University of Strathclyde Glasgow

THE PLACE OF USEFUL LEARNING

Database Fundamentals – CS990

Database and Web Systems Development - CS952

Image source: https://www.strath.ac.uk/branding/

Database and Web Systems Development CS952

Database Fundamentals CS990

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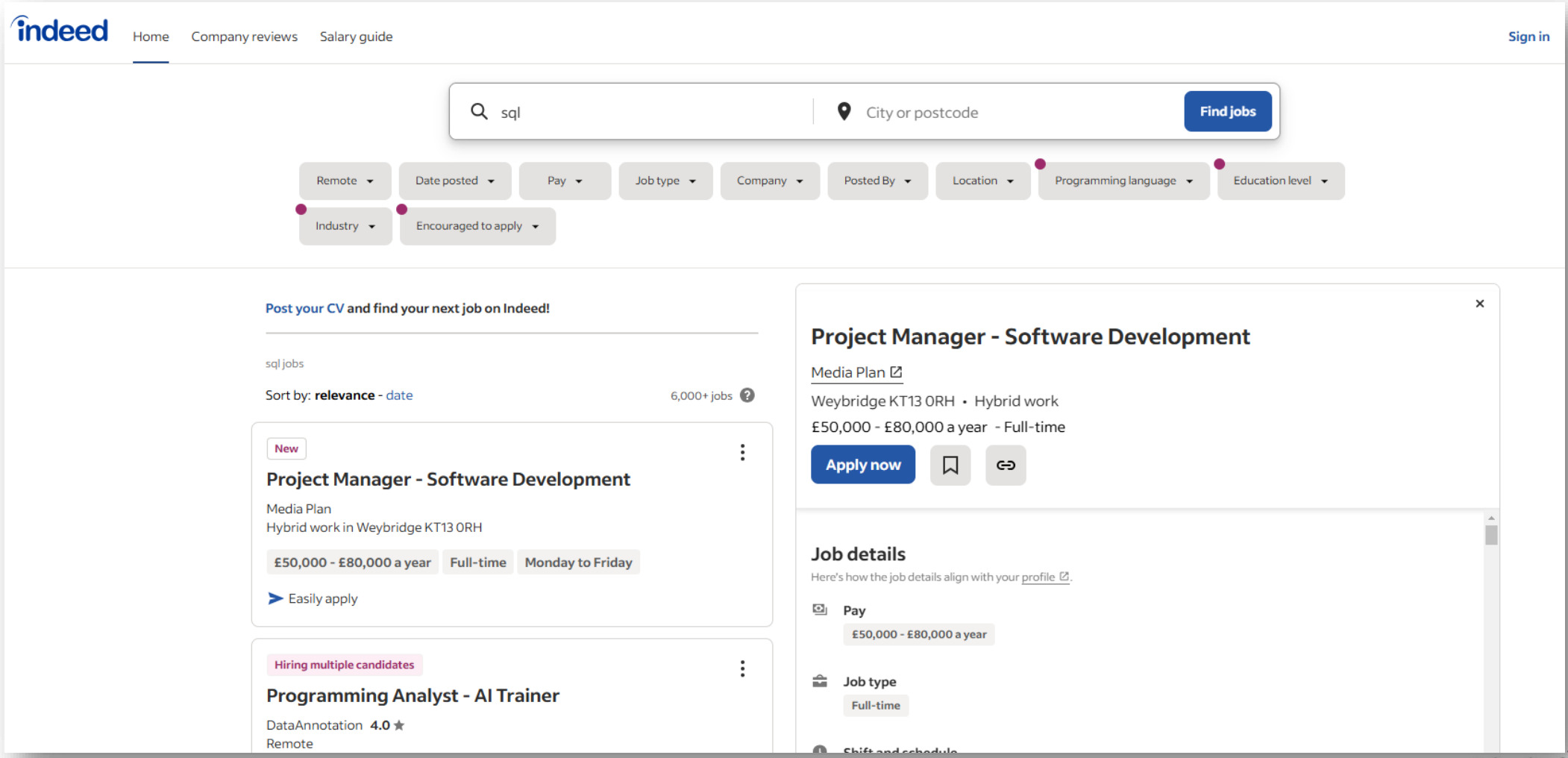
CS990 Database Fundamentals

- Module Content:
  - Introduction – basics and administration
  - The relational model
  - Database design
  - SQL
  - Normalisation
- Practical: Lab Sessions

