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COMP1031 – Databases and Interfaces

Ayman Salama

Lecture 1

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Self Introduction

Ayman Salama

Resume

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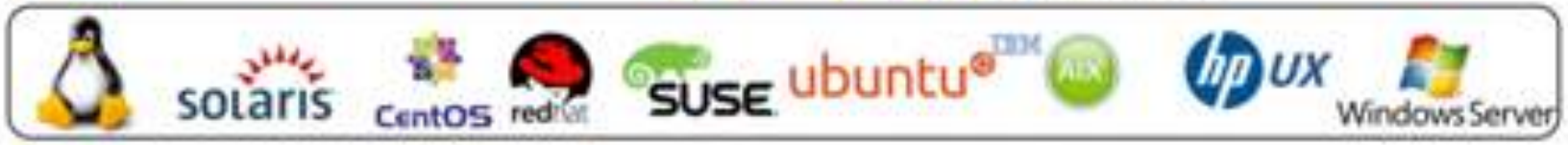

CFF
Crops For the Future

orange™

IBM

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Why Database

Database is the core business of Information System

IT - Software Jobs (1799)

Database

- Data Scientist (23)
- Functional Consultant/Business Analyst (119)
- IT Auditor (6)
- Management (29)
- Product Management (19)
- Project Management (68)
- Researcher (3)
- Software Architect (67)
- Software Engineer/Programmer (913)
- Software Quality Assurance (70)
- Software Security (9)
- Software/Application Trainer (29)
- Supervisor/Team Lead (29)
- System Analyst (86)
- Technical Writer (2)
- UI/UX Designer (40)
- Others (100)

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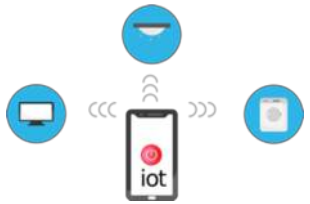
What is it about?

Database

Database



Databases are everywhere and we interact with many different databases every day, using the web, using electronic calendars, diaries or timetables, making appointments, searching for contact details, shopping online, looking up directions, and many more things.

Database

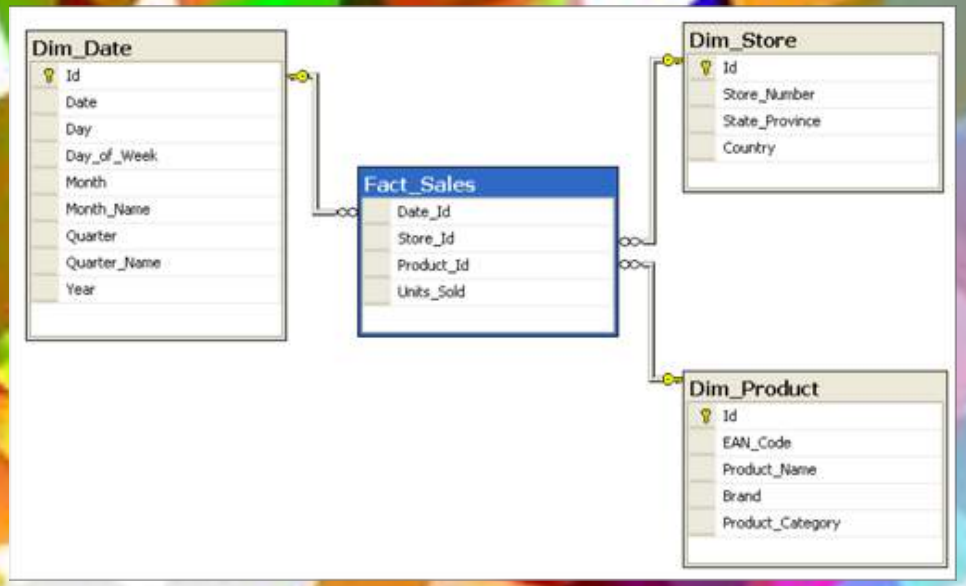
- Web indexes
- Library catalogues
- Medical records
- Bank accounts
- Stock control
- Personnel systems
- Product catalogues
- Telephone directories
- Train timetables
- Airline bookings
- Credit card details
- Student records
- Customer histories
- Stock market prices
- Discussion boards
- and so on...

Easy, fast and reliable!

These databases need to be both easy to use and fast. This module considers both the structure of databases, including how to make them fast, efficient and reliable, and the appropriate user interfaces which will make them easy to interact with for users.

