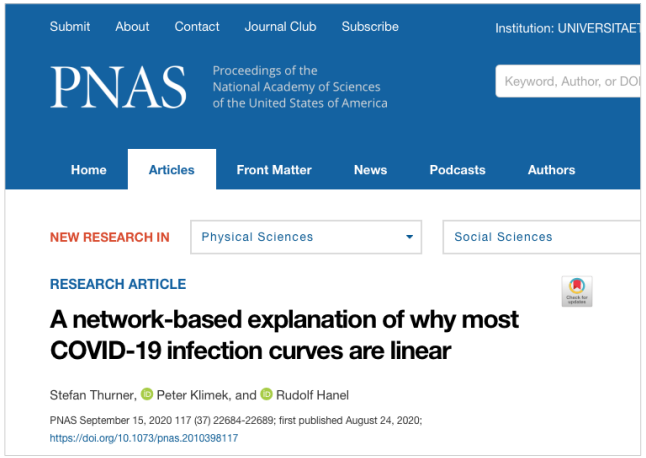
- *Frühe Standardwerke in der Informatik Grundausbildung.*

Complexity Science

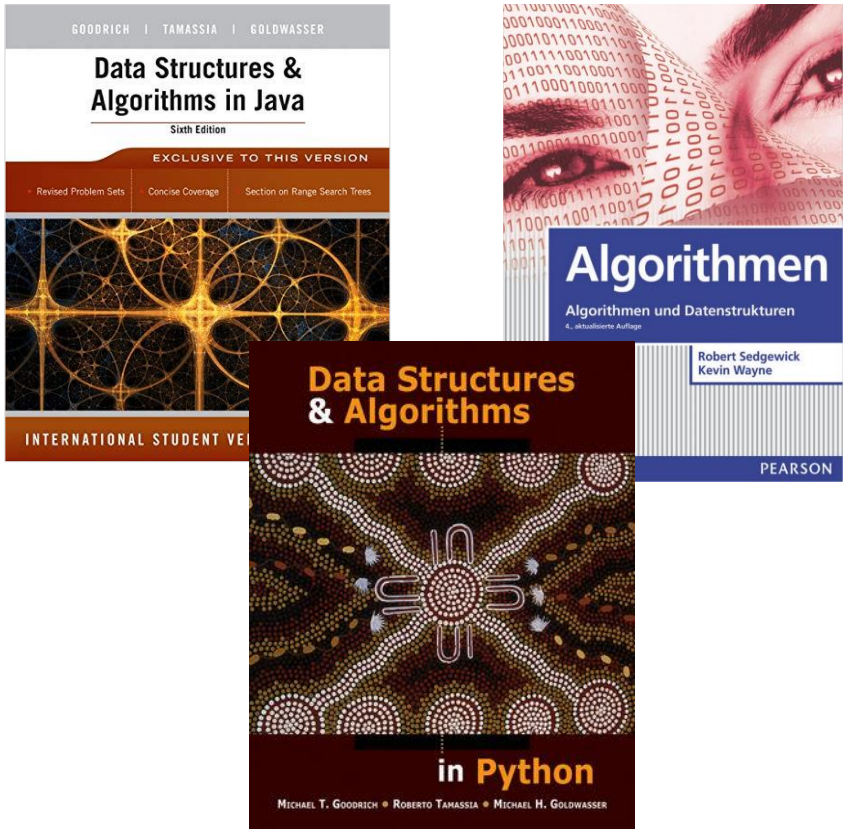


Stefan Thurner, Rudolf Hanel, Peter Klimek: Introduction to the Theory of Complex Systems, OXFORD University Press, 2018.

Stefan Thurner, Peter Klimek, Rudolf Hanel: A network-based explanation of why most COVID-19 infection curves are linear. Proceedings of the National Academy of Sciences Sep 2020, 117 (37) 22684-22689; DOI: 10.1073/pnas.2010398117



Recommended Literature



Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser: Data Structures and Algorithms in Java, Wiley & Sons Ltd, current edition. ISBN 978-1-118-80836-8

Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser: Data Structures and Algorithms in Python, Wiley & Sons Ltd, current edition. ISBN 978-1-118-54958-2

Robert Sedgewick, Kevin Wayne: Algorithmen und Datenstrukturen, Pearson Deutschland, 2014.
JKU LISSS

Exercise Schedule (preliminary)

Date	Topic
Oct 10/11	Introduction
Oct 24/25	Search Trees
Nov 07/08	Hashing
Nov 21/22	Graphs: Structure
Dec 05/06	Graphs: Shortest Paths
Jan 16/17	Graphs: Network Flows

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