Introduction

- Motivation
- Opportunities
- Module Organisation

22 Jan 2025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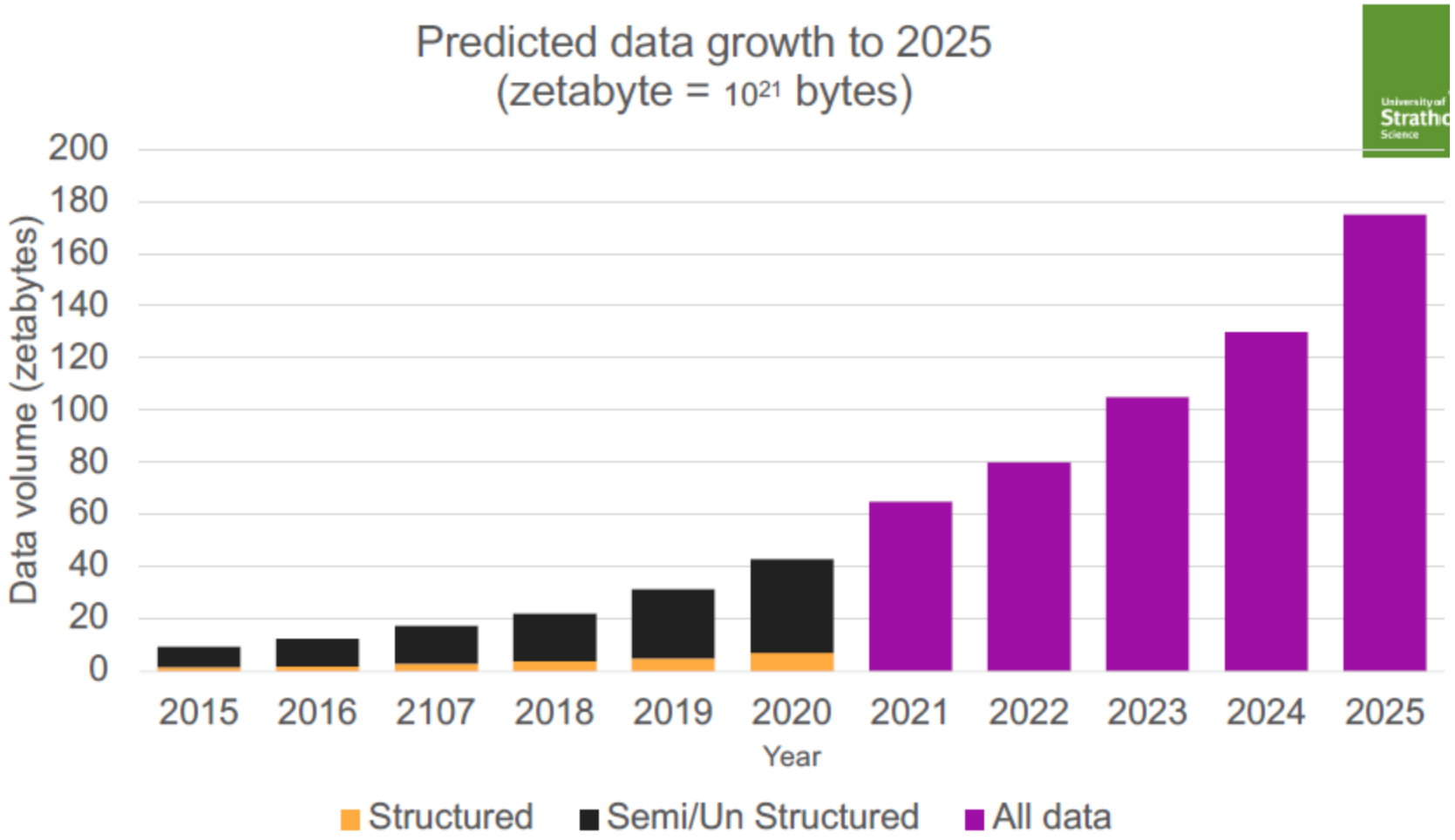
Full-time



Source: Data Age 2025: https://www.i-scoop.eu/big-data-action-value-context/data-age-2025-datasphere/ and other

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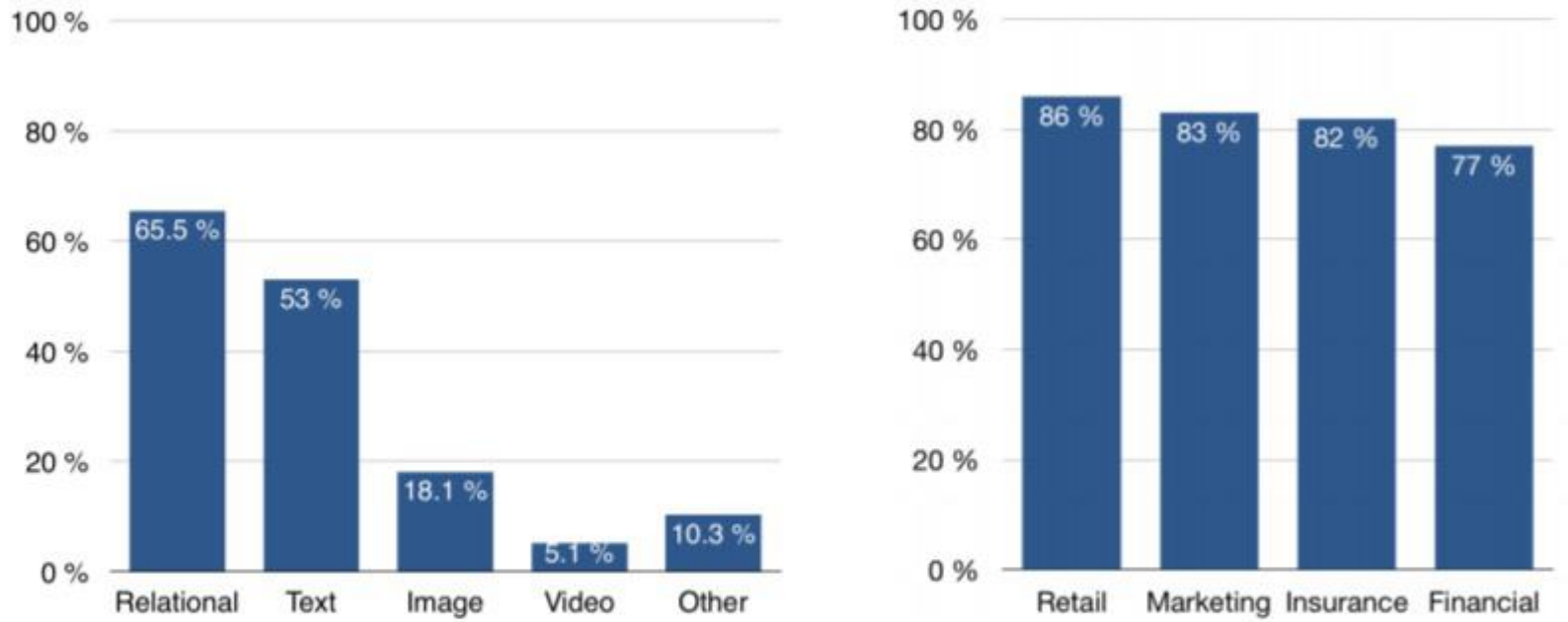


Figure 1: Kaggle survey of 16,000 practitioners on the state of data science and machine learning: Use of relational data: overall (left), by industry (right).

Dan Olteanu. The Relational Data Borg is Learning. PVLDB, 13(12): 3502-3515, 2020. DOI: https://doi.org/10.14778/3415478.3415572

Roles in the Database Environment

- Data Administrator (DA)
- Database Administrator (DBA)
- Database Designers (Logical and Physical)
- Application Programmers
- End Users (naive and sophisticated)

itjobswatch.co.uk/

Results 1 - 24 of 24

Description	Rank 6 Months to 17 Jan 2024	Rank YoY Change	Median Salary	Median Salary YoY Change	Historical Absolute & Relative Jobs Vacancies		Live Jobs
SQL	10	▼ -4	£59,028	-1.62%	8,786	14.13%	3,985

Module content

CS952	CS990	Lectures: Introduction – basics and administration
		The relational model
		Database design
		SQL
		Normalisation
		Tutorials: Database design & normalisation
		Practicals: Oracle
		Lectures: PHP/CSS/HTML/Javascript
		Security
		Accessibility
		Practicals: PHP/CSS/HTML/Javascript

