Databases

INTRODUCTION TO SQL



Jasmin Ludolf

Senior Data Science Content Developer, DataCamp

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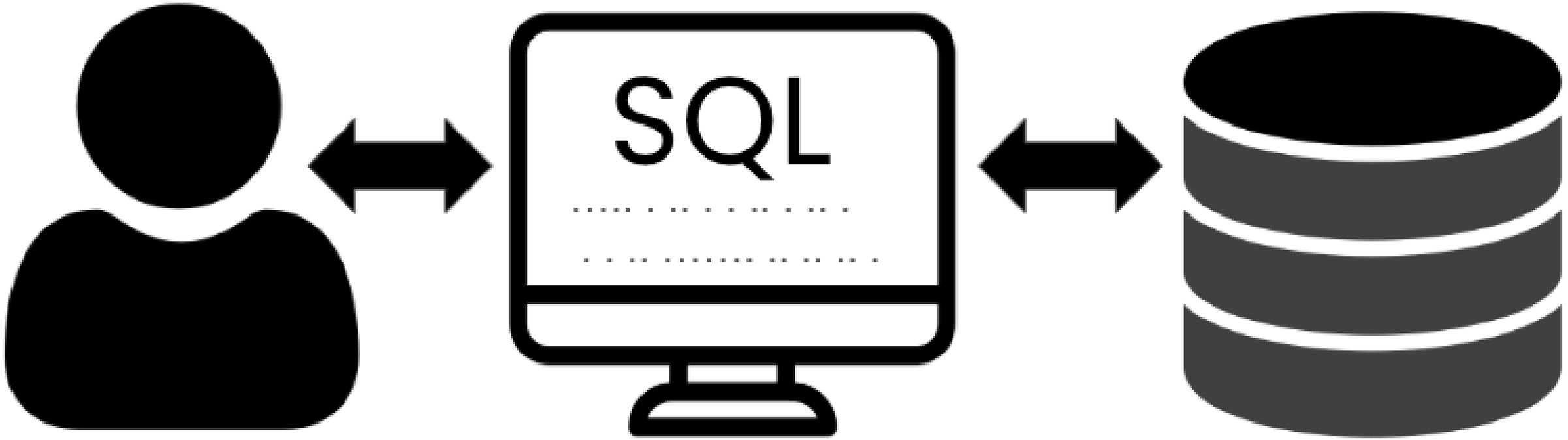
Course goals

1. Understand databases and their structure → Chapter 1
2. Extract information from databases using SQL → Chapter 2

Structured Query Language (SQL)

- SQL communicates with databases



Introducing databases

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

books

id	title	author	genre	pub_year
638	Being Mortal	Atul Gawande	Non-Fiction	2015
912	Educated	Tara Westover	Non-Fiction	2018
322	Night	Elie Wiesel	Non-Fiction	1956
156	Where the Wild Things Are	Maurice Sendak	Childrens	1963

checkouts

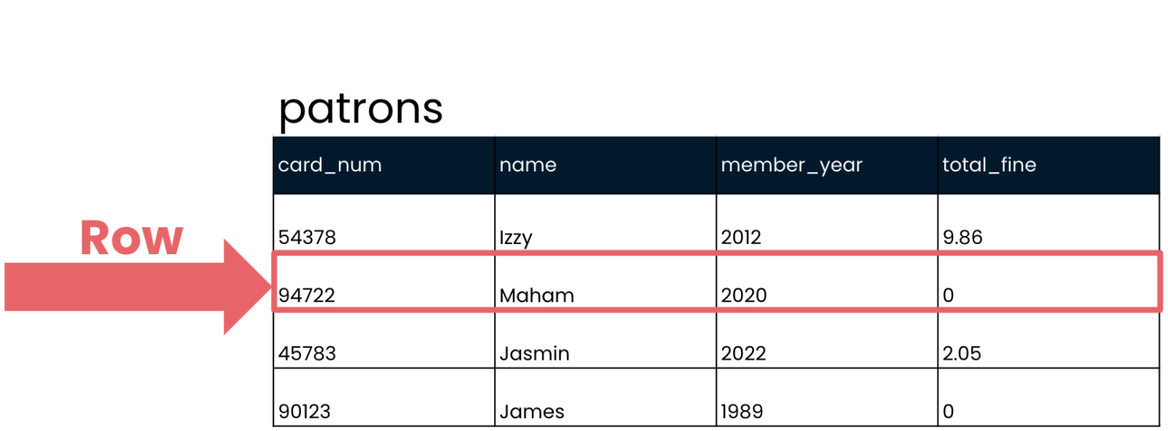
id	start_date	due_date	card_num	book_id
567	2022-05-13	2022-05-27	54378	638
568	2022-06-10	2022-06-24	54378	322
569	2022-06-27	2022-07-11	45783	156
570	2022-08-14	2022-08-28	90123	912

