Populating column-oriented databases

INTRODUCTION TO NOSQL

SQL

Jake Roach
Data Engineer

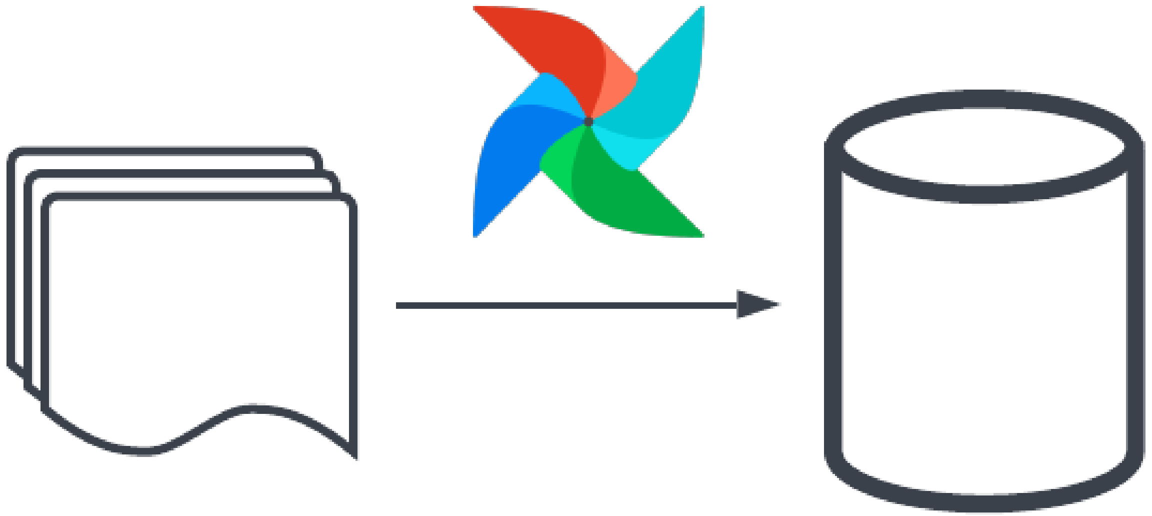
Populating row-oriented vs. column-oriented databases

Row-oriented:

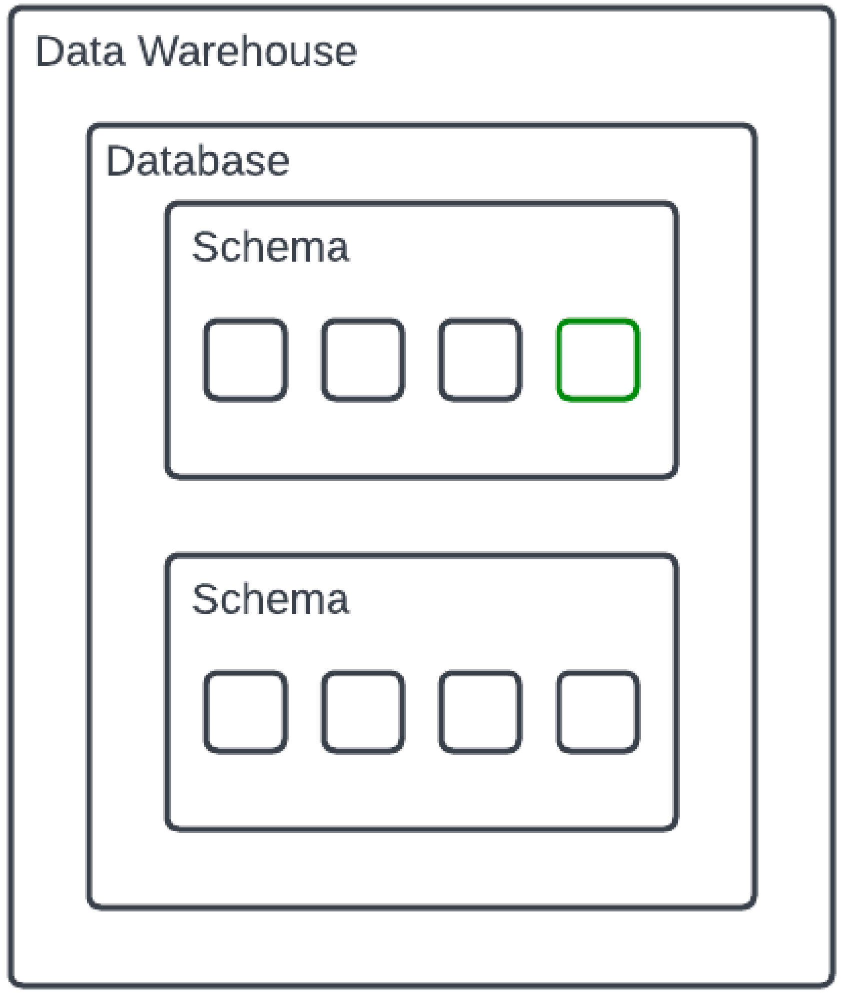
- Optimized for transactional use-cases
- Best performance when inserting, updating or deleting individual records

