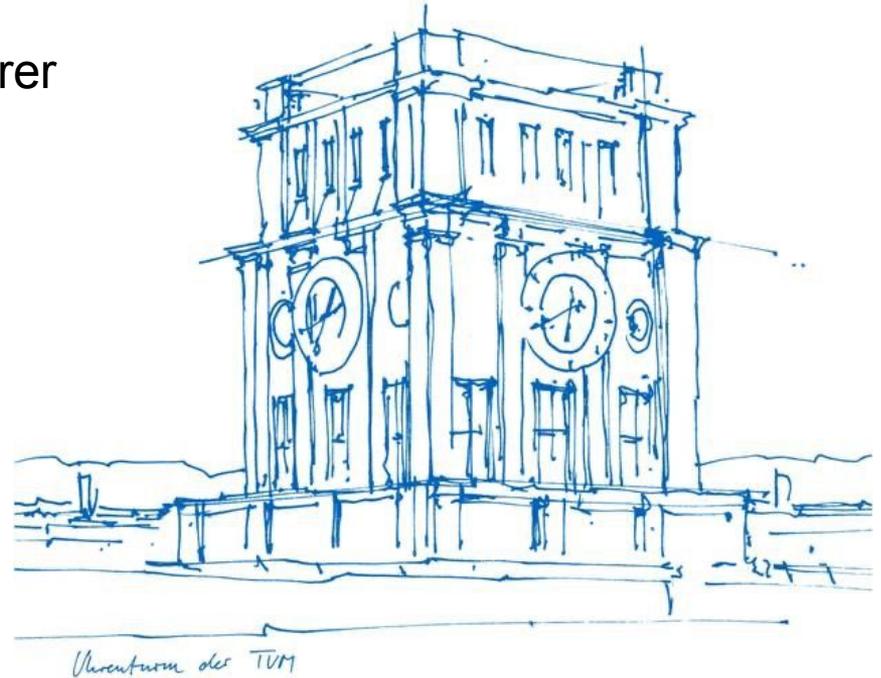


# Database Systems on Modern CPU Architectures

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Technical University of Munich

Chair for Database Systems



# Lecture Overview

Database Systems on Modern CPU Architectures

# Lecture Overview

Database Systems on Modern CPU Architectures

Database Systems **and** Modern CPU Architectures

# Lecture Overview

## **Implementation of Database Systems**

# Lecture Overview

## **Implementation of Database Systems**

(on Modern CPU Architectures)

# Lecture Overview

## Implementation of Database Systems

### 1. The Classical

#### Architecture

- 1.1. Storage
- 1.2. Access paths
- 1.3. Transactions &  
recovery

# Lecture Overview

## Implementation of Database Systems

### 1. The Classical Architecture

- 1.1. Storage
- 1.2. Access paths
- 1.3. Transactions &  
recovery

### 2. Efficient Query Processing

- 2.1. Set oriented query  
processing
- 2.2. Algebraic operators
- 2.3. Code generation

# Lecture Overview

## Implementation of Database Systems

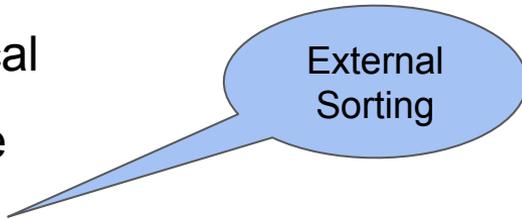
1. The Classical Architecture
  - 1.1. Storage
  - 1.2. Access paths
  - 1.3. Transactions & recovery
2. Efficient Query Processing
  - 2.1. Set oriented query processing
  - 2.2. Algebraic operators
  - 2.3. Code generation
3. Designing a DBMS for Modern Hardware
  - 3.1. Re-designing storage
  - 3.2. Optimizing cache locality
  - 3.3. Main memory databases

