Advanced Data Structures

Lecture 00: Course Overview

Florian Kurpicz
Organizational Matters

Lectures

- Monday 09:45–11:14 (50.34, -120)
- lecture only

Project (mandatory)

topics will be handed out 16.05.2022

coding project and small presentation

20% of the final grade

requires additional registration

Oral Exam

20 minutes

80% of the final grade

pizza marks content not relevant for exam

Office Hours (Room 210)

Monday 14:15–15:00 (lecture period)

by appointment (otherwise)
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Materials

**Slides**
- published before the lecture
  (https://algo2.iti.kit.edu/lehre_4264.php)
- before means like 10 to 15 minutes before

**Recordings**
- testing to record the lecture
### Materials

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<th>Additional Material</th>
</tr>
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<tbody>
<tr>
<td>• references to literature included</td>
</tr>
<tr>
<td>• most likely no script</td>
</tr>
</tbody>
</table>
| • MIT course (some topics match)  
  https://ocw.mit.edu/courses/  
  6-851-advanced-data-structures-spring-2012/ |
# Content

<table>
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<tr>
<th>Trees/Graphs</th>
<th>Integers</th>
<th>Strings</th>
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<td>bit vectors and succinct trees</td>
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<td>predecessor queries</td>
<td>compressed suffix array and suffix tree</td>
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<tr>
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<td>vEB-tree and fusion trees</td>
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| External Memory       |                                              |                                              |
|-----------------------|                                              |                                              |
| cache-oblivious B-trees|                                              |                                              |
| buffer trees and EM lookup |                                              |                                              |
# Content

## Trees/Grahps
- bit vectors and succinct trees
- dynamic bit vectors and succinct trees
- succinct graphs

## External Memory
- cache-oblivious B-trees
- buffer trees and EM lookup

## Integers
- range minimum queries (lowest common ancestor queries)
- predecessor queries
- vEB-tree and fusion trees

## Strings
- string B-trees and suffix arrays
- compressed suffix array and suffix tree
## Gap Between Theory and Practice (Lecture AE Sanders)

### Different Viewpoints

<table>
<thead>
<tr>
<th>Theory</th>
<th>Practice</th>
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<tbody>
<tr>
<td>simple</td>
<td>application model</td>
</tr>
<tr>
<td>simple</td>
<td>machine model</td>
</tr>
<tr>
<td>complex</td>
<td>algorithms</td>
</tr>
<tr>
<td>advanced</td>
<td>data structures</td>
</tr>
<tr>
<td>worst case</td>
<td>complexity measure</td>
</tr>
<tr>
<td>asymptotic</td>
<td>efficiency</td>
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</tbody>
</table>

**Notes:**
- Advanced data structures include arrays, 
- Best case complexity measure is often used in practice for efficiency.