Column-oriented:

- Use for analytics workflows
- Perform well when loading, updating, or deleting data in-bulk



CREATE TABLE



Data Warehouse

Database

Schema

Schema

```
CREATE TABLE books (
    title VARCHAR(100),
    author VARCHAR(100),
    price FLOAT
);
```

COPY INTO

```
COPY INTO books
FROM 'file://data_science_books.csv'
FILE_FORMAT = (
    TYPE = 'CSV'
    FIELD_DELIMITER = ','
    SKIP_HEADER = 1
);
```

`COPY INTO`

`FROM`

- Cloud storage location
- URL
- Staged files

`FILE_FORMAT`

- Type of file, delimiter, other metadata information

[1] https://docs.snowflake.com/en/sql-reference/sql/copy-into-table

CREATE TABLE ... AS

```
CREATE TABLE premium_books AS
SELECT *
FROM books
WHERE price > 50.00;
```

```
CREATE OR REPLACE TABLE premium_books AS
SELECT *
FROM books
WHERE price > 50.00;
```

`CREATE TABLE ... AS`

- Provide a table name
- Creates table in the current schema

`SELECT ...`

- Populates table with data returned by query

`OR REPLACE`

- If there is an existing table, it is replaced by new table

[1] https://docs.snowflake.com/en/sql-reference/sql/create-table

Let's practice!

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Advanced column-oriented database techniques

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Micro-partitioning data with Snowflake

Micro-partitioning:

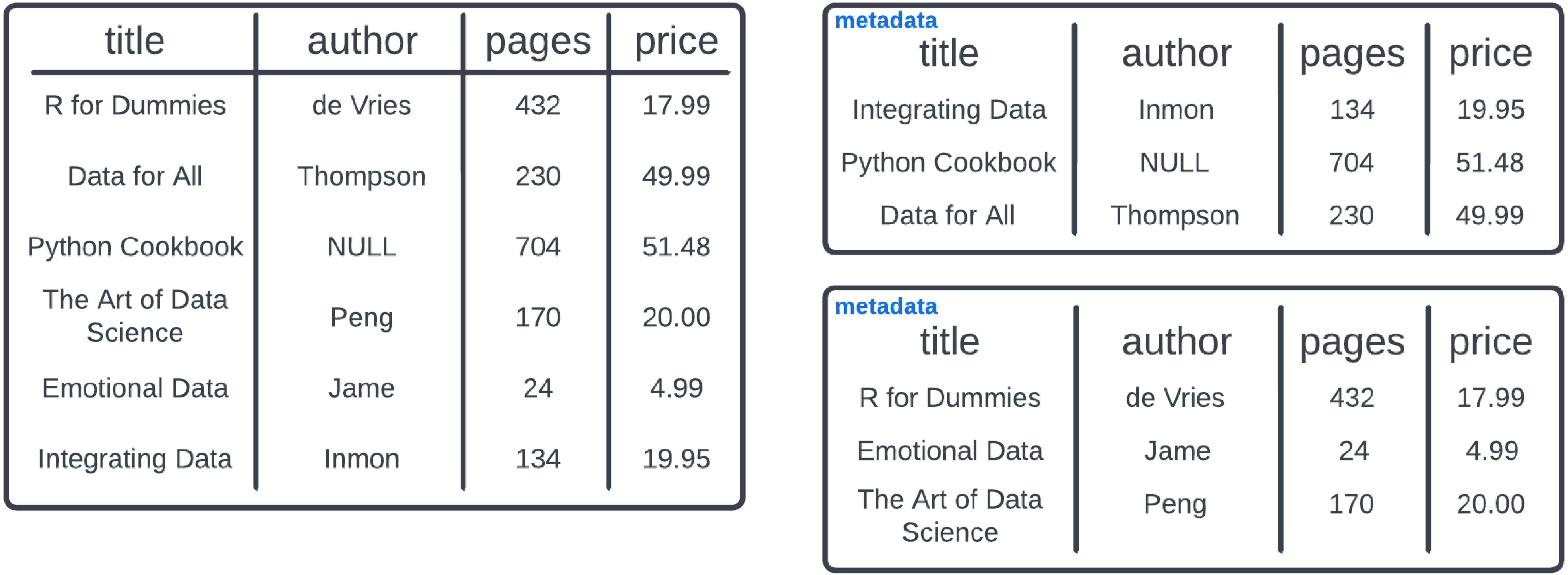
- Creates smaller "chunks" of rows, stored in columnar format
- Stores metadata about each partition

