Assignment 1

Task 1: Terms and Definition

1. **What is a database?**

   Collection of related data organized according to a schema

2. **What is a database management system?**

   Collection of software programs for defining, constructing, and manipulating a database

3. **What is a database system?**

   Combination of DB and DBMS software

4. **What is a data model?**

   the data model defines the data structure, operations and constraints for the database

5. **What are metadata and what are they used for?**

   Data about (stored) Data, describes data structures, schemas, constraints in the database

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

Research the types of database systems that exist and how they can be grouped.

- hierarchisch: Die Datenobjekte können ausschließlich in einer Eltern-Kind-Beziehung zueinander stehen.

- netzwerkartig: Die Datenobjekte werden miteinander in Netzen verbunden.

- relational: Die Daten werden zeilenweise in Tabellen verwaltet. Es kann beliebige Beziehungen zwischen Daten geben. Sie werden durch Werte bestimmter Tabellenspalten festgelegt.

- objektorientiert: Die Beziehungen zwischen Datenobjekten werden vom Datenbanksystem selbst verwaltet. Objekte können Eigenschaften und Daten von anderen Objekten erben.

- dokumentenorientiert: Die zu speichernden Objekte werden als Dokumente mit möglicherweise verschiedenen Attributen, d. h. ohne die Voraussetzung der Strukturgleichheit, gespeichert.

Task 4: Entity-Relationship Model - Basics

1. **What are the basic building blocks of the ER model?**

   entity types, relationship types, attributes

2. **How are attributes classified in the ER model?**

   single-/multivalued, simple/composite, stored/derived

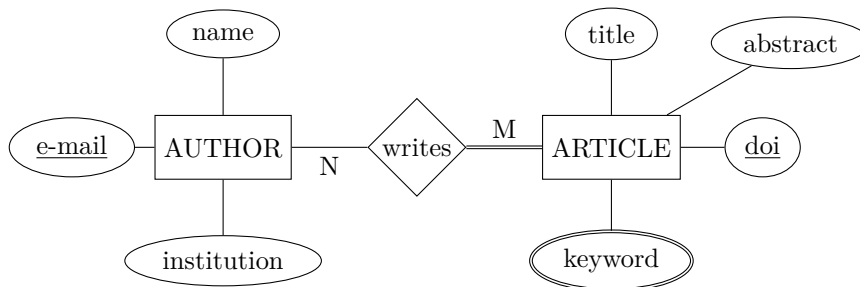3. **What is the significance of cardinality ratios in relationships within the ER model?**

   Specifies the number of relationship instances that an entity can participate in

4. **What is the significance of participation constraints in relationships within the ER model?**

   Specifies whether the existence of an entity depends on its participation in a relationship with another entity
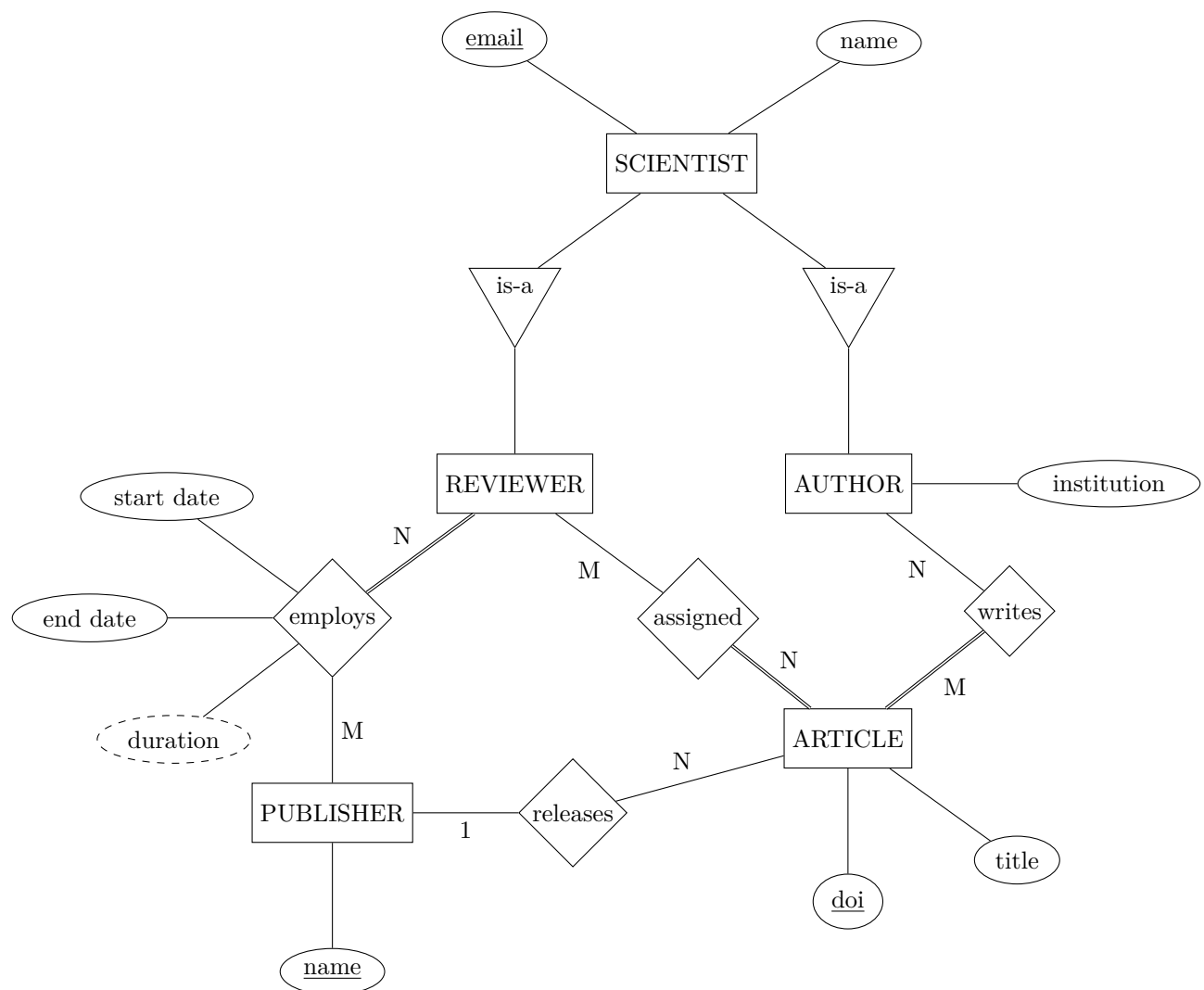
Task 5: ER-Model I