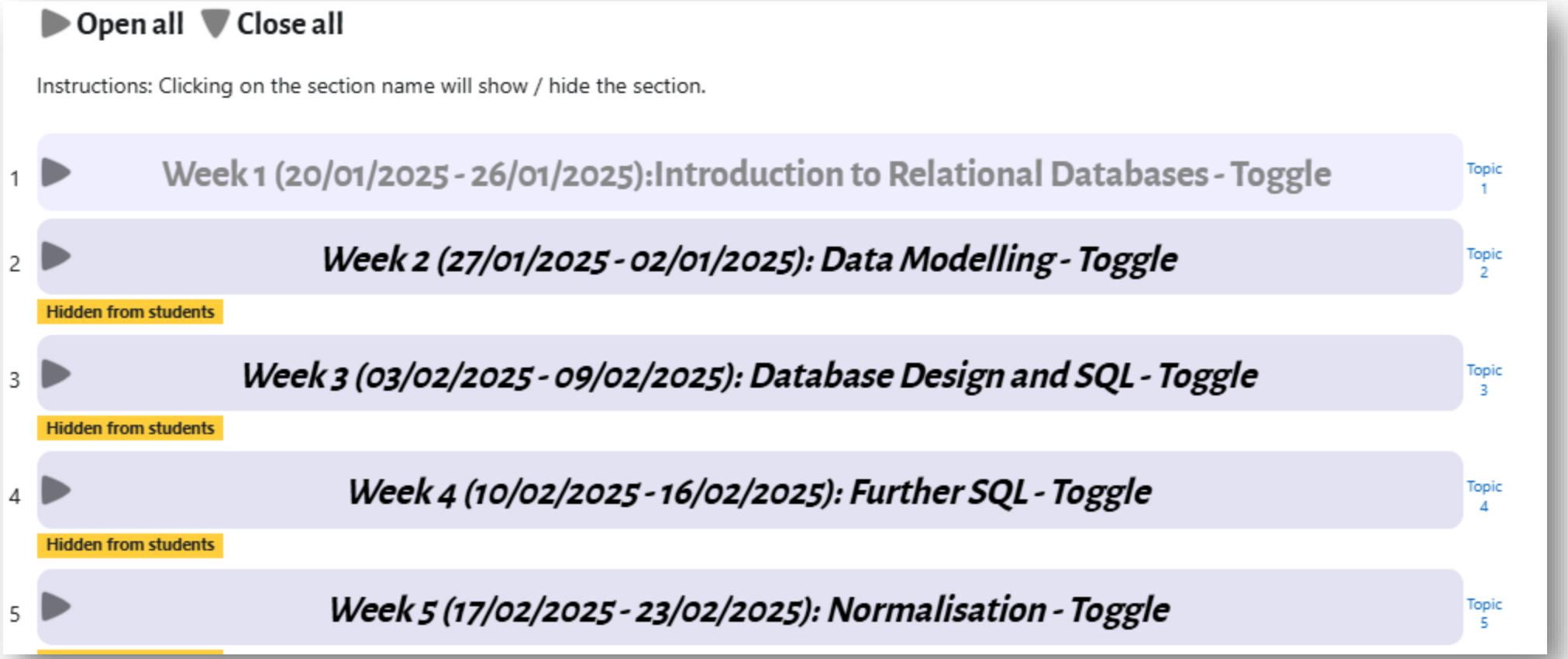
Assessments – CS990

Classwork 1: Entity Relationship Modelling – A self-assessed formative exercise.	0%
Class Tests (3) - MCQs - Online on MyPlace	30%
Exam 1 hour	70%
Resit: Examination	100%

Assessments – CS952

Classwork 1: Entity Relationship Modelling – A self-assessed formative exercise.	0%
Class tests (3) - MCQs - Online on MyPlace	15%
Classwork 2 - Database & Web Systems Project	35%
Exam – 2 Hour – Paper based	50%
Resit: Examination – Paper based	100%

Resources - MyPlace



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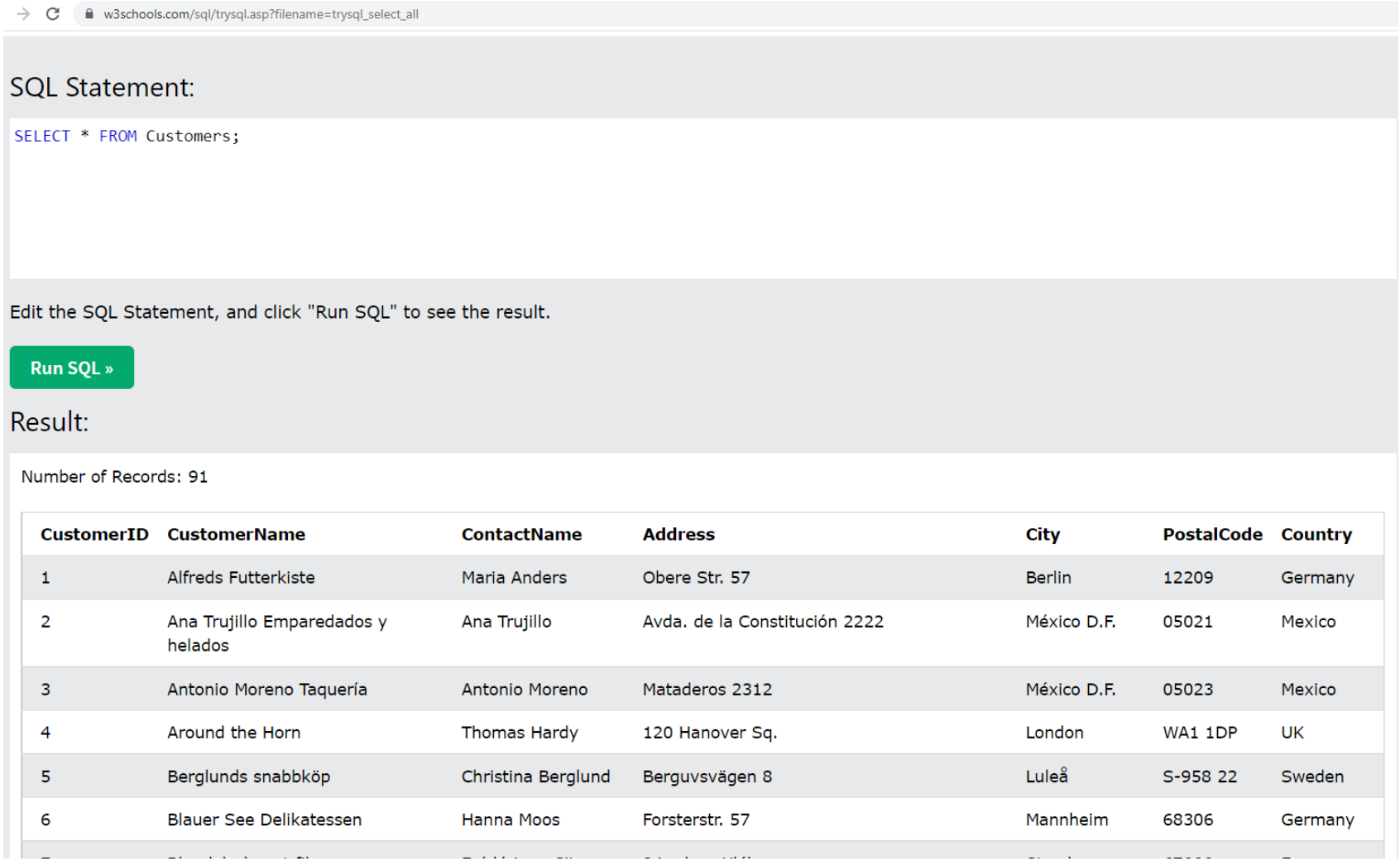
Additional resources



CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany

Recommended Text/Reading

Internet & World Wide Web How to Program (4th Edition). *Deitel, H.* and *Deitel, P.* Prentice Hall, 2007. ISBN-13: 978-0136035428 | Stocked at Amazon (Other retailers are available)

Database Systems: A Practical Approach to Design, Implementation and Management (6th Edition). *Connolly. T.M.* and *Begg, C.E.* Pearson, 2014. | Stocked at Amazon (Other retailers are available)