A closer look at tables

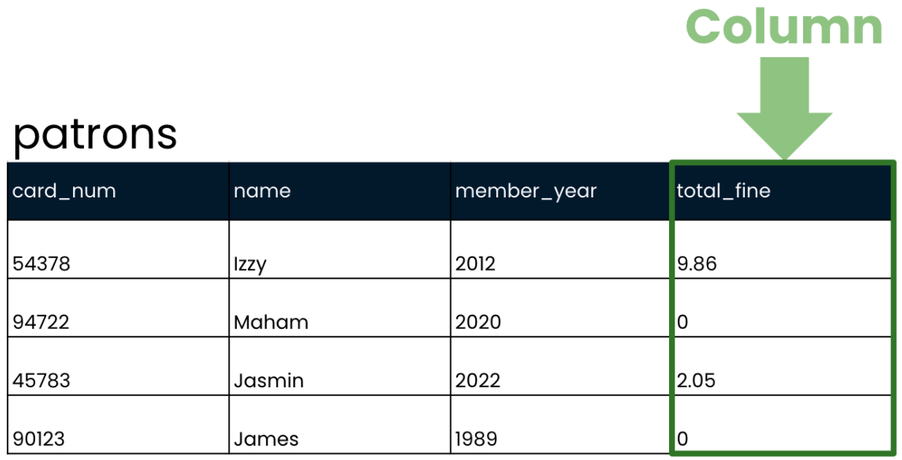
patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

Rows and columns



- Individual data



- Specific part of data

Relational databases

- Define relationships between tables of data inside the database

checkouts

id	start_date	due_date	**card_num**	**book_id**
23359	2024-05-11	2024-05-25	**54378**	**547**
23360	2024-05-12	2024-05-26	**94722**	**156**
23361	2024-05-12	2024-05-26	**45783**	**912**
23362	2024-05-13	2024-05-27	**90123**	**838**

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
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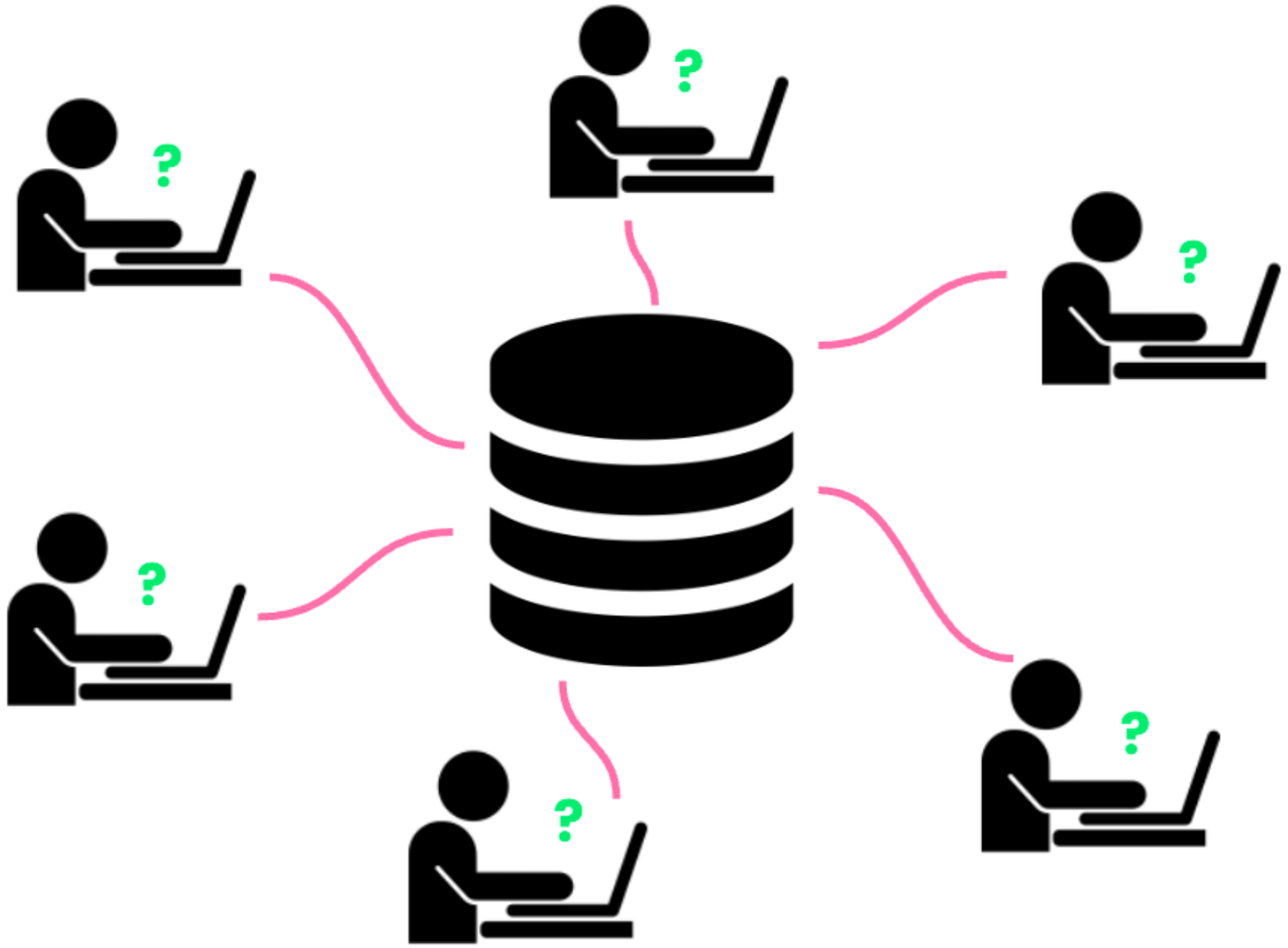
books