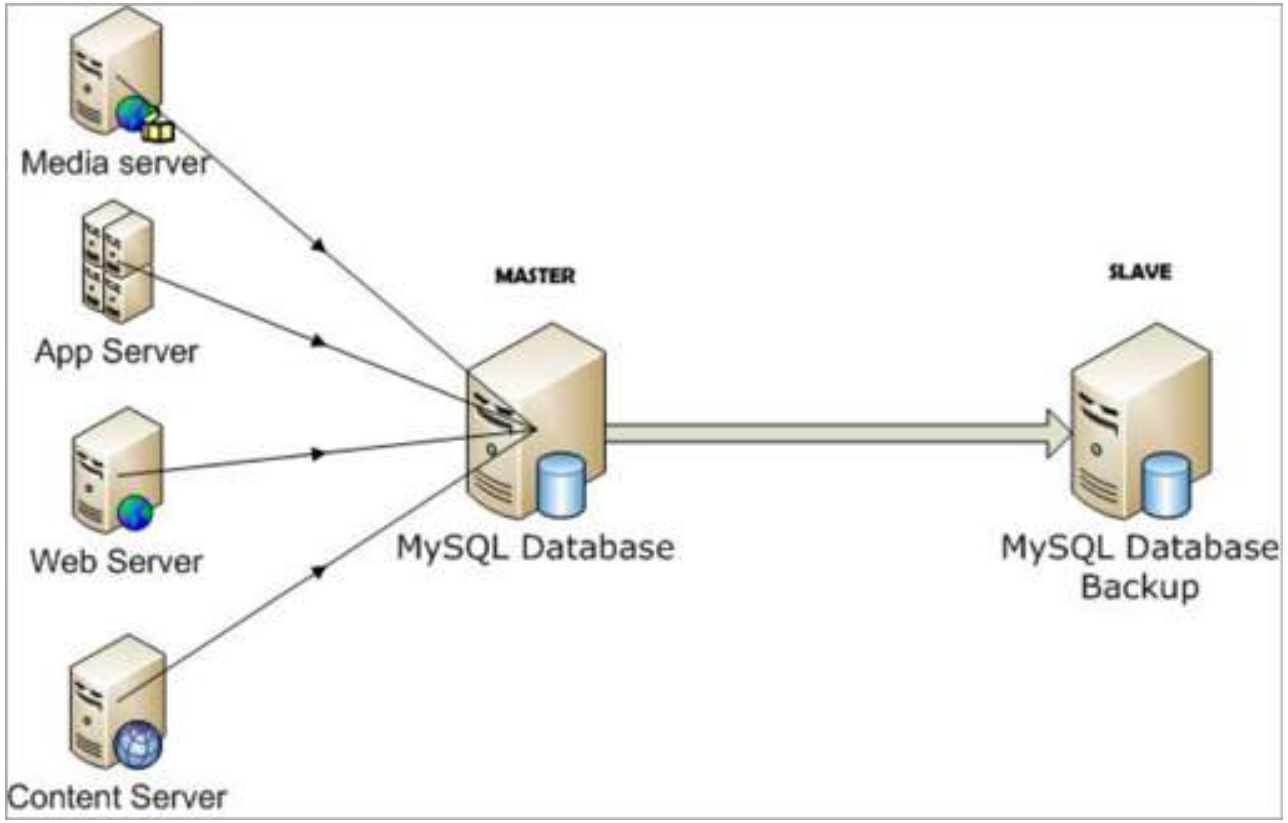
Database design

You will start by looking at how to design a database, gaining an understanding of the standard features that management systems provide and how you can best utilise them and then develop an interactive application to access your database.

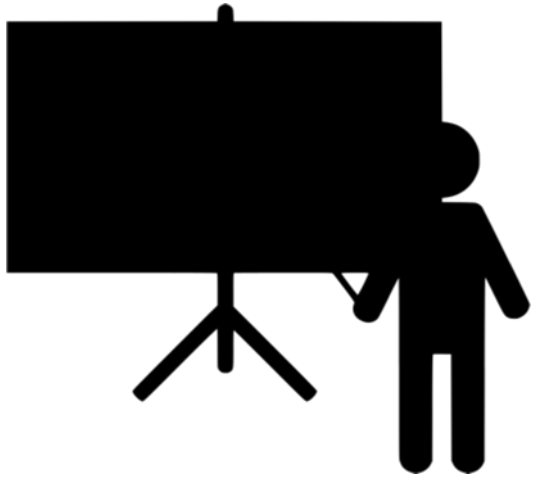


System Design

Throughout the lectures and computing sessions you will learn how to design and implement systems using a standard database management system, web technologies and GUI interfaces through practical programming/system examples.



Summary



You will spend around three hours per week in lectures and two hours per week in organised computer labs studying for this module, and will be expected to spend additional time practising and completing your coursework.

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Course details

Timetable

- Weekly
  - Two lectures (1 x 2hr and 1 x 1hr)
  - 1 x 2hr practical.

Module: COMP/1031/01 Databases and Interfaces

Click here to go to a list view of this timetable

	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30
Mon																		
Tue															COMP/1031/01/Lecture/01/01 Lecture Databases And Interfaces BlockF3 F3A08+ Ayman Salama Mr 21, 23-33			
Wed									COMP/1031/01/Computing/01/01 Computing Databases And Interfaces BlockD DA08 - Computer Engineering Lab* Ayman Salama Mr 21, 23-33									
Thu																		
Fri					COMP/1031/01/Lecture/02/01 Lecture Databases And Interfaces BlockF3 F3A08+ Ayman Salama Mr 21, 23-33													

Resources

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher	ISBN
1	Clare Churcher	2012	Beginning Database Design	3rd	Apress	1430242108
2	Thomas Connolly and Carolyn Begg.	2005	Fundamentals of Database Systems	4th	Addison Wesley	0- 3212-0448- 4

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Course Overview

Database

Weekly Programme

Week No	Topics
1	Introduction, overview and module contents
2	Introduction to Database Systems, The Relational Model
3	Database Models & Relational Database
4	Relational Algebra & Entity Relationship Modelling
5	Normalisation
6	SQL Data Definition
7	More SQL – Data Definition Language
8	Data Administration and Security
9	Object-relational & Object-oriented Databases, XML and databases
10	Good and Bad ‘Modern’ Databases
11	Revision

What is a database?

- A database is a collection of structured data. A database captures an abstract representation of the domain of an application.

.

- Typically organized as “records” (traditionally, large numbers, on disk) and relationships between records

- “A set of information held in a computer” Oxford English Dictionary

- “One or more large structured sets of persistent data, usually associated with software to update and query the data” Free On-Line Dictionary of Computing

- “A collection of data arranged for ease and speed of search and retrieval” Dictionary.com

1. Introduction, overview and module contents

First Database ever!