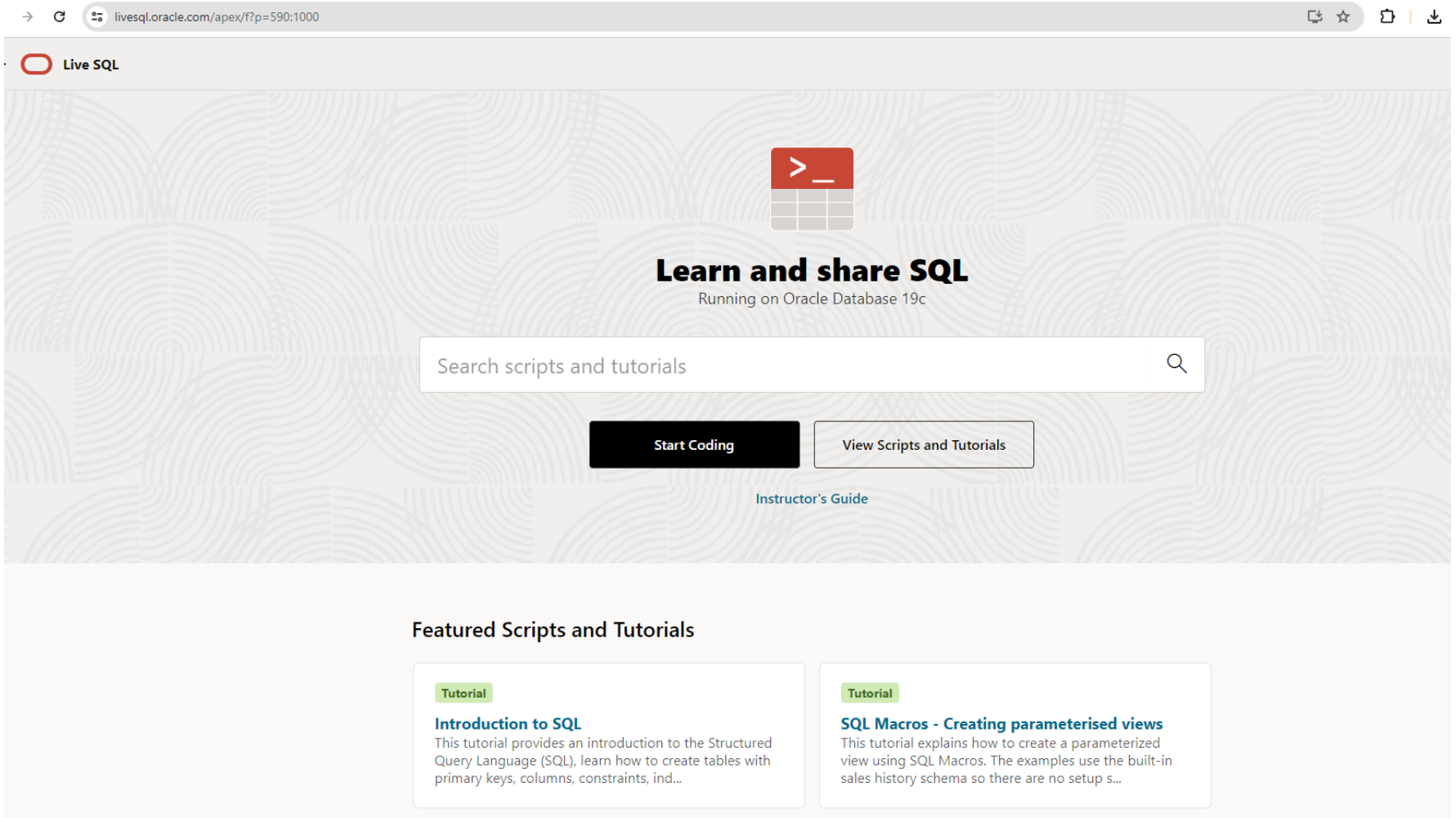
Database Principles and Design (3rd Edition). *Ritchie, C.* Cengage, 2008. ISBN-13: 978-1844805402 | Stocked at Amazon (Other retailers are available)

Practical - organisation

Practical Session	Programme
Tuesday 15:00 – 17:00	MSc Software Development
Thursday 12:00 – 14:00	MSc Information Management - MSc Data Analytics
Friday 12:00 – 14:00	MSc Data Science for Politics and Policy Making MSc Digital Health Systems

Oracle live: Web based Database learning platform.
https://livesql.oracle.com

Oracle Live


livesql.oracle.com/apex/f?p=590:1000
Live SQL
Learn and share SQL
Running on Oracle Database 19c
Search scripts and tutorials
Start Coding
View Scripts and Tutorials
Instructor's Guide
Featured Scripts and Tutorials
Tutorial
Introduction to SQL
This tutorial provides an introduction to the Structured Query Language (SQL), learn how to create tables with primary keys, columns, constraints, ind...
Tutorial
SQL Macros - Creating parameterised views
This tutorial explains how to create a parameterized view using SQL Macros. The examples use the built-in sales history schema so there are no setup s...

Getting started with Database

Database

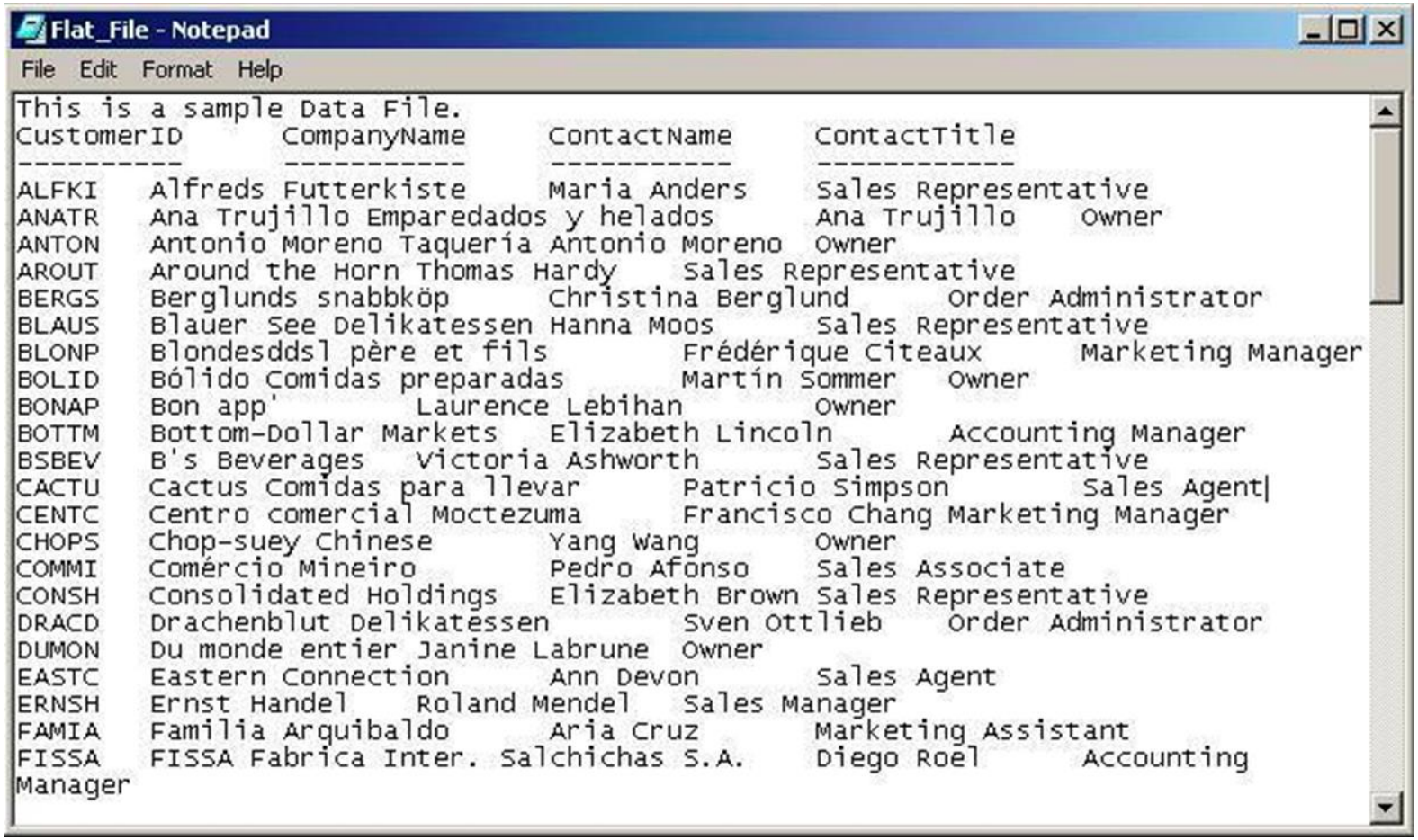
- A shared collection of logically-related data (along with its description) intended to meet the information needs of an organisation.
- Data - facts: bill. Information – organised data: Name-bill.
- Logically related data that represents the entities, attributes, and relationships of an organisation’s information.
- The description is provided in a system catalogue – the metadata.