id	title	author	genre	pub_year
838	Being Mortal	Atul Gawande	Non-Fiction	2015
912	Educated	Tara Westover	Non-Fiction	2018
547	Segment of One	Michael Grigsby	Fiction	2022
156	Where the Wild Things Are	Maurice Sendak	Childrens	1963

Database advantages



Let's practice!

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Tables

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Table naming

Table names:

- Clear
- Refer the data it contains(plural)
- Lowercase
- Use underscores—no spaces







patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
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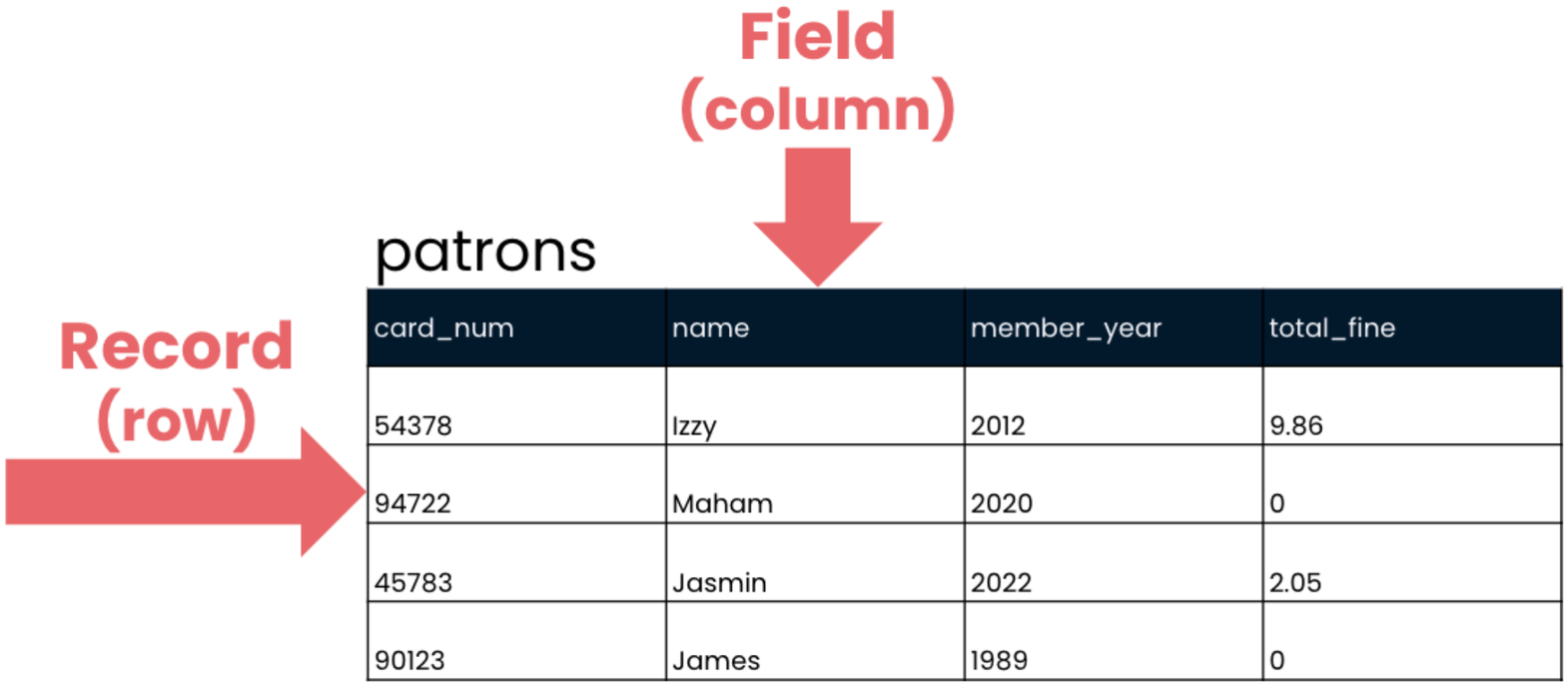
Records and fields