# Lecture Overview

## Implementation of Database Systems

### 1. The Classical Architecture

- 1.1. Storage
- 1.2. Access paths
- 1.3. Transactions &  
recovery



External  
Sorting

# Lecture Overview

## Implementation of Database Systems

### 1. The Classical Architecture

- 1.1. Storage
- 1.2. Access paths
- 1.3. Transactions &  
recovery

External  
Sorting

Buffer  
Manager

# Lecture Overview

## Implementation of Database Systems

### 1. The Classical Architecture

1.1. Storage

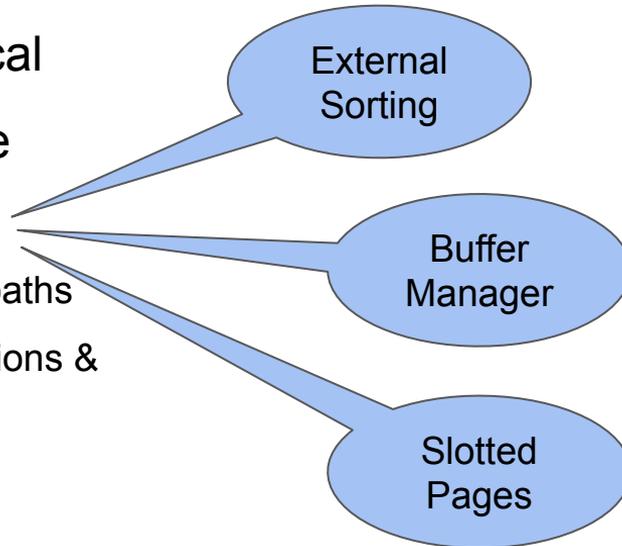
1.2. Access paths

1.3. Transactions &  
recovery

External  
Sorting

Buffer  
Manager

Slotted  
Pages

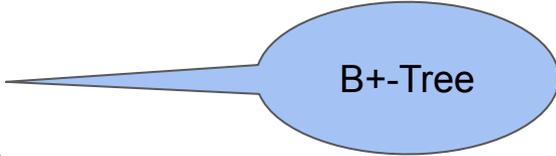


# Lecture Overview

## Implementation of Database Systems

### 1. The Classical Architecture

- 1.1. Storage
- 1.2. Access paths
- 1.3. Transactions &  
recovery



B+-Tree

# Lecture Overview

## Implementation of Database Systems

### 1. The Classical Architecture

- 1.1. Storage
- 1.2. Access paths
- 1.3. Transactions & recovery

### 2. Efficient Query Processing

- 2.1. Set oriented query processing
- 2.2. Algebraic operators
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# Lecture Overview

## Implementation of Database Systems

### 1. The Classical Architecture

- 1.1. Storage
- 1.2. Access paths
- 1.3. Transactions &  
recovery

### 2. Efficient Query Processing

- 2.1. Set oriented query  
processing
- 2.2. Algebraic operators
- 2.3. Code generation

### 3. Designing a DBMS for Modern Hardware

- 3.1. Re-designing storage
- 3.2. Optimizing cache  
locality
- 3.3. Main memory  
databases

# Exercises

- Sessions: Tuesdays 15:30 – 17:00
- Programming assignments every 2 weeks, starting today
- Announcements on website & **Mattermost**
- Implementation assignment tasks on **GitLab**
  - Submit via git
  - Due two weeks later, Tuesdays @14:00
- No Teams. We will check for copied code!
- Bonus System:
  - .3/.4 grade bonus on final exam ( $\geq 5\%$  exercises passed)
  - Bonus is only applied to this year's exam, it is not transferable
  - Passed: Green GitLab **CI** (build, lint, test)
  - Fail: CI pipeline failed, skipped/disabled tests

# Exam

- Written exam, 90 minutes
- Exam date and location: please check TUMOnline
- Exam registration: via TUMOnline (only!)
- No retake exam!

# GitLab & Mattermost

- Register: <https://gitlab.db.in.tum.de/>
- Join Group: <https://gitlab.db.in.tum.de/moderndbs-2025>
- Fork first task External Sort
- Clone & Push your solution
- Announcements / Questions:  
<https://mattermost.db.in.tum.de/moderndbs25>