Limestone Kish tablet from Sumer with pictographic writing, Kish (Iraq); may be the earliest known writing, 3500 BC. Ashmolean Museum Oxford (United Kingdom).

First Database ever!

History

- **1970's :**
  - Ingres: Developed at UCB
  - System R: Developed at IBM
- **Early 80's:**
  - IBM DB2
  - Informix started by Cal alum Roger Sippl
- **Mid 80's :**
  - SQL becomes "intergalactic standard".
  - DB2 becomes IBM's flagship product.
- **1990's:**
  - Postgres project at UC Berkeley open source "Russia"
  - Illustra (from Postgres) → Informix → IBM
  - MySQL

2. Introduction to Database Systems, The Relational Model

person

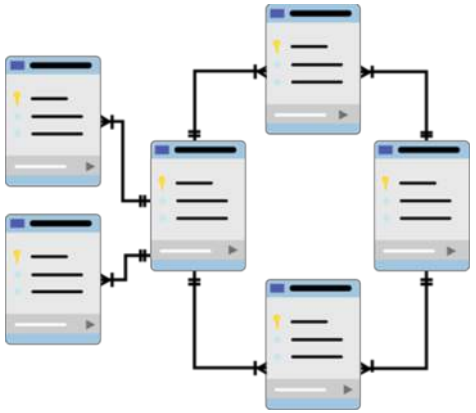
name	nickname	phone
carlo	baffo	123
mike	lungo	456
tony	shifezza	789

involved

pers_name	oper_name	role
carlo	snowflake	chief
tony	snowflake	sold
mike	chocolate	chief

operation

title	descr.	econ_val	coverup
snowflake	..	$10M	laundromat
chocolate	...	$5M	irish pub
caffe	...	$2M	irish pub

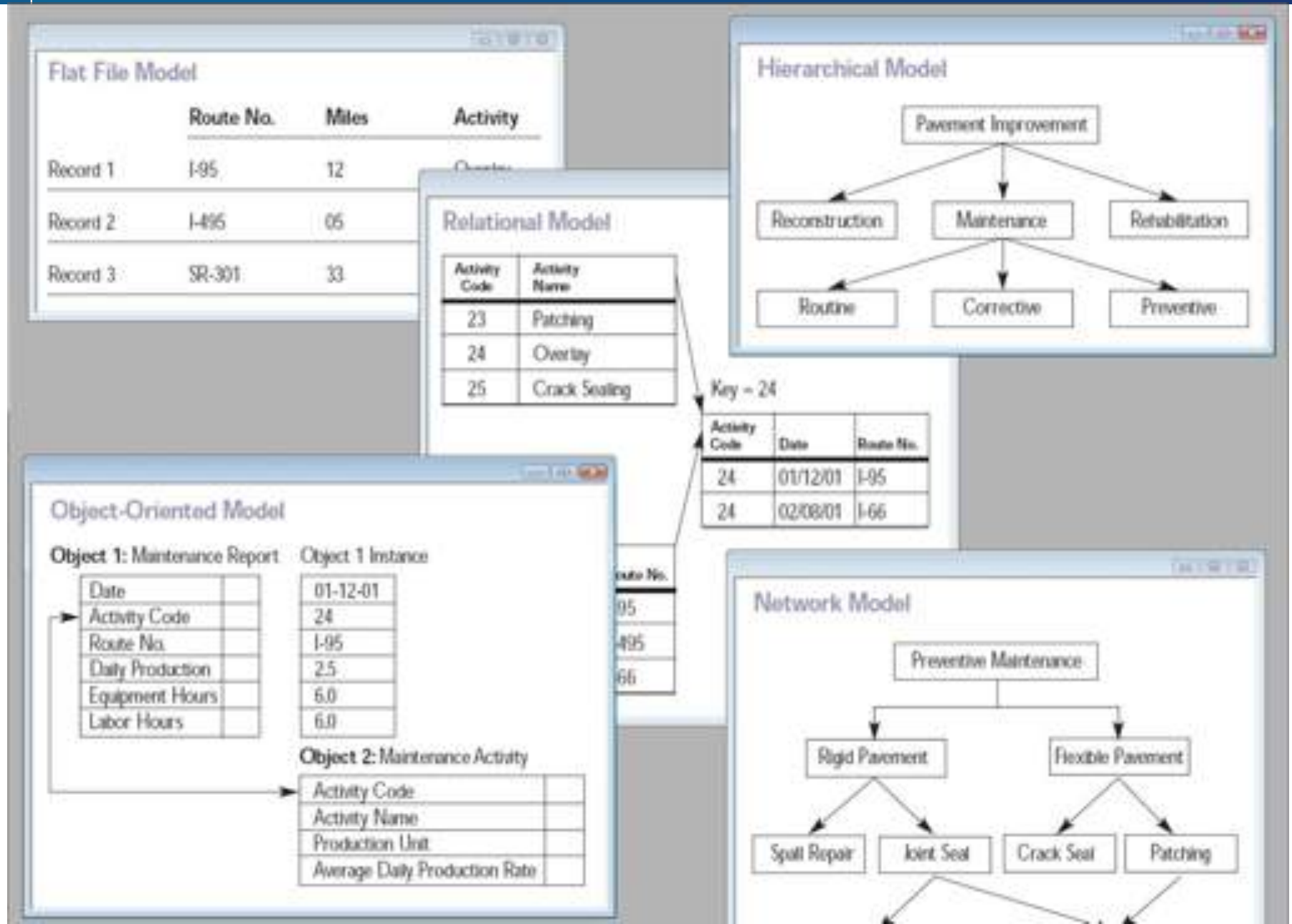


https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/lecture-notes/MIT6_830F10_lec01.pdf