- Table rows are *records*
- Table columns are *fields*



card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

Records

- A specific data observation



patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
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45783	Jasmin	2022	2.05
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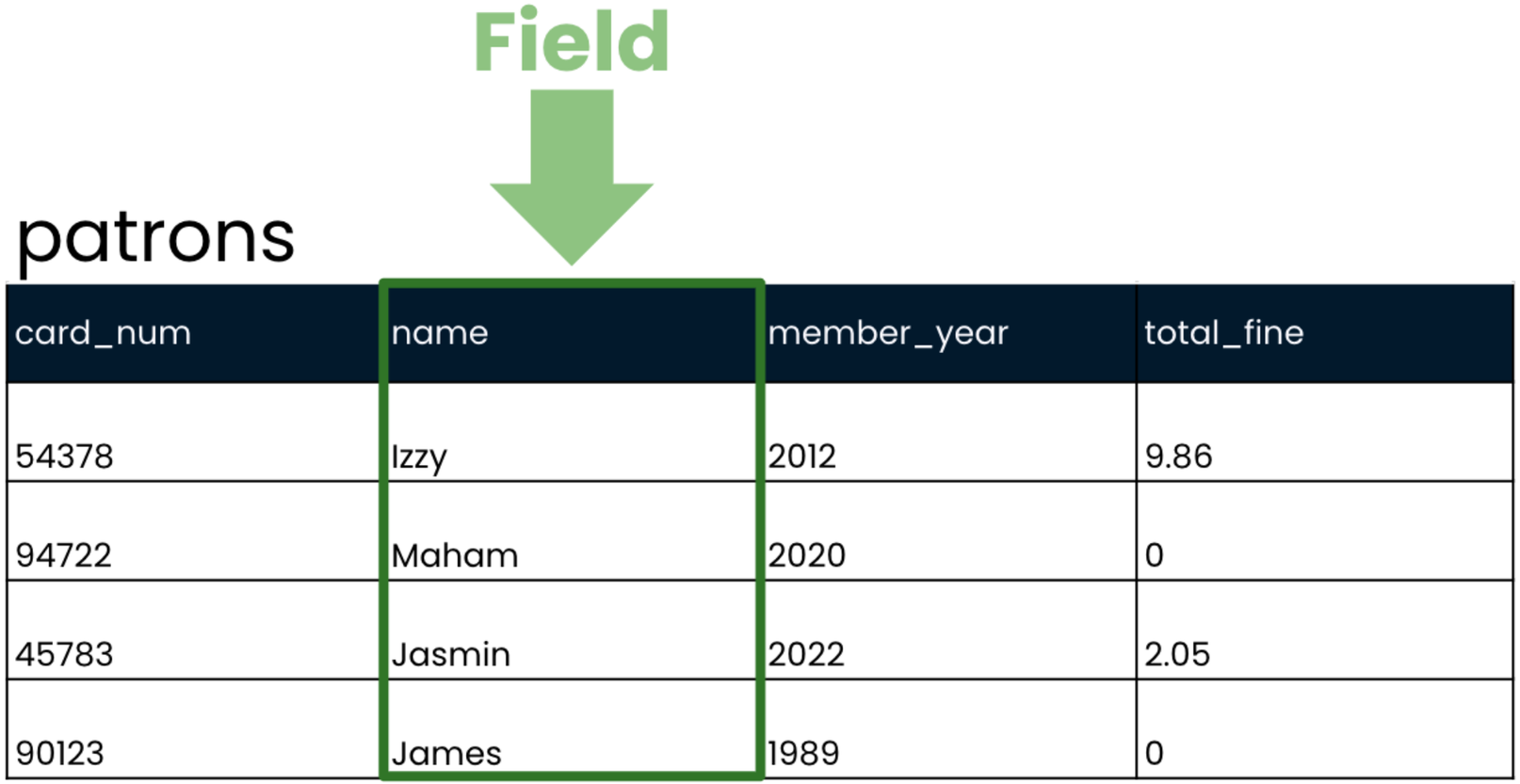
Fields

- One piece of a record



Field naming

Field names:

- Lowercase
- Use underscores—no spaces
- Singular
- Different from the table name

Unique identifiers

- *Keys* identify unique records



patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
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90123	James	1989	0

Multiple tables

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

checkouts

id	start_date	due_date	card_num	book_id
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568	2022-06-10	2022-06-24	54378	322
569	2022-06-27	2022-07-11	45783	156
570	2022-08-14	2022-08-28	90123	912

card_num	name	member_year	total_fine	checkout_id	start_date	due_date	book_id
54378	Izzy	2012	9.86	23359	2024-05-11	2024-05-25	547
54378	Izzy	2012	9.86	23360	2024-05-11	2024-05-26	156
94722	Maham	2020	0				
45783	Jasmin	2022	2.05	23361	2024-05-12	2024-05-26	912
90123	James	1989	0	23362	2024-05-13	2024-05-27	838

Let's practice!

