Databases! A Web-Based Introduction to the Data Science Techniques of Database Querying and Design

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Introduction to Databases

The Introduction to Databases module promotes the understanding of how a database operates, and how to better utilize the power databases have. Databases provide a powerful tool to ask different questions, or queries, of data that without changing the data.

In this module students will learn:
- Limitation of spreadsheets
- Breakdown of spreadsheets into smaller tables to avoid redundancies
- Introduction to primary and foreign keys and how a database uses keys to identify and relate information
- Brief introduction to asking questions over a database

Introduction to Querying

The Introduction to Querying module provides a conceptual introduction to the various operations required to retrieve data from a database to answer a question. The visualization of these operations and how the SQL standard specifies these operations provides a strong foundation for students to use SQL to query relational databases.

In this module students will learn:
- Motivation to identify data and relationships
- Common set operators
- Operations to horizontally and vertically filter data
- More ways of combining tables of data that require a form of filtering
- Introduction to querying using SQL

Database Design

The Database Design module builds on the previous two modules with the introduction of entity-relationship diagrams, where entities are associated by the use of relationships. These relationships are realized within a database using referential integrity between the foreign and primary keys, which are essential to the querying process.

In this module students will learn:
- What is conceptual design?
- Overview of Entity Relationship Diagrams (ER Diagram) and how they are mapped to tables
- What concepts are stored in a database and how they are related
- Alternative approaches to ER Diagrams

Formative Feedback

Self assessment quizzes referred to as “Checkpoints” are provided at the end of each module to promote the understanding of the material presented. Feedback is always presented to the student. If a student answers incorrectly, the question will be asked again later.

Teacher Resources

Resources are provided to teachers to introduce the animations as well as follow up on skills learned using cooperative learning exercises in class, if desired. Students are provided a worksheet for recording their Access query and their formulation of the same query in SQL. The QBE interface of Access inherently supports the design aspect of answering a query and illustrates the primary foreign key relationships.

To further the connection to statistics, a statistics classroom follow up activity is available that asks students for univariate statistics of queried results.

References

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