Flat Files (1968)

The Evolution :

1968 File-Based: predecessor of database, Data was maintained in a flat file.

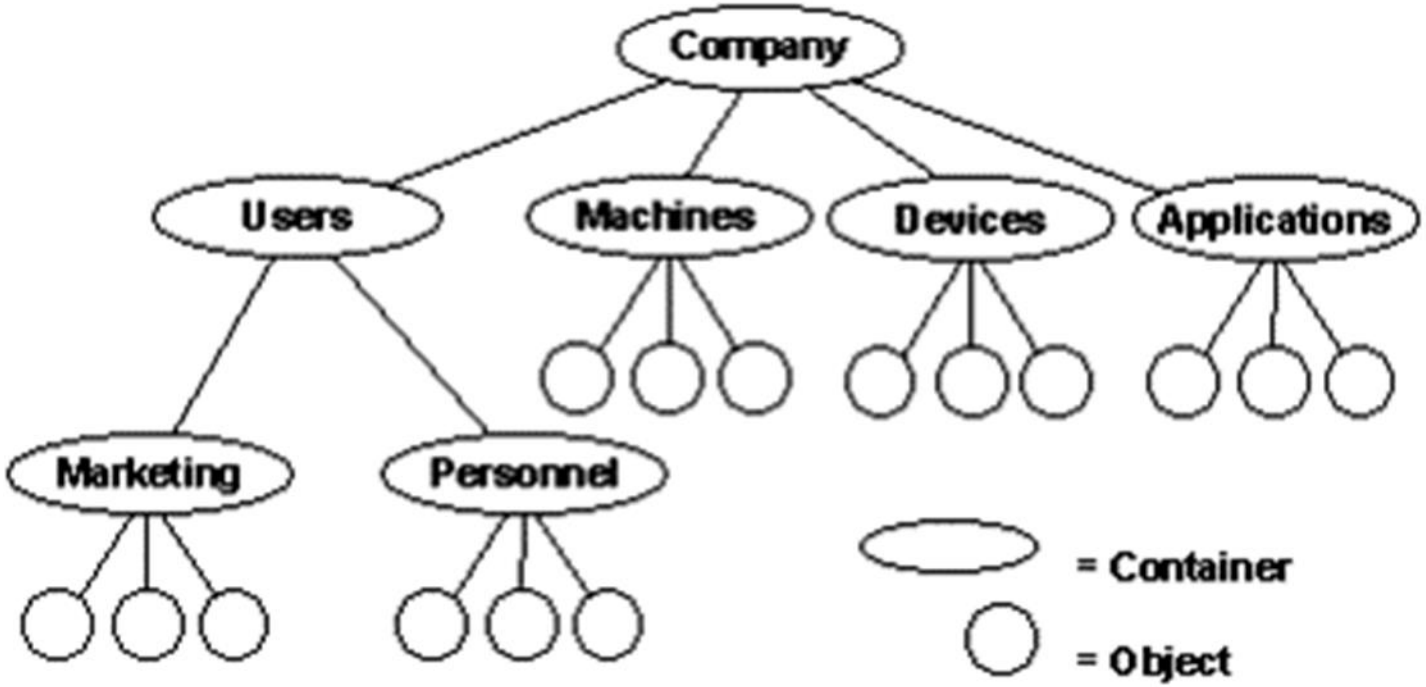
Flat Files: Earlier, punched cards technology was used to store data – later, files. But the files have no as such advantage, rather have several limitations.



https://mhaadi.wordpress.com/2010/10/18/the-evolution-of-database/

Hierarchical Data Model (*1968-1980*)

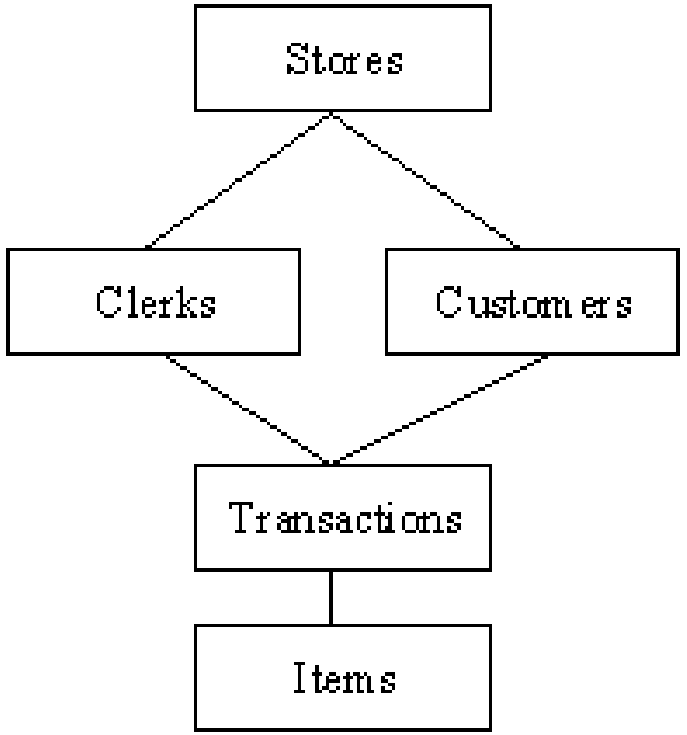
Files are related in a parent/child manner, with each child file having at most one parent file.



https://mhaadi.wordpress.com/2010/10/18/the-evolution-of-database/

Network Data Model (1960-1971)

- Files are related as owners and members, similar to the common network model except that each member file can have more than one owner.