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Data types

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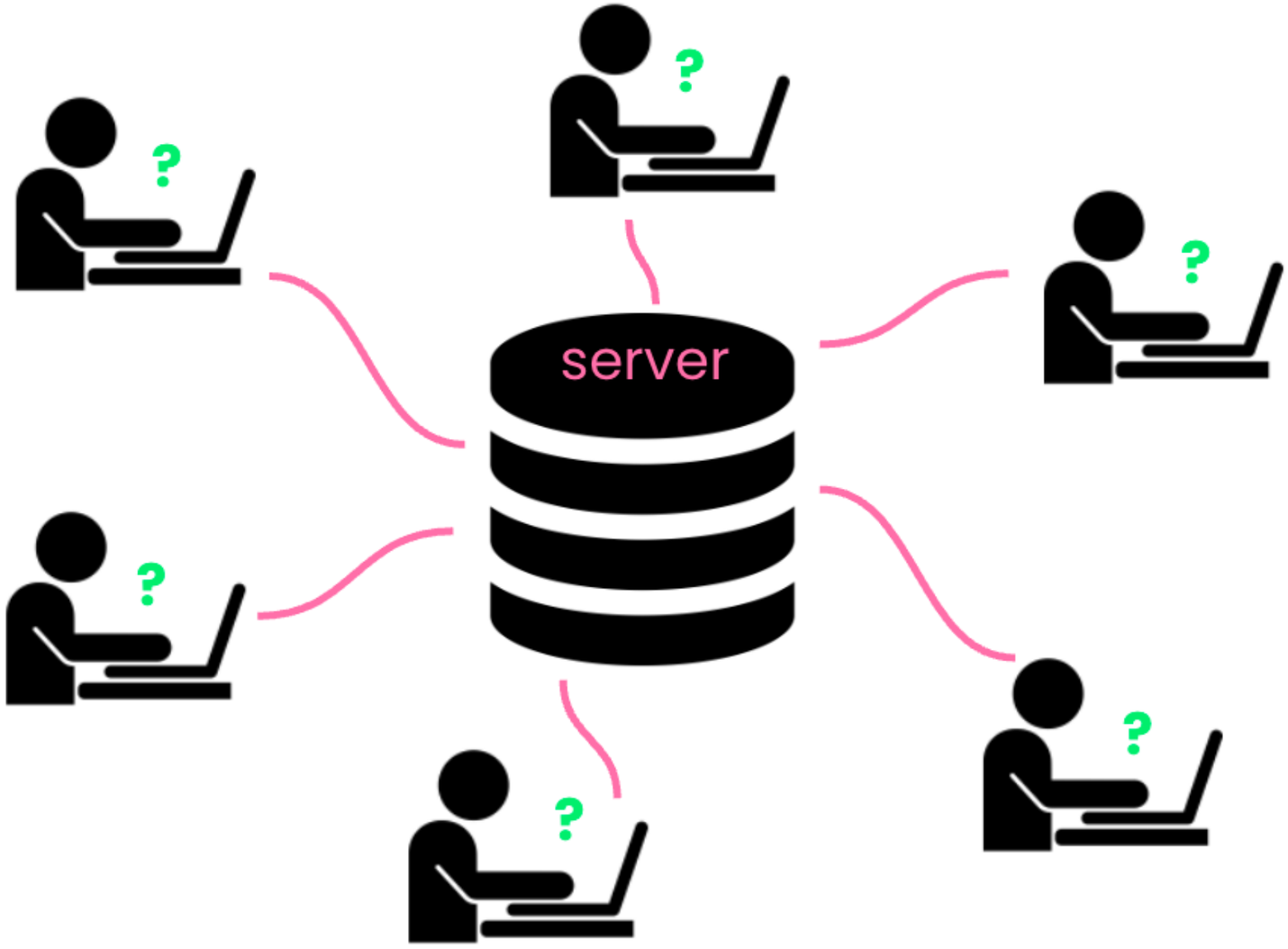
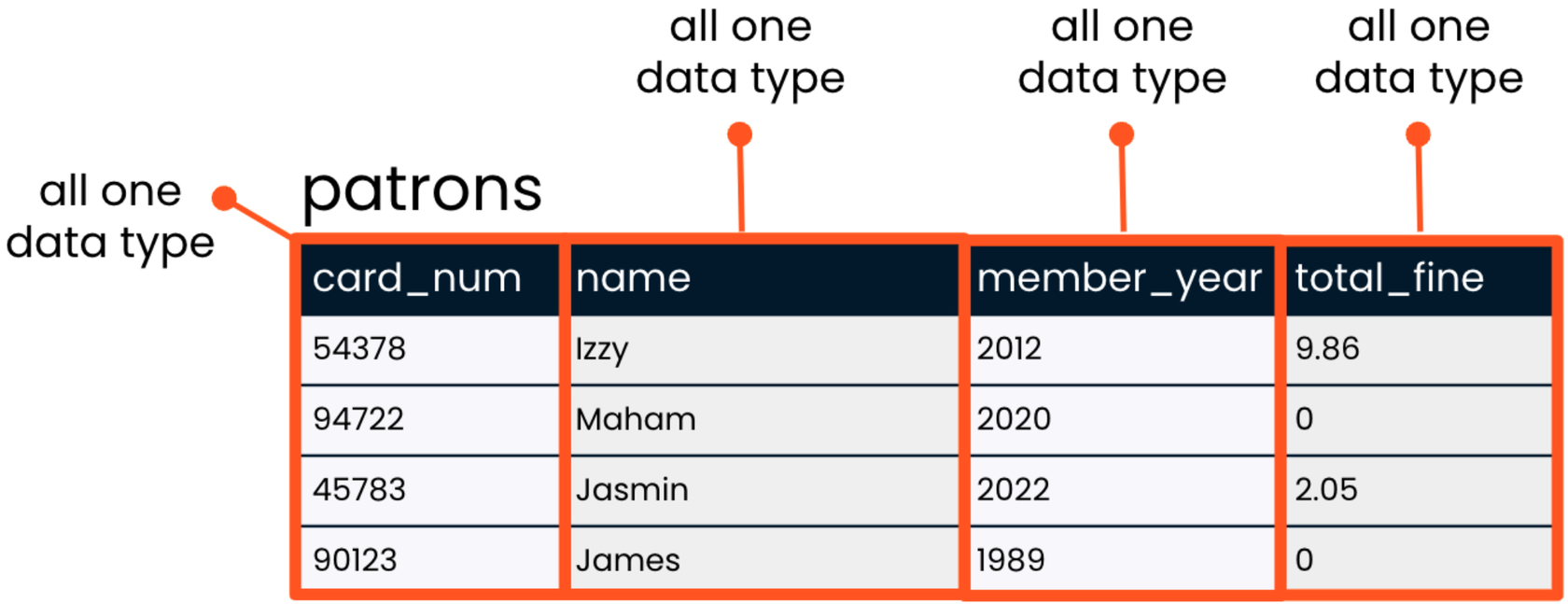
Database storage



