MongoDB – Definition

MongoDB is an **open-source, NoSQL, document-oriented database** that stores data in **flexible, JSON-like documents (BSON)** instead of traditional rows and tables.
It is designed for **high performance, scalability, and ease of development**, making it ideal for modern, data-intensive applications.

Key Features of MongoDB

1. Document-Oriented Storage

- Data is stored as **documents** in BSON format.
- Documents can have **dynamic schemas** (no fixed structure).
- Closely maps to objects in application code.

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2. Schema Flexibility

- No need to predefine tables or columns.
- Fields can vary from document to document.
- Perfect for **rapid development and evolving requirements**.

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3. High Performance

- Optimized for **fast read and write operations**.
- Supports in-memory processing.
- Indexes significantly improve query speed.

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4. Scalability (Horizontal Scaling)

- Supports **sharding** to distribute data across multiple servers.
- Handles **large volumes of data** and high traffic efficiently.

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5. Rich Query Language

- Supports CRUD operations.
- Advanced queries with:
    - Filtering
    - Sorting
    - Aggregation
    - Joins (using `$lookup`)
- Aggregation Framework enables complex data processing.

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6. Indexing

- Supports multiple index types:
    - Single field
    - Compound
    - Text
    - Geospatial
- Improves performance for search and query operations.

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7. High Availability

- Uses **replica sets** for data redundancy.
- Automatic failover ensures minimal downtime.

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8. Built-in Replication

- Maintains multiple copies of data across nodes.
- Enhances reliability and fault tolerance.

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9. Geospatial Support

- Supports location-based queries.
- Useful for maps, delivery apps, and location tracking systems.

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10. Easy Integration

- Works seamlessly with modern programming languages:
    - Java
    - Python
    - JavaScript
    - Node.js
- Strong support for REST APIs and microservices.

Where MongoDB is Commonly Used

- Web and mobile applications
- Real-time analytics
- Content management systems
- IoT and big data applications
- Microservices architectures

What is BSON?

BSON (Binary JSON) is a **binary-encoded serialization format** used by MongoDB to store and transfer data.
It is an **extended version of JSON**, designed to be **more efficient, faster, and richer in data types** than plain JSON.

Why MongoDB Uses BSON

MongoDB uses BSON because it:

- Is **faster to parse** than text-based JSON
- Supports **more data types**
- Is **efficient for storage and network transfer**

Key Features of BSON

1. Binary Format

- Stored in binary form, not plain text.
- Faster read/write operations.

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2. Supports Rich Data Types

BSON supports additional data types that JSON does not, such as:

- `Date`
- `Timestamp`
- `Binary data`
- `ObjectId`
- `Decimal128`
- `Regular Expressions`

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3. Lightweight and Efficient

- Encodes data with length information.
- Enables quick traversal and indexing.

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4. Ordered Fields

- Field order is preserved (unlike some JSON implementations).

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5. Language Independent

- Works across many programming languages.
- Ideal for distributed systems.

Example: JSON vs BSON (Conceptual)

JSON

```
{
  "name": "Ravi",
  "age": 25
}
```

BSON (Stored Internally)

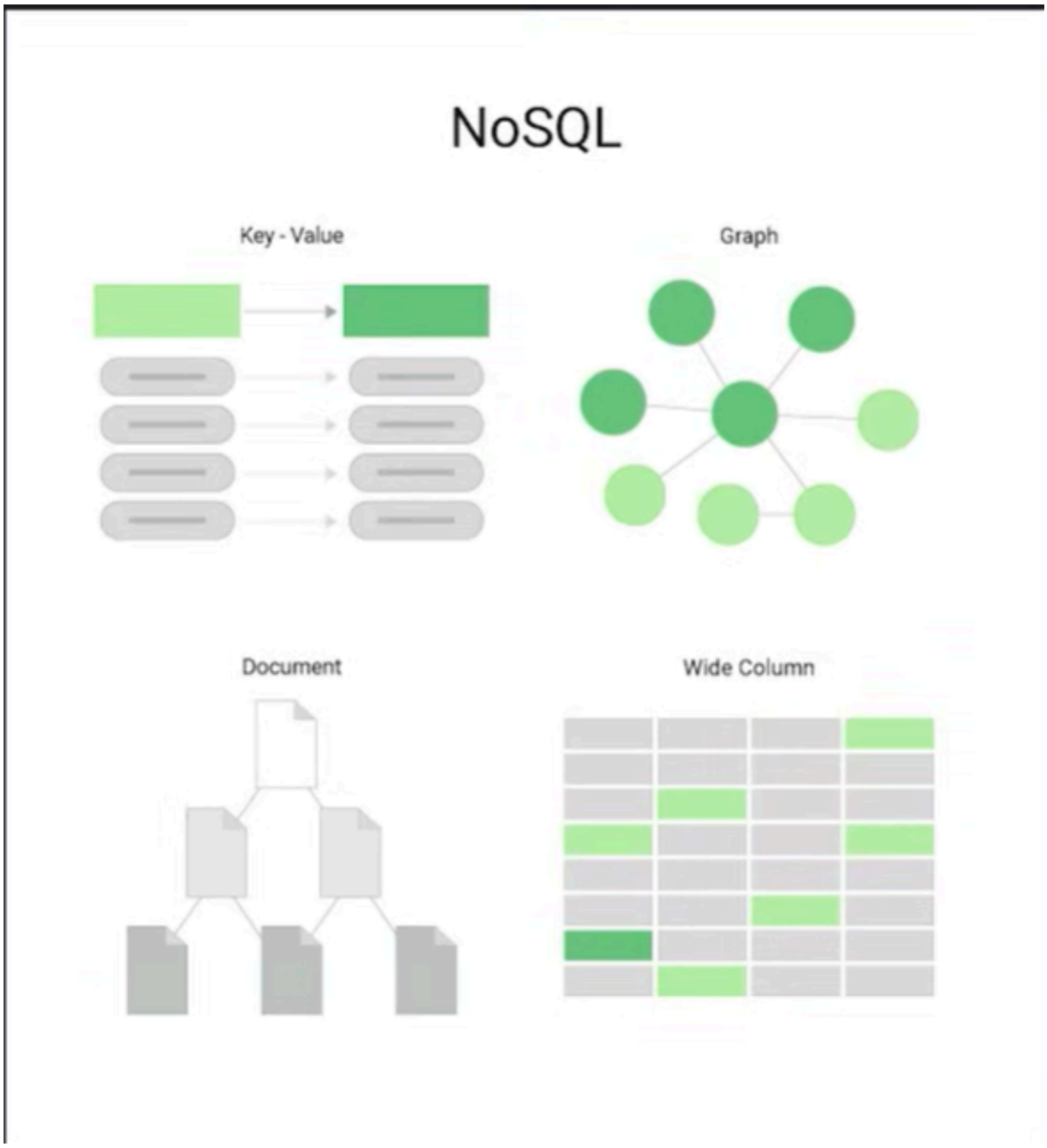
```
Binary encoded with type and length information
```