Allowing for:

- Query pruning to reduce the amount of data accessed
- Efficient execution of DML (data manipulation language)

[1] https://docs.snowflake.com/en/user-guide/tables-clustering-micropartitions

Micro-partitioning data



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Data for All	Thompson	230	49.99
Python Cookbook	NULL	704	51.48
The Art of Data Science	Peng	170	20.00
Emotional Data	Jame	24	4.99
Integrating Data	Inmon	134	19.95

metadata

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Data clustering with Snowflake

Data clustering:

- Organizing or grouping similar data points together
- Automatically performed during data load

Allowing for:

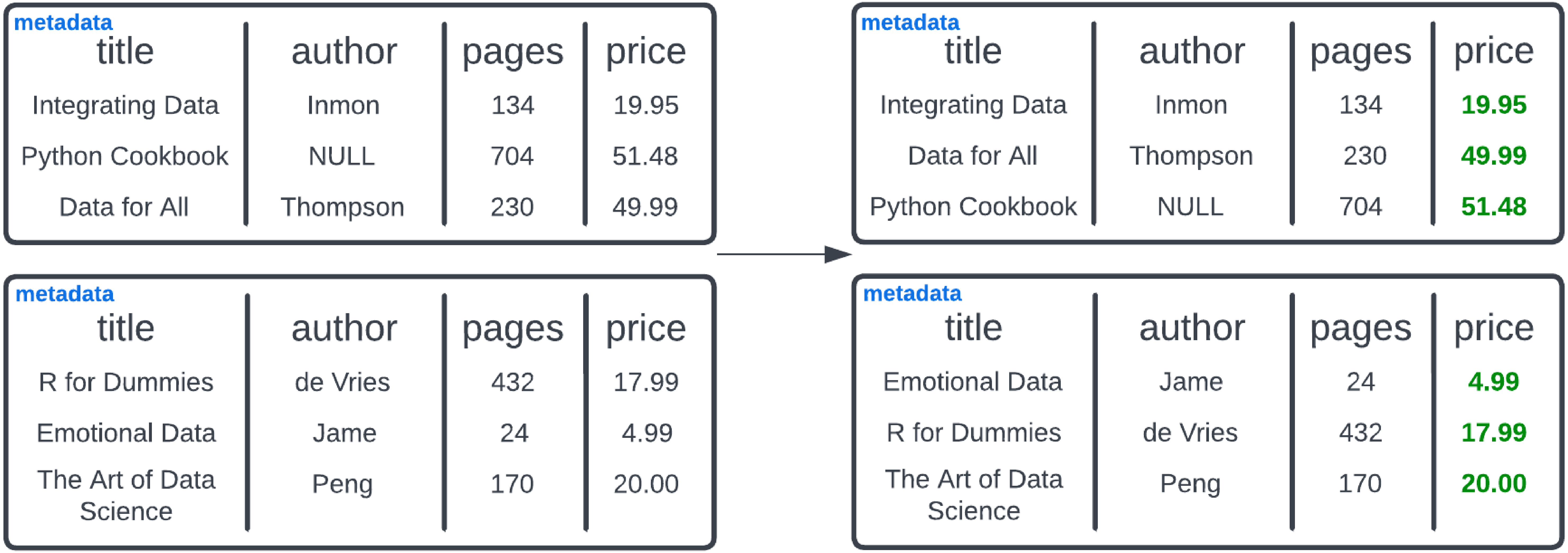
- Decreasing data accessed during execution
- Improved query performance