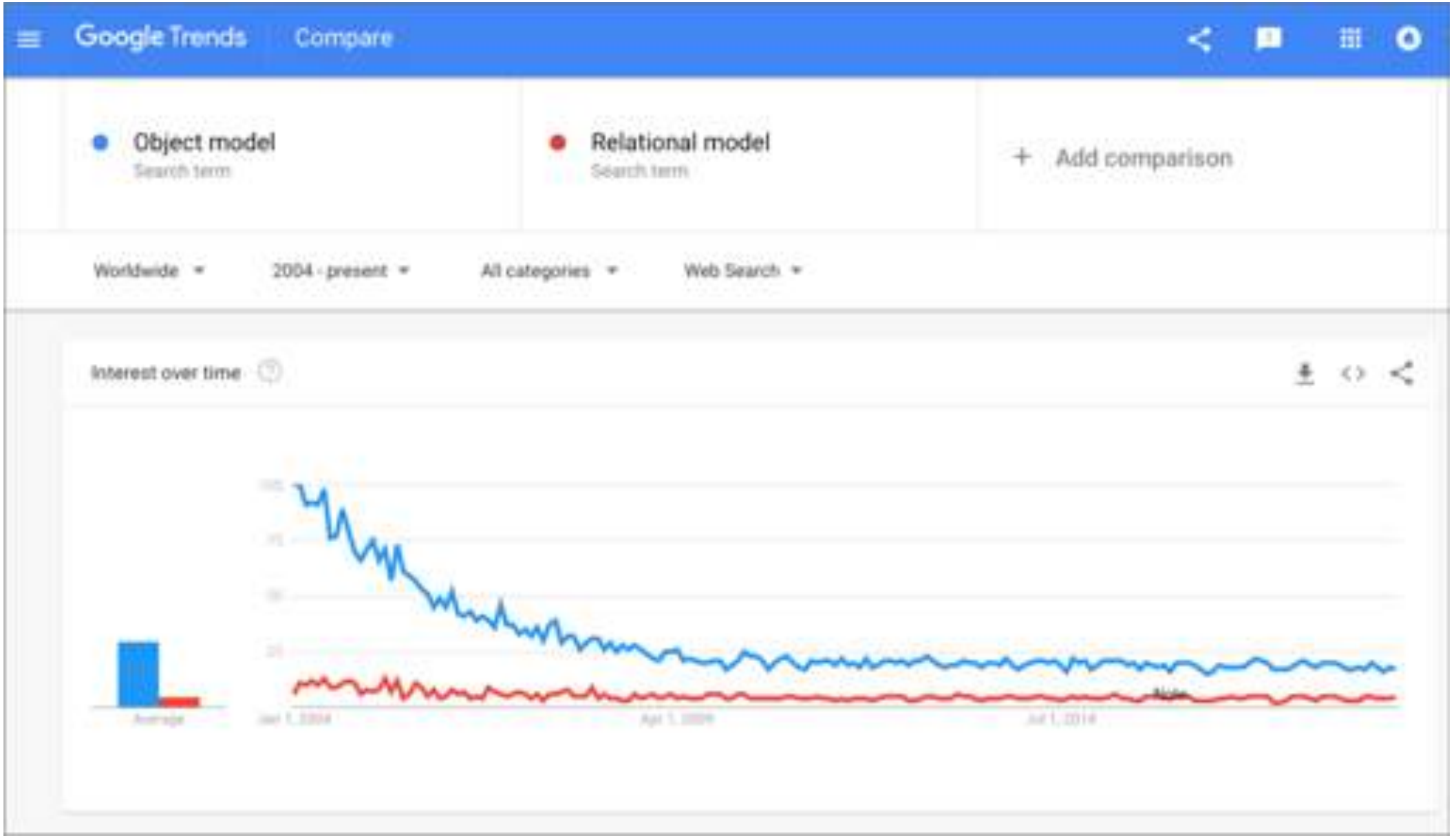
Data Model

1. Hierarchical database model
2. Network model
3. Relational model
4. Entity–relationship model
5. Enhanced entity–relationship model
6. Object model
7. Document model
8. Entity attribute value model
9. XML database
10. Star schema
11. Correlational model
12. Multidimensional mode
13. Semantic model
14. Named graph
15. Flat file model
16. etc

3. Database Models & Relational Database



3. Database Models & Relational Database



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In 5 mins, find the most famous RDMS?