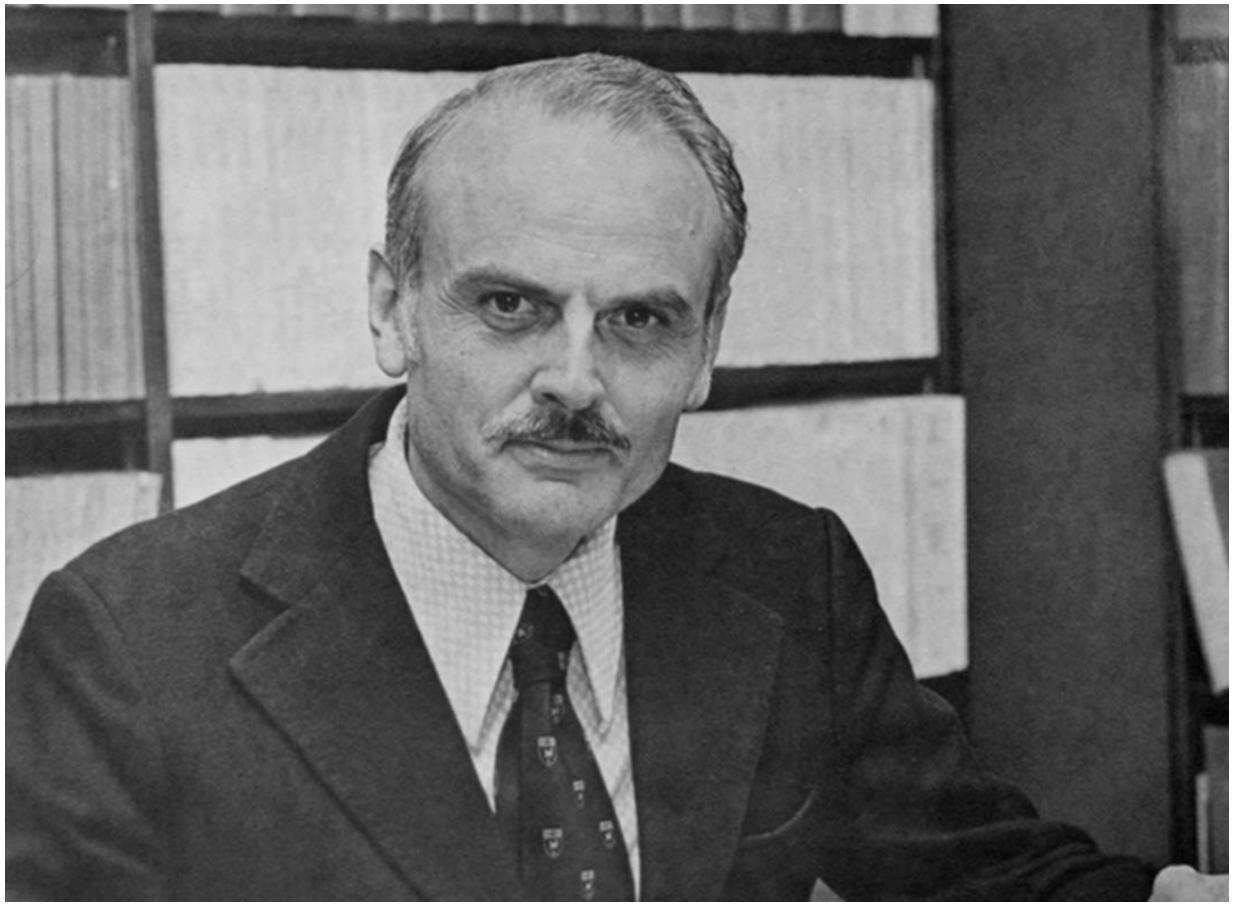


Relational Model: Ted Codd

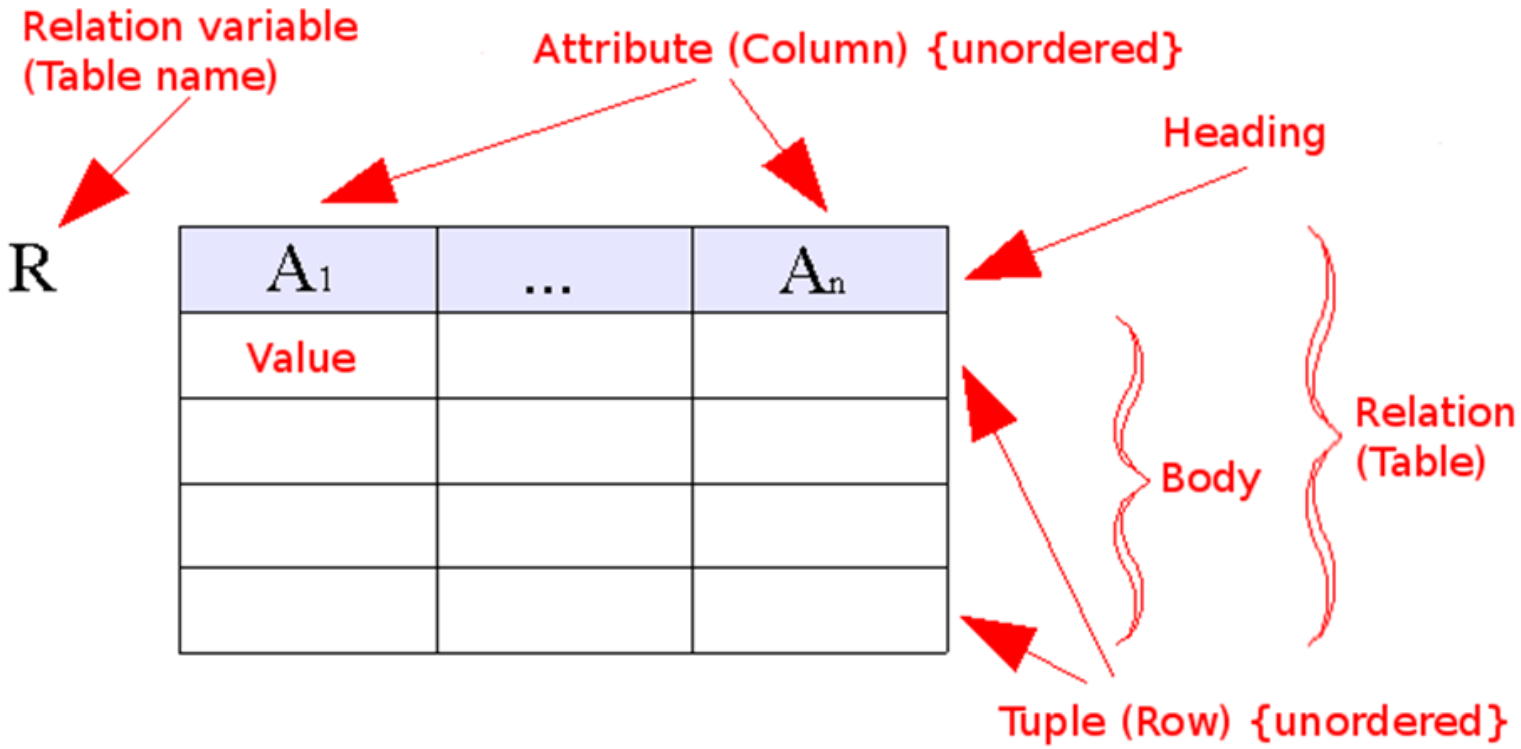
Two terminologies:

- Instance – a table with rows or columns.
- Schema – specifies the structure (name of relation, name and type of each column)

The model is based on branches of mathematics called ***set theory*** *and* ***predicate logic.***