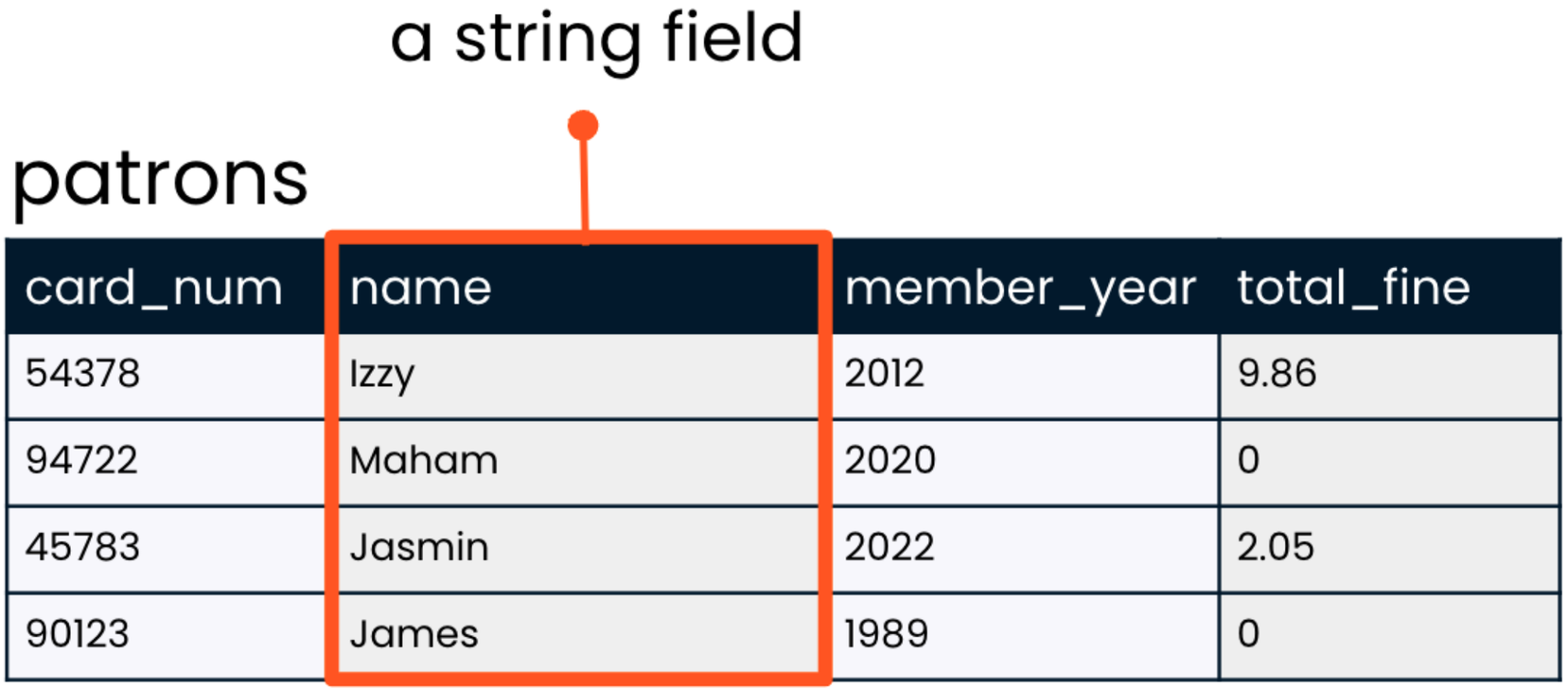
SQL data types



card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

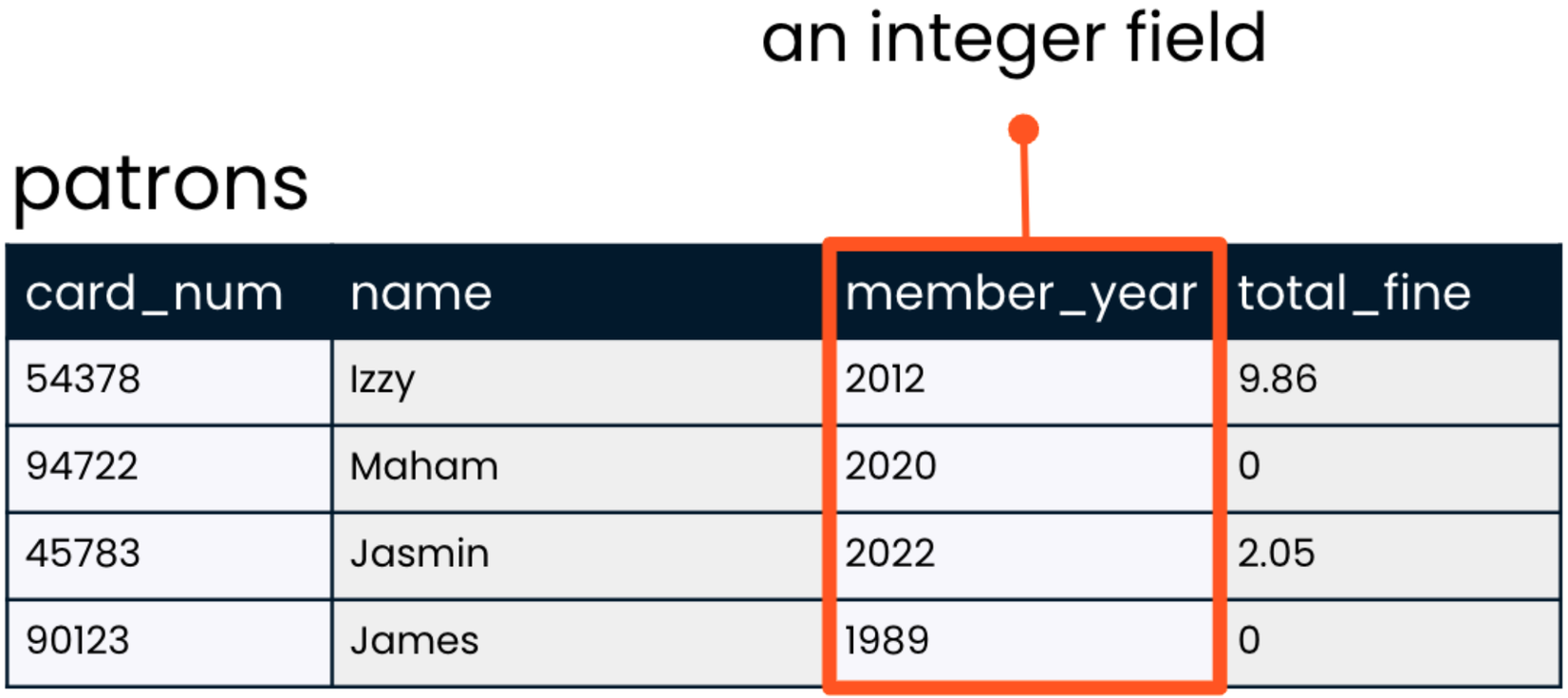
- Different types of data are stored differently and take up different space
- Some operations only apply to certain data types