Oracle RDBMS

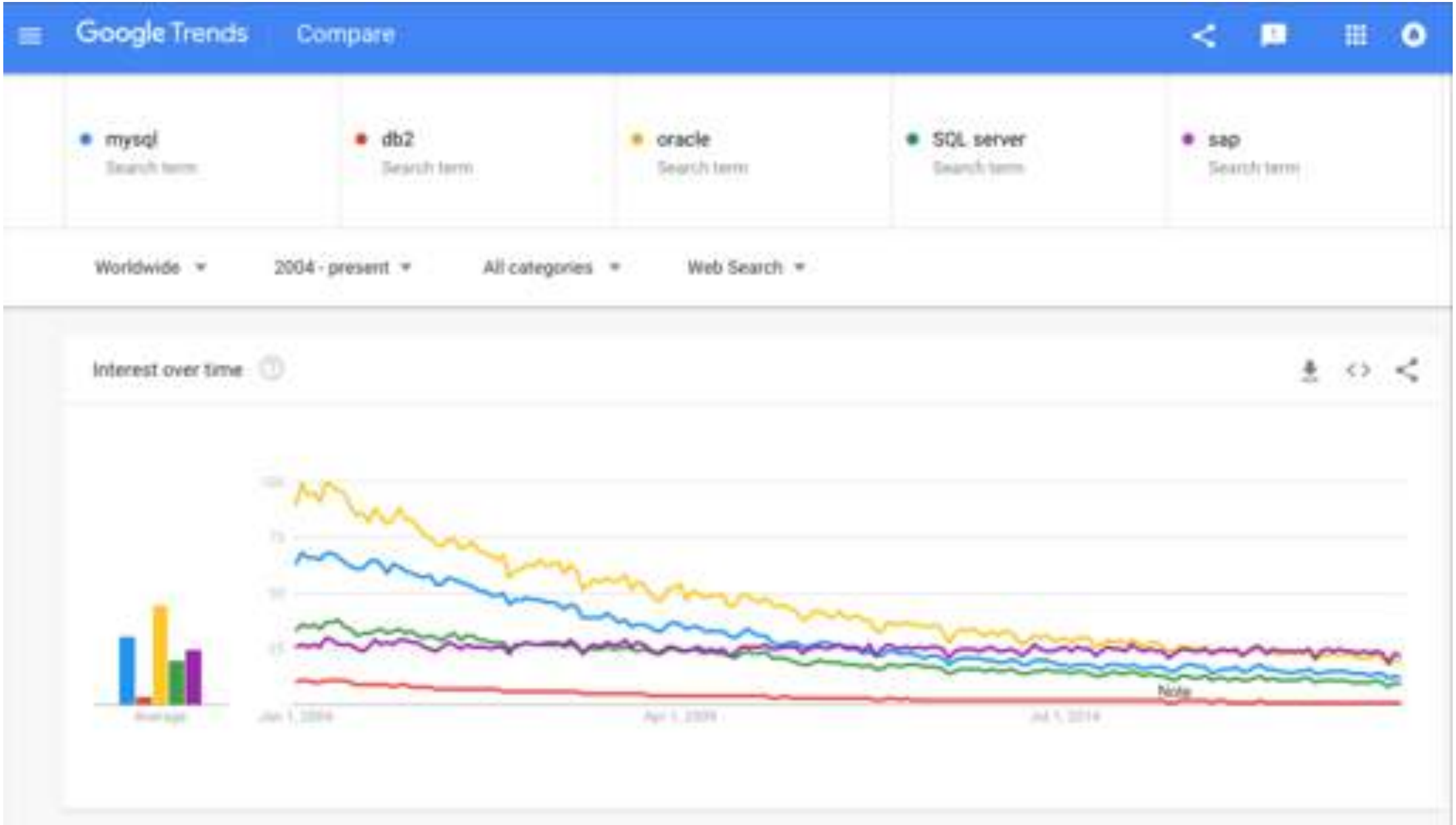
IBM DB2

SQL Server

MYSQL

SAP Sybase

4. Relational Algebra & Entity Relationship Modelling



5. Normalisation

Normalization generally involves taking a design with fewer tables and many columns and transforming it into a design with more tables with fewer columns

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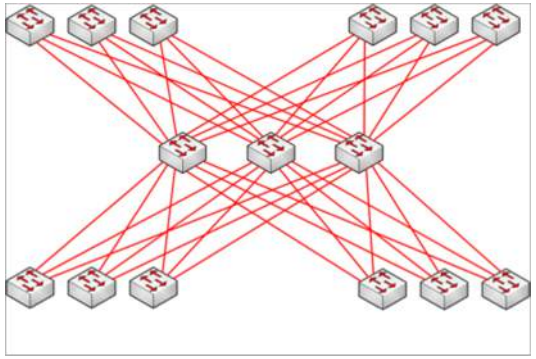
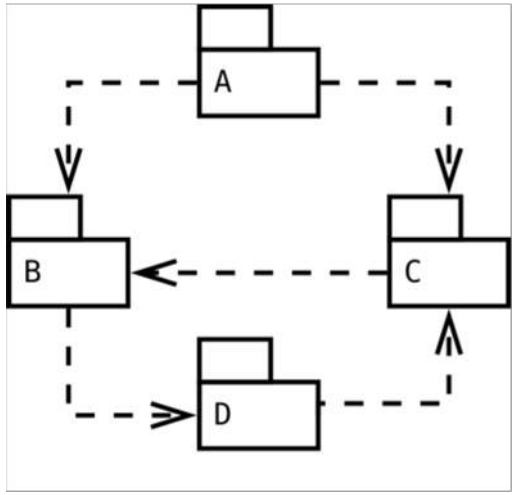
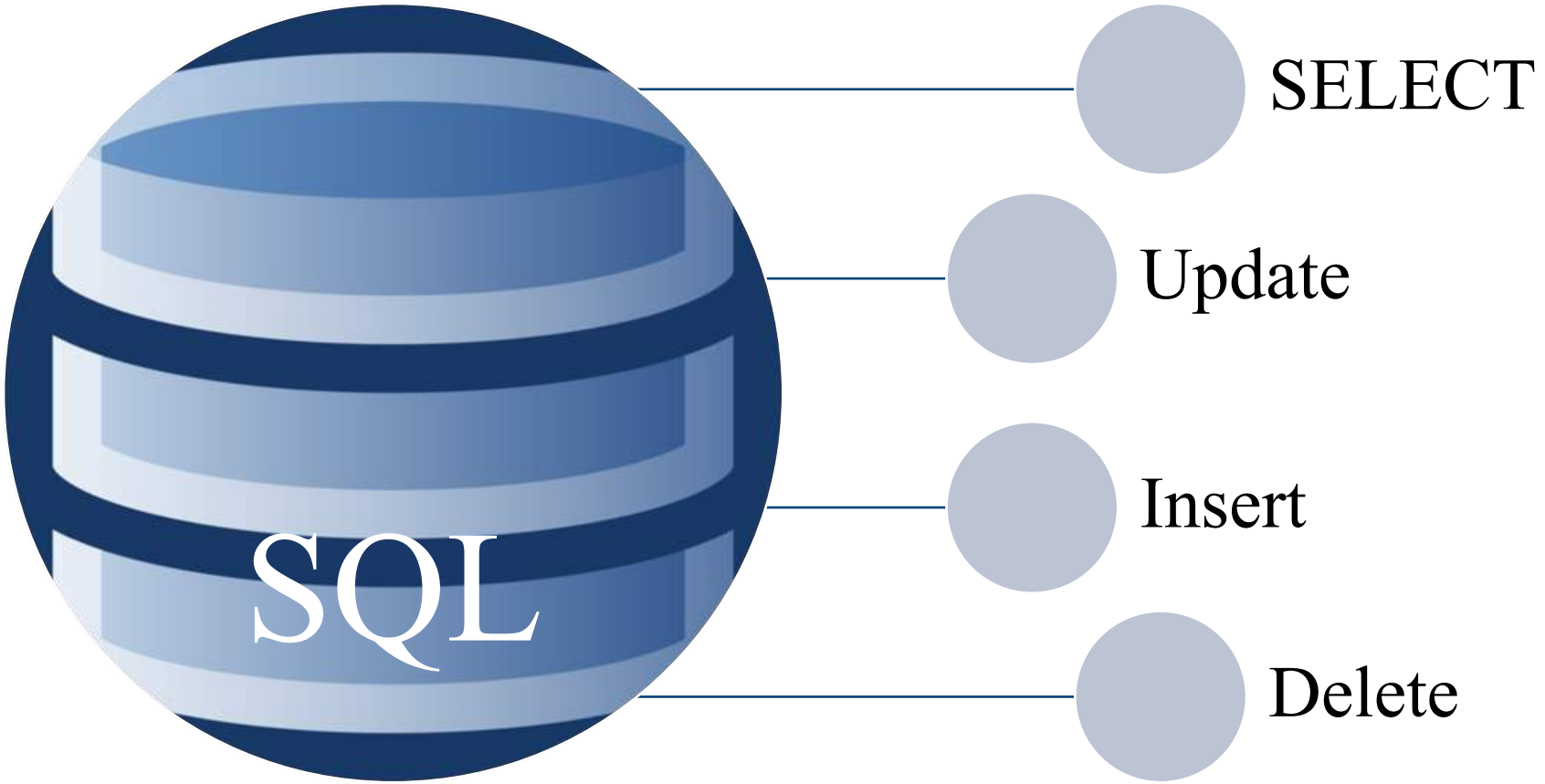