[1] https://docs.snowflake.com/en/user-guide/tables-clustering-micropartitions

Data clustering

Data is clustered by price column

cluster key



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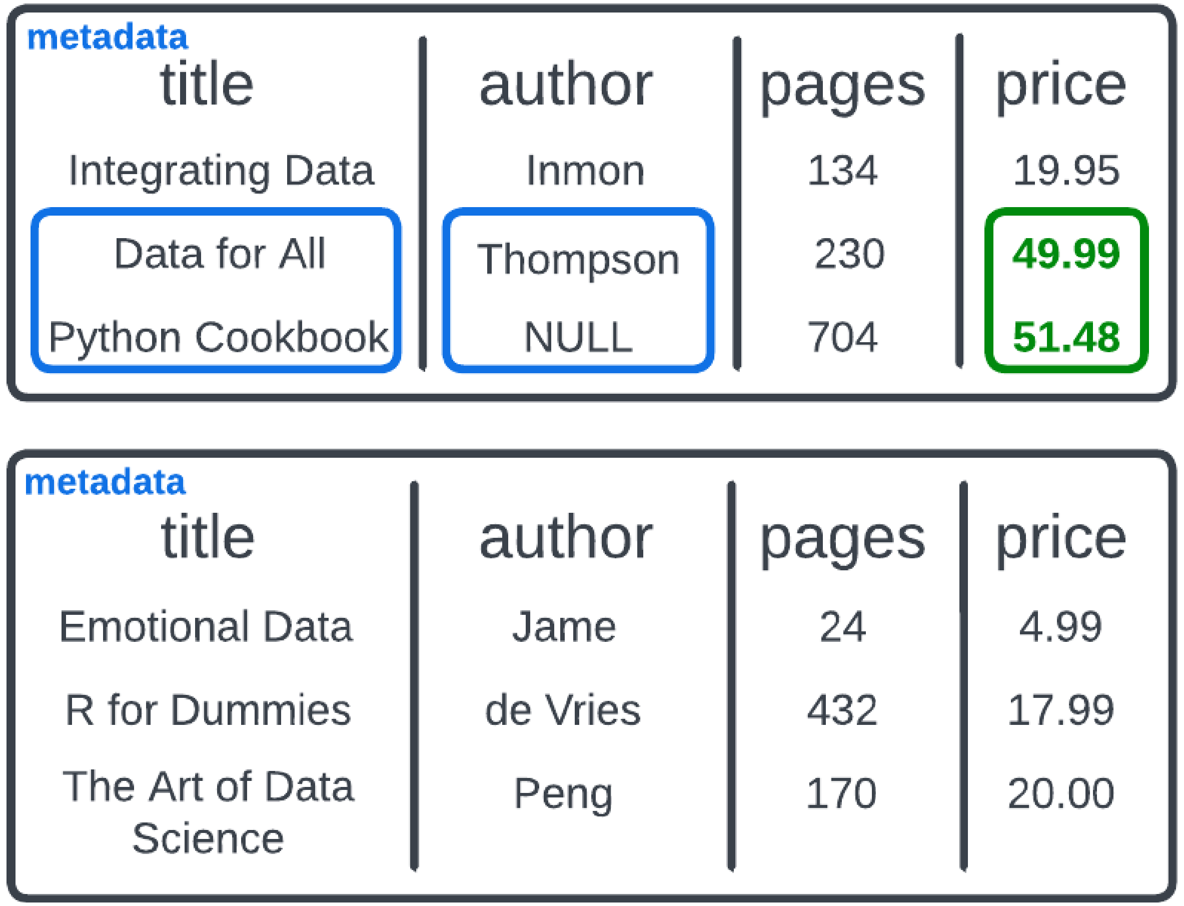
Query pruning

The query manager first looks in the first cluster, then second. In this case there no rows greater than 25 in second micro partition.
Supported by columnar database (Clustering).

```
SELECT
    title,
    author,
    price
FROM books
WHERE
    price > 25.00;
```



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Micro-partitioning and data clustering allow for:

- Reducing data scanned
- Fast time-to-insights

Second partition of the data doesn't contain value greater than 25, then they are pruined.

Supported by data partitioning.

Let's practice!

Analytics workflows for column-oriented databases

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Data Engineer

Common table expressions with Snowflake

Name, subqueries, temp tables using with keyword.