Strings



- A string is a sequence of characters such as letters or punctuation
- `VARCHAR` is a flexible and popular string data type in SQL

Integers



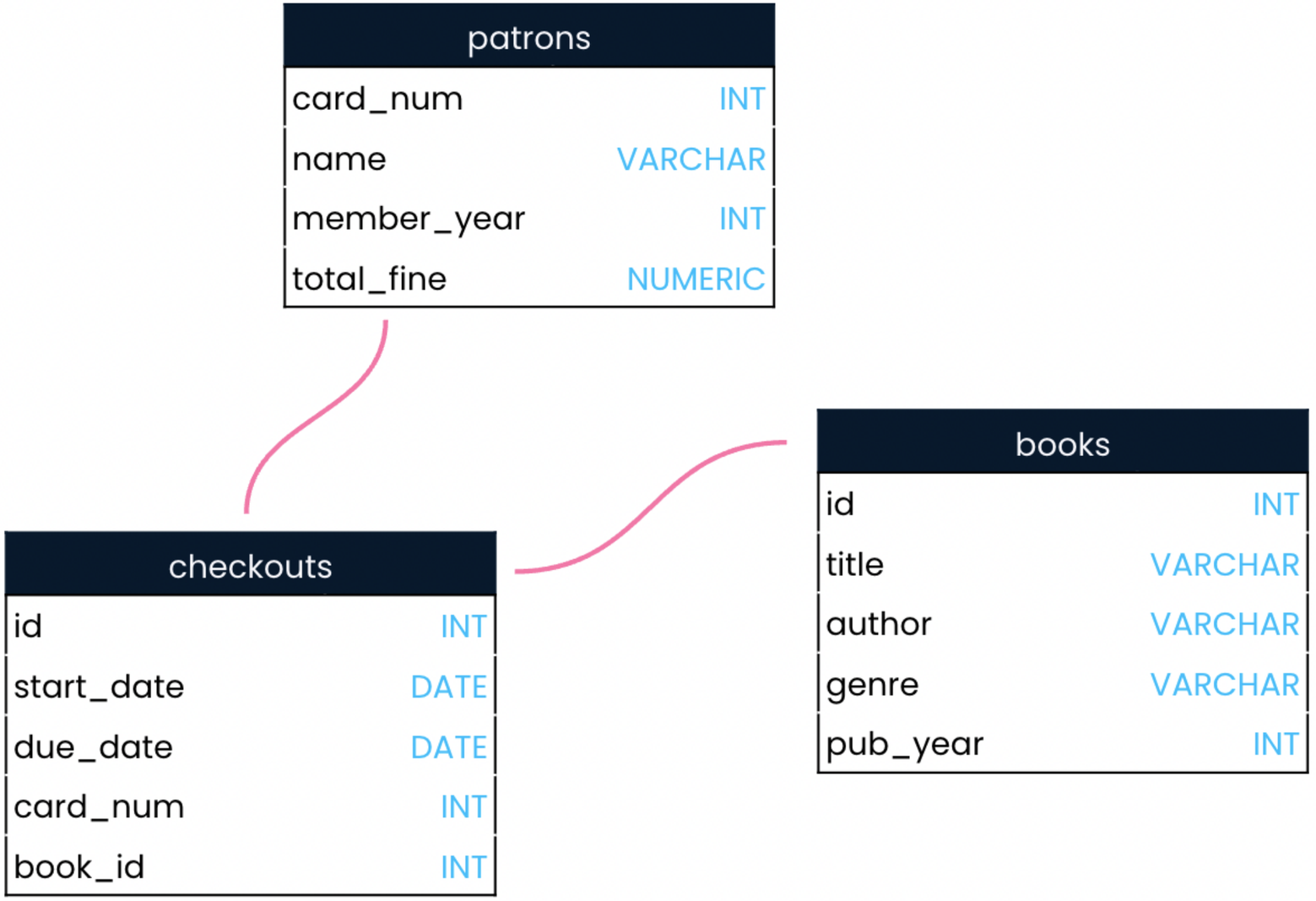
- Integers store whole numbers
- `INT` is a flexible and popular integer data type in SQL

Floats



- Floats store numbers that include a fractional part
- `NUMERIC` is a flexible and popular float data type in SQL

Schemas


patrons
card_num INT
name VARCHAR
member_year INT
total_fine NUMERIC
checkouts
id INT
start_date DATE
due_date DATE
card_num INT
book_id INT
books
id INT
title VARCHAR
author VARCHAR
genre VARCHAR
pub_year INT

Let's practice!

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