6. SQL Data Definition



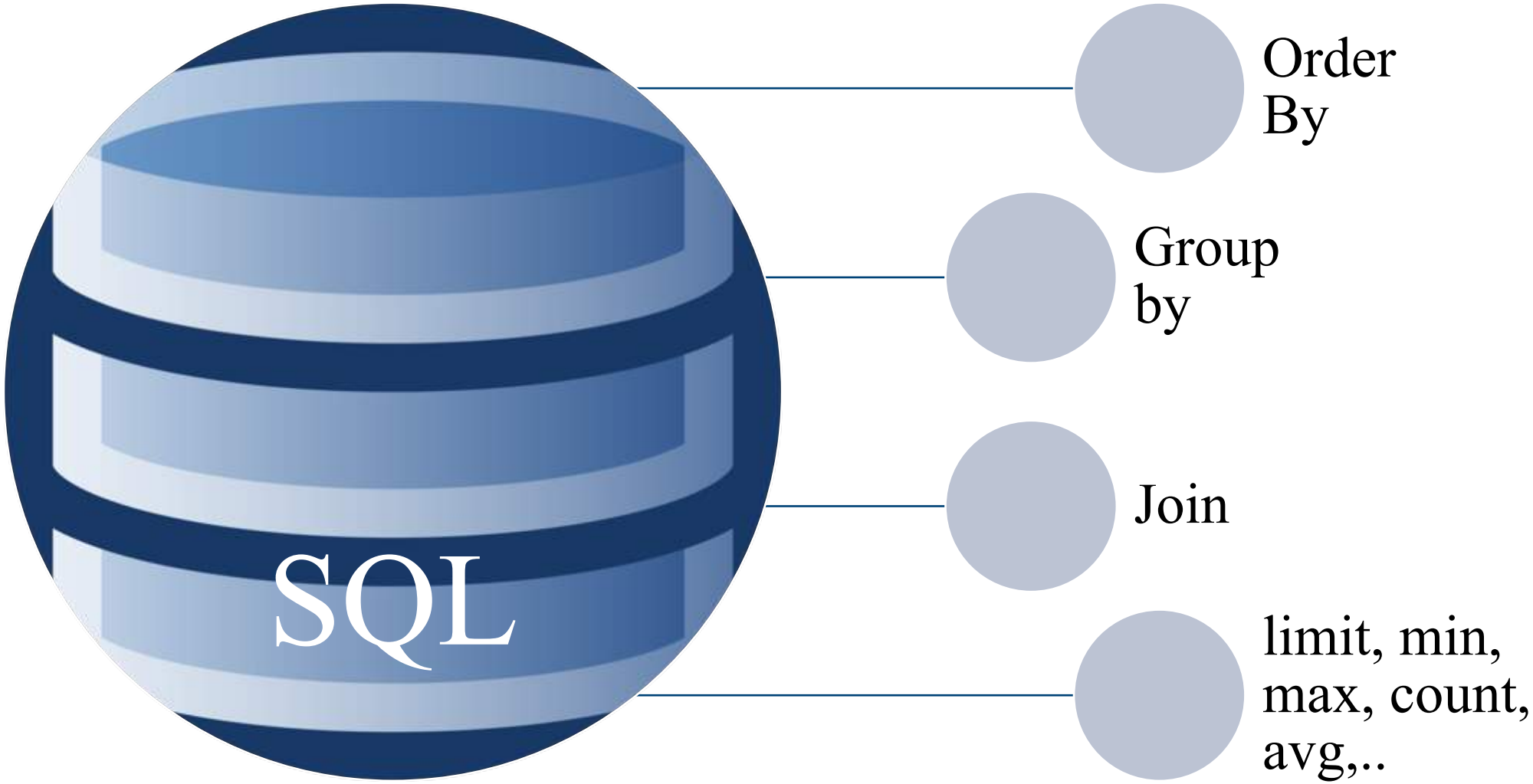
6. SQL Data Definition

- A database system consists of
  - Data (the database)
  - Software
  - Hardware
  - Users
- We focus mainly on the software

- Database systems allow users to
  - Store
  - Update
  - Retrieve
  - Organise
  - Protect

their data.

7. More SQL – Data Definition Language

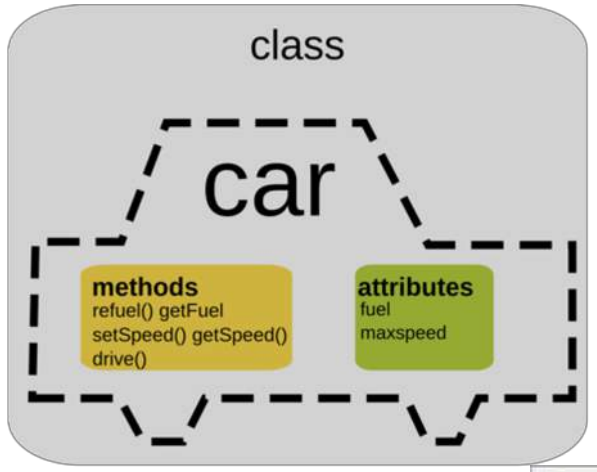


8. Data Administration and Security

8. Data Administration and Security

- End users
  - Use the database system to achieve some goal
- Application developers
  - Write software to allow end users to interface with the database system
- Database Administrator (DBA)
  - Designs & manages the database system