Common table expressions (CTEs):

- Named sub-queries/temporary tables, defined using the `WITH` keyword
- Creates a object that can be later queried
- Reduce the amount of data that is being queried and/or `JOIN` 'ed
- More modular, easier to troubleshoot

```
WITH <cte-name> AS (
    SELECT
        ....
    FROM <table-name>
    [JOIN | WHERE | ...]
)

SELECT
    ...
FROM <cte-name>;
```

[1] https://docs.snowflake.com/en/user-guide/queries-cte

Writing common table expressions

```
WITH premium_books AS (
    SELECT
        title,
        author,
        avg_reviews
    FROM books
    WHERE price > 25.00
)
SELECT
    author,
    MIN(avg_reviews) AS min_avg_reviews,
    MAX(avg_reviews) AS max_avg_reviews
FROM premium_books
GROUP BY author;
```

- Creating a `premium_books` temporary object
- Using `premium_books` downstream

Can creating multiple temporary objects:

```
WITH
    <first-name> AS (...),
    <second-name> AS (...),
    ...
...
;
```

Views with Snowflake

Views:

- Allow query results to be accessed like a table
- Non-materialized and materialized

```
CREATE VIEW <view-name> AS
  SELECT
      ...
  FROM <table-name>
  [WHERE | JOIN | ...];
```

Creating views with Snowflake

```
CREATE VIEW premium_books AS
    SELECT
        title,
        author,
        avg_reviews
    FROM books
    WHERE price >= 25.00;
```

Non Materialized.

```
SELECT * FROM premium_books;
```

- Query executes when `premium_books` is called
- "Named definition" of a query

```
CREATE MATERIALIZED VIEW premium_books AS
    SELECT
        title,
        author,
        avg_reviews
    FROM books
    WHERE price >= 25.00;
```

```
SELECT * FROM premium_books;
```

- Results are stored upon execution
- Better query performance, requires refreshing

Let's practice!

INTRODUCTION TO NOSQL

Working with semi-structured data in Snowflake

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Jake Roach
Data Engineer

datacamp

Semi-structured data in Snowflake

```
{
    "ISBN_13": "978-1685549596",
    "publisher": "Notion Press Media",
    "size": {
        "dimensions": "8.5 x 1.01 x 11 inches",
        "weight": "2.53 pounds"
    }
}
```

- Allows data to be stored in "raw" format
- `VARIANT` type
- Store each object in a single column