- An author has a name, an institution and an email address.

- An article has a title, three keywords, an abstract, and a DOI (Document Object Identifier).

- Articles are written by multiple authors, and one author may be involved in multiple articles.

We assume that the email is unique for an author and that an author does not have to write articles. An article can have three keywords.
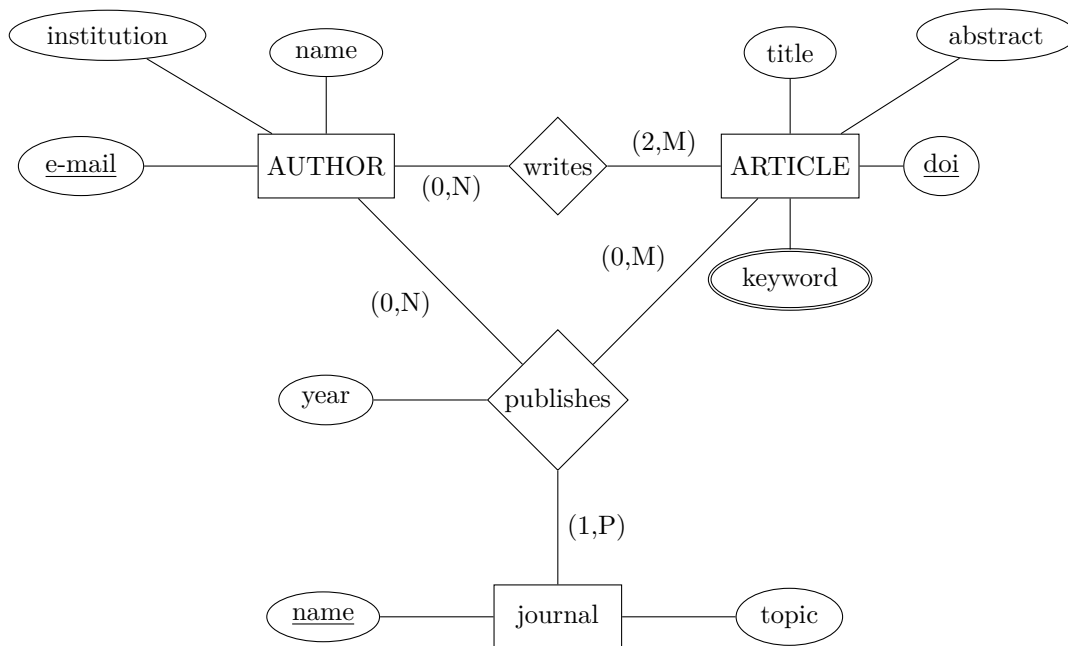
Task 6: ER-Model II

- A publisher has a unique name

- A scientist can be an author or a reviewer. Scientists have a name and an e-mail address. Authors additionally have an institution.

- Publishers employ reviewers for up to six months to review authors' articles.

- An article has a title and a DOI (Document Object Identifier) and is assigned to at least one reviewer for review.

- Publishers release articles after reviewing them in a given year.

An article is published only once or not at all. You can only be a reviewer if you are employed by a publisher. duration is derived by start date and end date and can be at most six months. Articles will only be published, if they have been reviewed.

Task 7: ER-Model III

- An author has a name, an institution and an email address.

- An article has a title, three keywords, an abstract, and a DOI (Document Object Identifier).

- A journal has a unique name and topic.

- Articles are written by multiple authors, and one author may be involved in multiple articles.

- 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.

- If articles do not fit the theme of the journal, they will not be published in that journal.

If articles do not fit theme of journal they will not be published in that journal. Not more than 10 articles are published in one journal by the same author. In a journal must be at least 1 article. An author does not have to publish. An author does not have to write an article. An article can have three keywords.