- Database systems programmer
  - Writes the database software itself

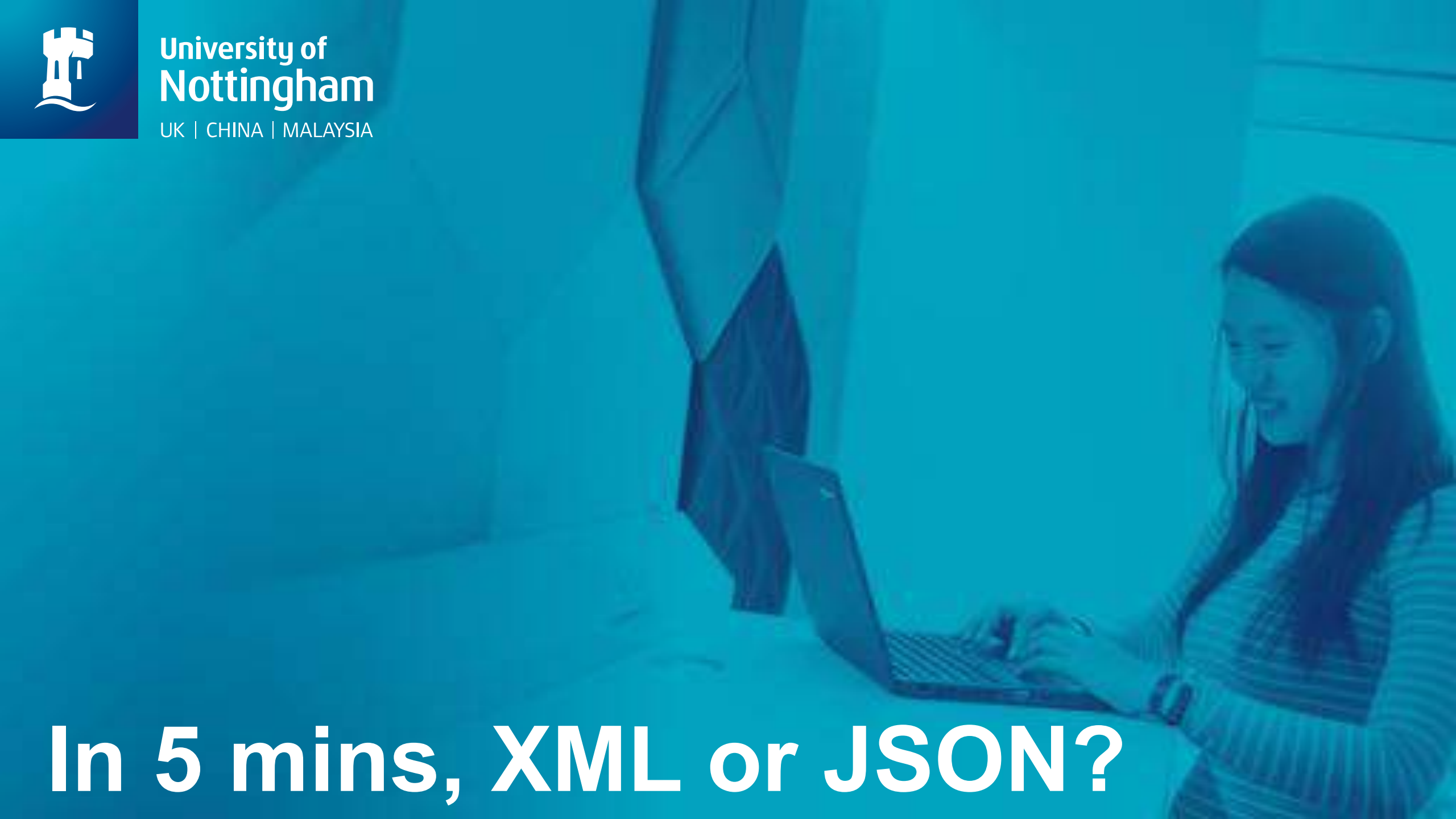
9. Object-relational & Object-oriented Databases, XML and databases




```
{
        "title": "Example Schema",
        "type": "object",
        "properties": {
                "firstName": {
                        "type": "string"
                },
                "lastName": {
                        "type": "string"
                },
                "age": {
                        "description": "Age in years
                        "type": "integer",
                        "minimum": 0
                }
        },
        "required": ["firstName", "lastName"]
}
```

