Datenbanksysteme SoSe25

-Assignment 1-

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Task 1: Terms and Definitions

1. **What is a database(DB)?**
   - A Database is a collection of related data, which is organized according to a specific schema
2. **What is a database management system?(DBMS)**
   - A DBMS is a collection of software programs for defining, constructing, and manipulating a database
3. **What is a database system?**
   - A DBS is the combination of a Database and a Databse Management System
4. **What is a data model?**
   - A Data model is defined by three points:
     - Data Structures: how data is organized (in tables, graphs and trees)
     - Operations: What manipulations is allowed within the database (queries, insertions, updates)
     - Constraints: specific rules for a Database, which ensure integrity and correctness.
5. **What are metadata and what are they used for?**
   - Metadata is the description of data structures, schemas and constraints

Task 2: Data Independence

1. **What is physical data independence?**
   - Changes in the physical schema (e.g., indexing methods, storage devices) do not affect the logical structure or applications
2. **What is logical data independence?**
   - Changes to the logical schema (e.g., table structure) have minimal or no impact on existing applications

Task 3: Taxonomy of Database Systems

1. **Research the types of database systems that exist and how they can be grouped.**
   - There are four types of Database Systems: [1]
     - Hierarchical Database System
     - Network Database System
     - Relational Database System
     - Object-Oriented Database System

Task 4: Entity Relationship Model - Basics

1. What are the basic building blocks of the ER model?
2. How are attributes classified in the ER model?
3. What is the significance of cardinality ratios in relationships within the ER model?

Task 5: Entity Relationship Model I

Model the facts below as an Entity Relationship Model using the notation taught in the lecture (Chen notation):

1. An author has a name, an institution and an email address.
2. An article has a title, three keywords, an abstract, and a DOI(Document Object Identifier).
3. Articles are written by multiple authors, and one author may be involved in multiple articles.

Task 6: Entity Relationship Model II

1. A publisher has a unique name
2. A scientist can be an author or a reviewer. Scientists have a name and an e-mail address. Authors additionally have an institution.
3. Publishers employ reviewers for up to six months to review authors' articles.
4. An article has a title and a DOI (Document Object Identifier) and is assigned to at least one reviewer for review.
5. Publishers release articles after reviewing them in a given year.

Task 7: Entity Relationship Model III

1. An author has a name, an institution and an email address.
2. An article has a title, three keywords, an abstract, and a DOI (Document Object Identifier).
3. A journal has a unique name and topic.
4. Articles are written by multiple authors, and one author may be involved in multiple articles.
5. Authors publish articles in a given year in a journal, and no more than 10 publications by the same author are ever published in a journal.
6. If articles do not fit the theme of the journal, they will not be published in that journal.

References

[1] Syeda Famita Amber. *Database Systems: Key Concepts Explained*. URL: https://hevodata.com/learn/database-systems/#Types_of_Database_Systems. (accessed: 29.04.2025).