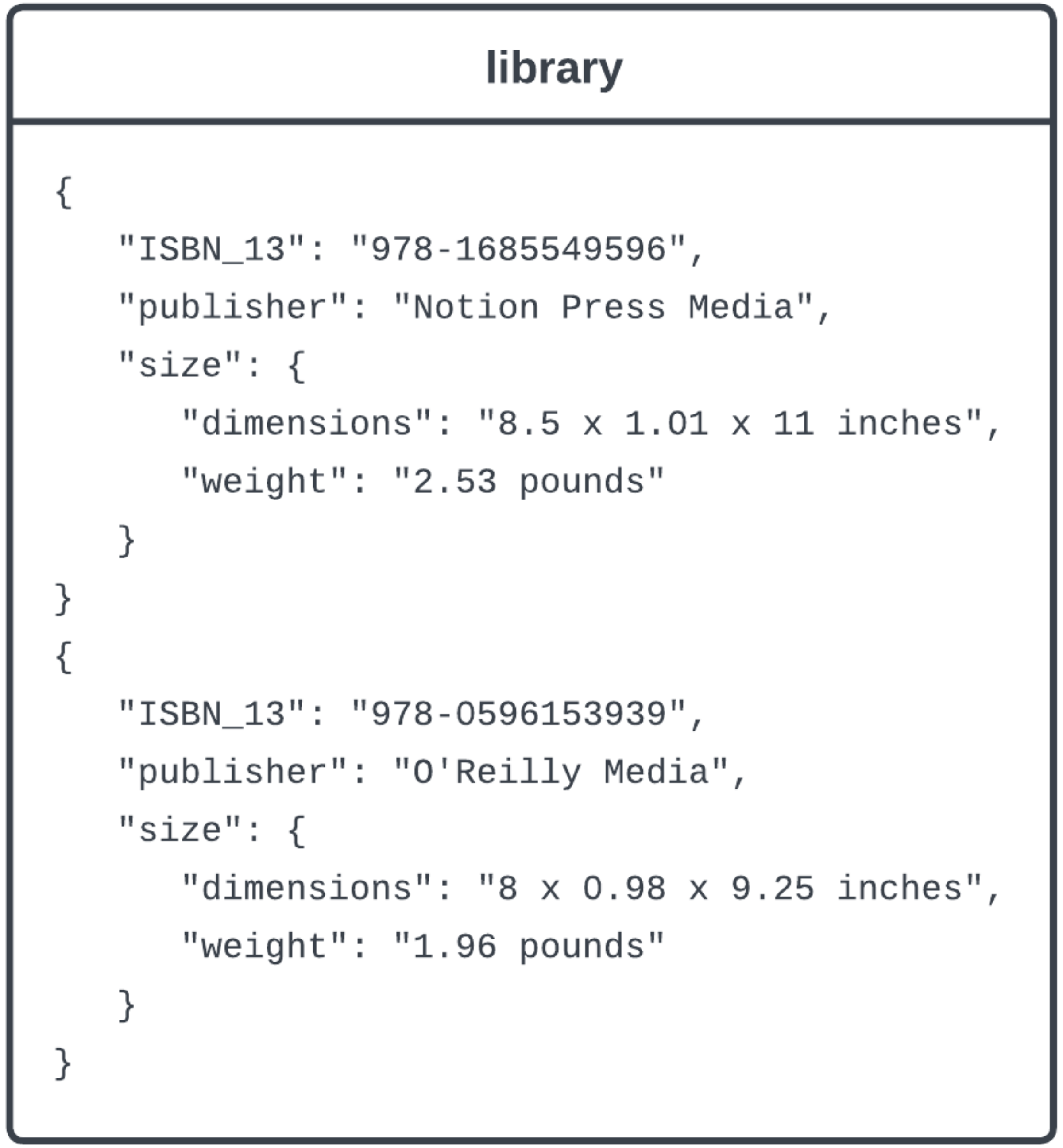
Semi-structured data types in Snowflake

Snowflake also supports the `OBJECT` and `ARRAY` types

- `OBJECT` is similar to dictionaries in Python
- `ARRAY` is similar to lists in Python

`VARIANT` type

- Stores semi-structured data in a single column



library

```
{
   "ISBN_13": "978-1685549596",
   "publisher": "Notion Press Media",
   "size": {
      "dimensions": "8.5 x 1.01 x 11 inches",
      "weight": "2.53 pounds"
   }
}
{
   "ISBN_13": "978-0596153939",
   "publisher": "O'Reilly Media",
   "size": {
      "dimensions": "8 x 0.98 x 9.25 inches",
      "weight": "1.96 pounds"
   }
}
```

Querying semi-structured data with bracket notation

library

```
{
   "ISBN_13": "978-1685549596",
   "publisher": "Notion Press Media",
   "size": {
      "dimensions": "8.5 x 1.01 x 11 inches",
      "weight": "2.53 pounds"
   }
}
{
   "ISBN_13": "978-0596153939",
   "publisher": "O'Reilly Media",
   "size": {
      "dimensions": "8 x 0.98 x 9.25 inches",
      "weight": "1.96 pounds"
   }
}
```

Query:

```
SELECT
    library['ISBN_13']
FROM books;
```

Result:

library['ISBN_13']
"978-1685549596"
"978-0596153939"

Querying semi-structured data with dot notation

library

```
{
   "ISBN_13": "978-1685549596",
   "publisher": "Notion Press Media",
   "size": {
      "dimensions": "8.5 x 1.01 x 11 inches",
      "weight": "2.53 pounds"
   }
}
{
   "ISBN_13": "978-0596153939",
   "publisher": "O'Reilly Media",
   "size": {
      "dimensions": "8 x 0.98 x 9.25 inches",
      "weight": "1.96 pounds"
   }
}
```

Query:

```
SELECT
    library:ISBN_13,
    library:publisher
FROM books;
```

Result:

library:ISBN_13	library:publisher
"978-1685549596"	"Notion Press Media"
"978-0596153939"	"O'Reilly Media"

Querying nested semi-structured data

library

```
{
   "ISBN_13": "978-1685549596",
   "publisher": "Notion Press Media",
   "size": {
      "dimensions": "8.5 x 1.01 x 11 inches",
      "weight": "2.53 pounds"
   }
}
{
   "ISBN_13": "978-0596153939",
   "publisher": "O'Reilly Media",
   "size": {
      "dimensions": "8 x 0.98 x 9.25 inches",
      "weight": "1.96 pounds"
   }
}
```

```
SELECT
    library:ISBN_13,
    library:size.dimensions,
    library:size.weight,
FROM books;
```

```
SELECT
    library["ISBN_13"],
    library["size"]["dimensions"],
    library["size"]["weight"],
FROM books;
```

library:ISBN_13	library:size:dimensions	library:size:dimensions
"978-1685549596"	"8.5 x 1.01 x 11 inches"	"2.53 pounds"
"978-0596153939"	"8.5 x 1.01 x 11 inches"	"1.96 pounds"

Let's practice!

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