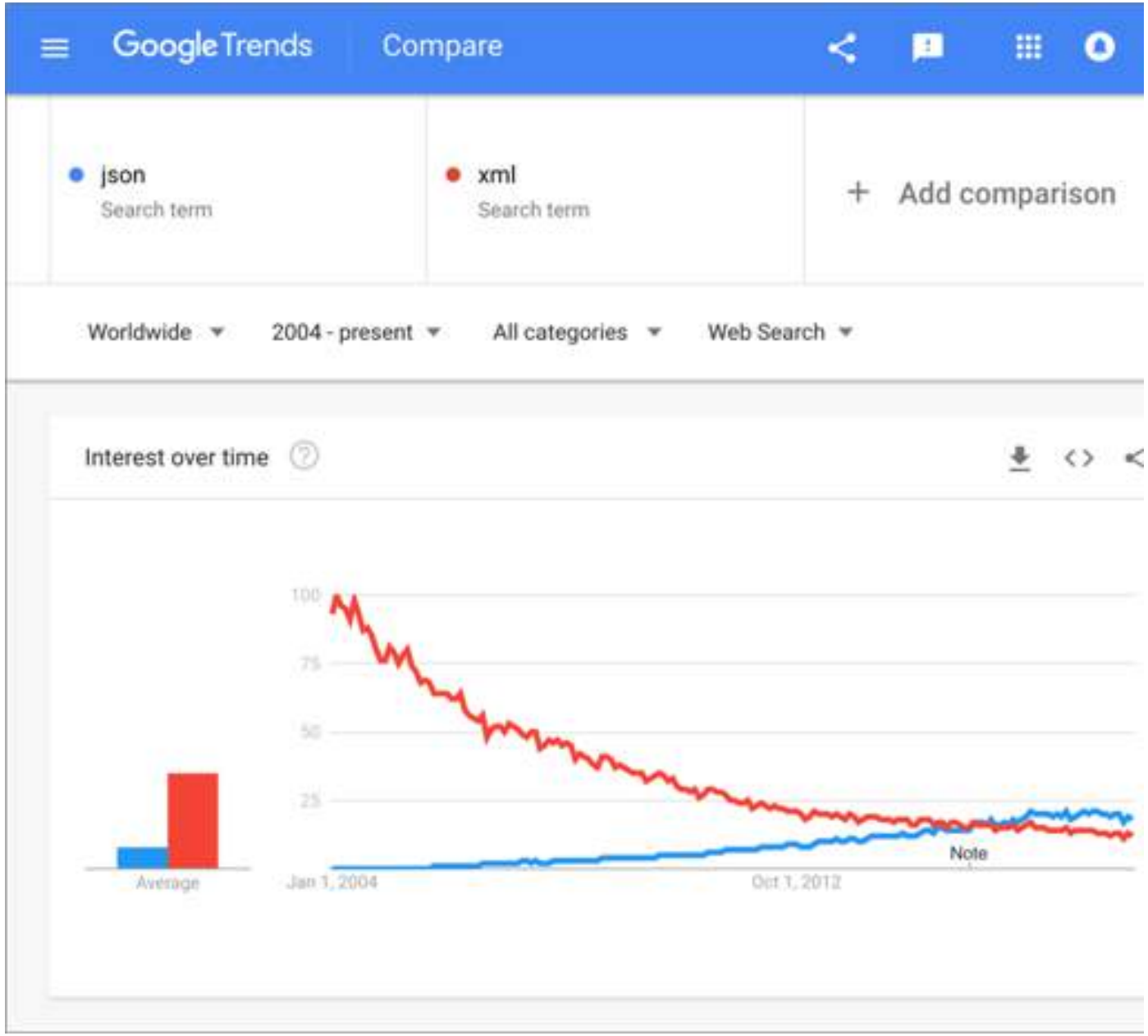
```
<?xml version="1.0"?>
<quiz>
 <qanda seq="1">
  <question>
   Who was the forty-second
   president of the U.S.A.?
  </question>
  <answer>
   William Jefferson Clinton
  </answer>
 </qanda>
 <!-- Note: We need to add
  more questions later.-->
</quiz>
```

XML



In 5 mins, XML or JSON?

9. Object-relational & Object-oriented Databases, XML and databases



10. Good and Bad 'Modern' Databases

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Lab Work

Lab work

1. Install and configure RDBMS
2. Create database schema, perform operations
3. Administration, security, backup & recovery
4. Complex operations and optimizations.
5. Create API to the database
6. Develop application to access the database.
7. Final project.

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Next Lecture

The Relational Model

- Relational data structure
- Relational data integrity
- Relational data manipulation