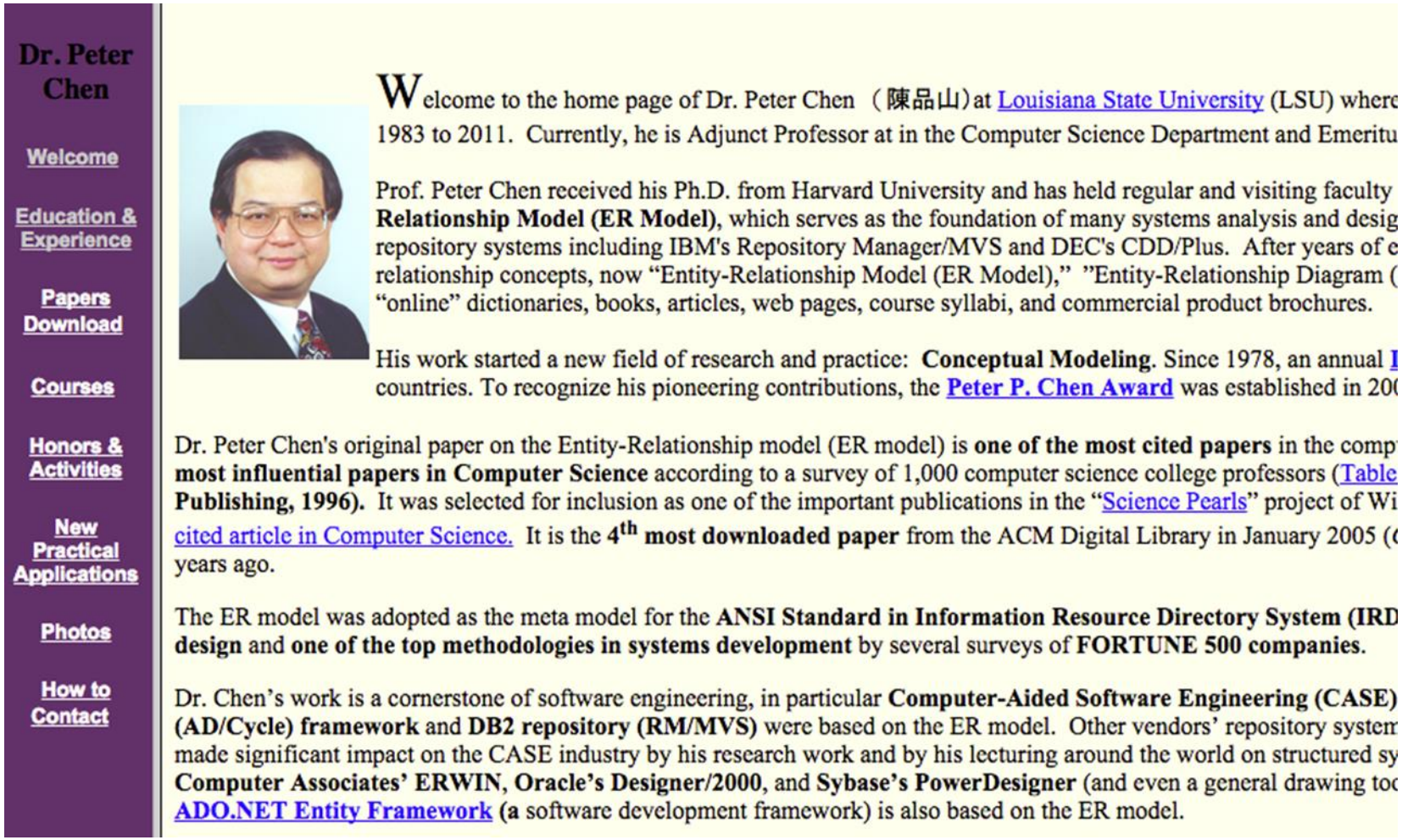
Relational Model (*1970-present*)



https://en.wikipedia.org/wiki/Relational_model#/media/File:Relational_model_concepts.png

ER Notation: Peter Chen

ER Notation: Peter Chen



Dr. Peter Chen

Welcome

Education & Experience

Papers Download

Courses

Honors & Activities

New Practical Applications

Photos

How to Contact

Welcome to the home page of Dr. Peter Chen （陳品山）at Louisiana State University (LSU) where
1983 to 2011. Currently, he is Adjunct Professor at in the Computer Science Department and Emeritu

Prof. Peter Chen received his Ph.D. from Harvard University and has held regular and visiting faculty
Relationship Model (ER Model), which serves as the foundation of many systems analysis and desig
repository systems including IBM's Repository Manager/MVS and DEC's CDD/Plus. After years of e
relationship concepts, now "Entity-Relationship Model (ER Model)," "Entity-Relationship Diagram (
"online" dictionaries, books, articles, web pages, course syllabi, and commercial product brochures.

His work started a new field of research and practice: **Conceptual Modeling**. Since 1978, an annual I
countries. To recognize his pioneering contributions, the **Peter P. Chen Award** was established in 20(

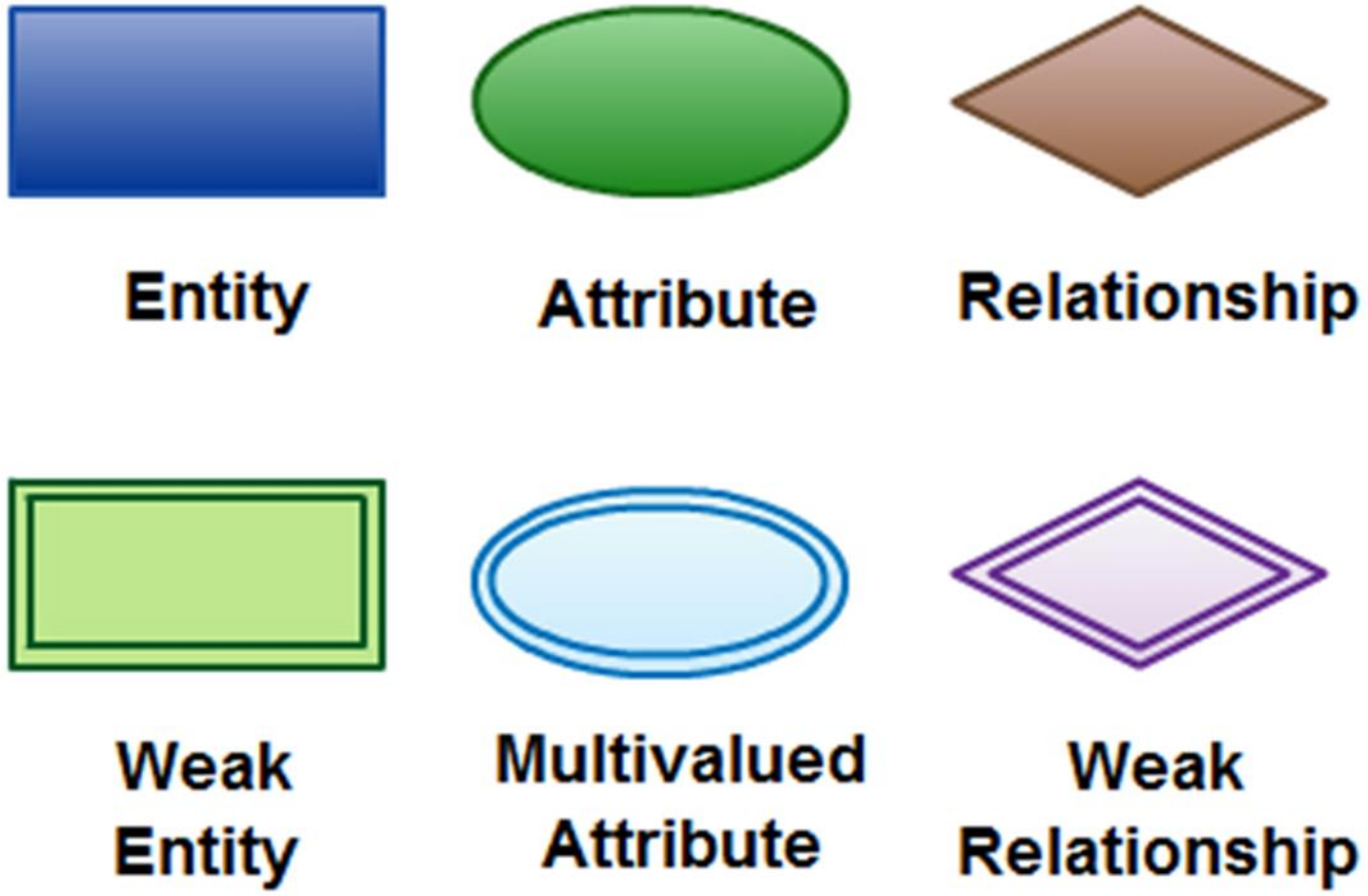
Dr. Peter Chen's original paper on the Entity-Relationship model (ER model) is **one of the most cited papers** in the comp
most influential papers in Computer Science according to a survey of 1,000 computer science college professors (Table
Publishing, 1996). It was selected for inclusion as one of the important publications in the "Science Pearls" project of Wi
cited article in Computer Science. It is the **4th most downloaded paper** from the ACM Digital Library in January 2005 (
years ago.

The ER model was adopted as the meta model for the **ANSI Standard in Information Resource Directory System (IRD**
design and **one of the top methodologies in systems development** by several surveys of **FORTUNE 500 companies**.

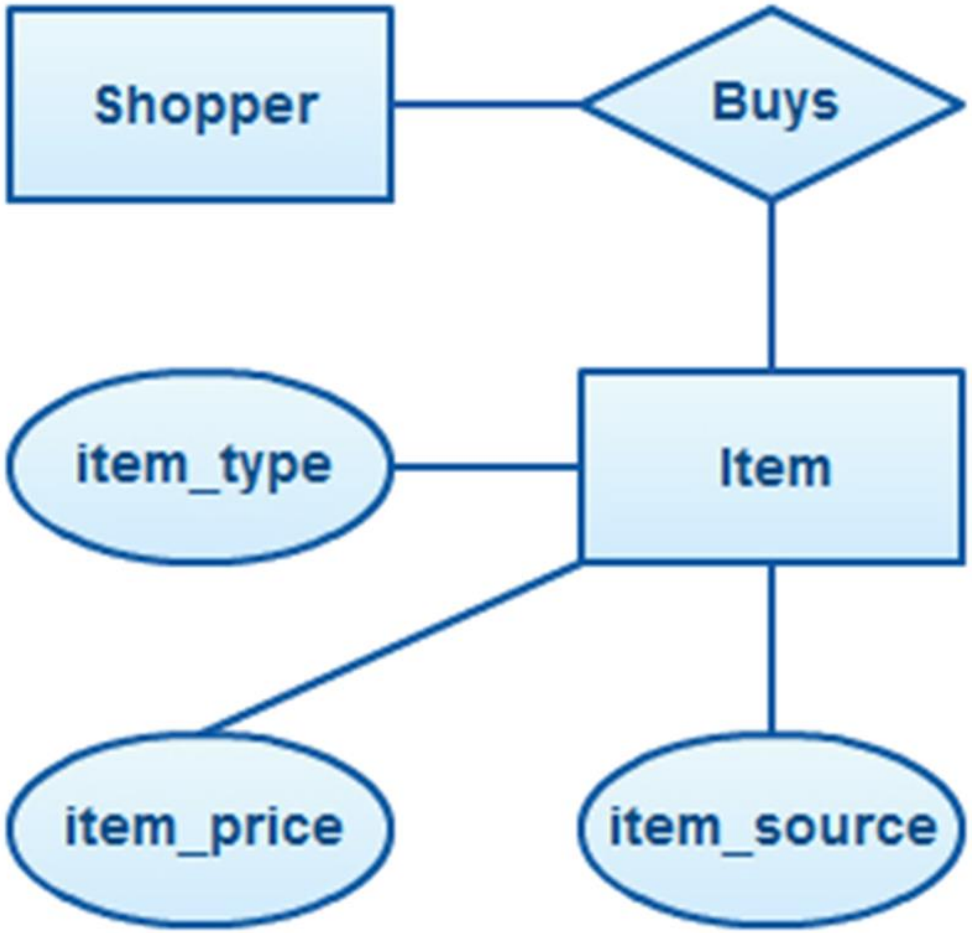
Dr. Chen's work is a cornerstone of software engineering, in particular **Computer-Aided Software Engineering (CASE)**
(AD/Cycle) framework and **DB2 repository (RM/MVS)** were based on the ER model. Other vendors' repository system
made significant impact on the CASE industry by his research work and by his lecturing around the world on structured sy
Computer Associates' ERWIN, **Oracle's Designer/2000**, and **Sybase's PowerDesigner** (and even a general drawing too
ADO.NET Entity Framework (a software development framework) is also based on the ER model.

https://www.csc.lsu.edu/~chen/

ER Notation



Really Simple



Examples of Database Applications

- Purchases from the supermarket
- Facebook/Twitter (FB 5 petabytes/day)
- Booking a holiday
- Checking your phone
- Taking out insurance
- Using the Internet
- Studying at university

Basics 1

table name

table

column

primary key

column name

Dept

Name	Number	Location
CIS	52	LT11.01
Maths	19	LT8.26
English	21	LT8.26

row

value

Basics 2

Dept

Name	Number	Location
CIS	52	LT11.01
Maths	19	LT8.26
English	21	LT8.26

SQL "select" is used to retrieve data from databases.

column names

```
select Name, Number, Location
from Dept
where Number > 20;
```

table name

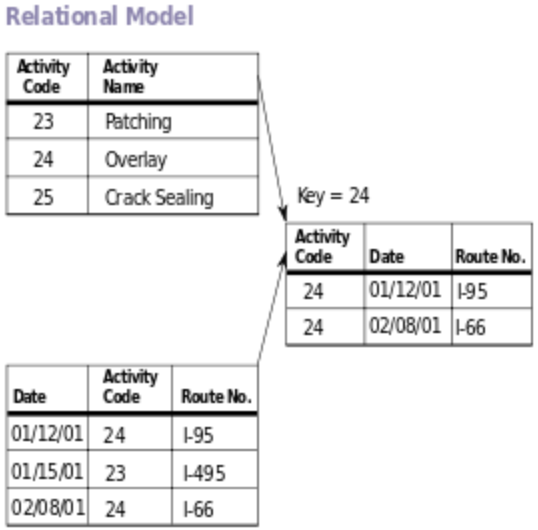
SQL keywords

condition

Name	Number	Location
CIS	52	LT11.01
English	21	LT8.26

Next lecture

- The Relational Model



https://simple.wikipedia.org/wiki/Relational_model

Course Content

1. Introduction to Relational Databases *(Introduction + Relational Model)*
2. Data Modelling - *(Entity Relationship Modelling + The Enhanced Entity Relationship Model)*
3. Database Design and SQL - *(Logical modelling + Introduction to SQL)*
4. Further SQL - *(Advanced SQL queries + Creating tables with SQL)*
5. Normalisation - *(Normalisation to second normal form + Third normal form)*

thank you

Reach me at: *muhammad.irfan@strath.ac.uk*

Image source: fluentu.com

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Glasgow