👉 BSON is not meant to be written manually—it is **handled internally by MongoDB**.

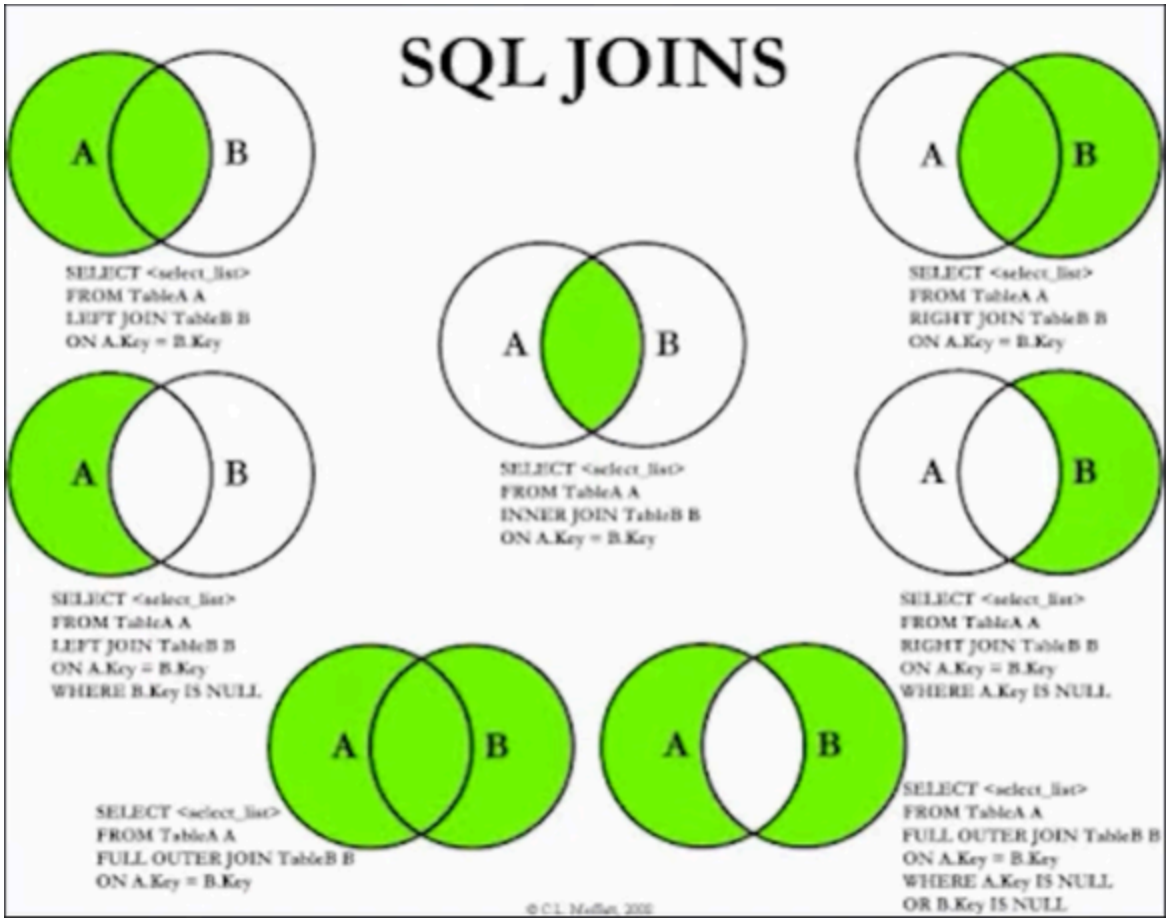
Difference Between SQL and NoSQL

Feature	SQL Databases	NoSQL Databases
Full Form	Structured Query Language databases	Not Only SQL databases
Data Model	Relational (tables, rows, columns)	Non-relational (documents, key-value, column, graph)
Schema	Fixed schema (predefined structure)	Flexible / dynamic schema
Data Storage	Stored in rows and tables	Stored as documents, key-value pairs, columns, or graphs
Scalability	Vertical scaling (scale up)	Horizontal scaling (scale out)
Query Language	Uses SQL	Uses database-specific query APIs
Transactions	Strong ACID compliance	Typically BASE (eventual consistency)
Joins	Supports complex joins	Limited or no joins
Performance	Good for complex queries	Optimized for high-volume, fast operations

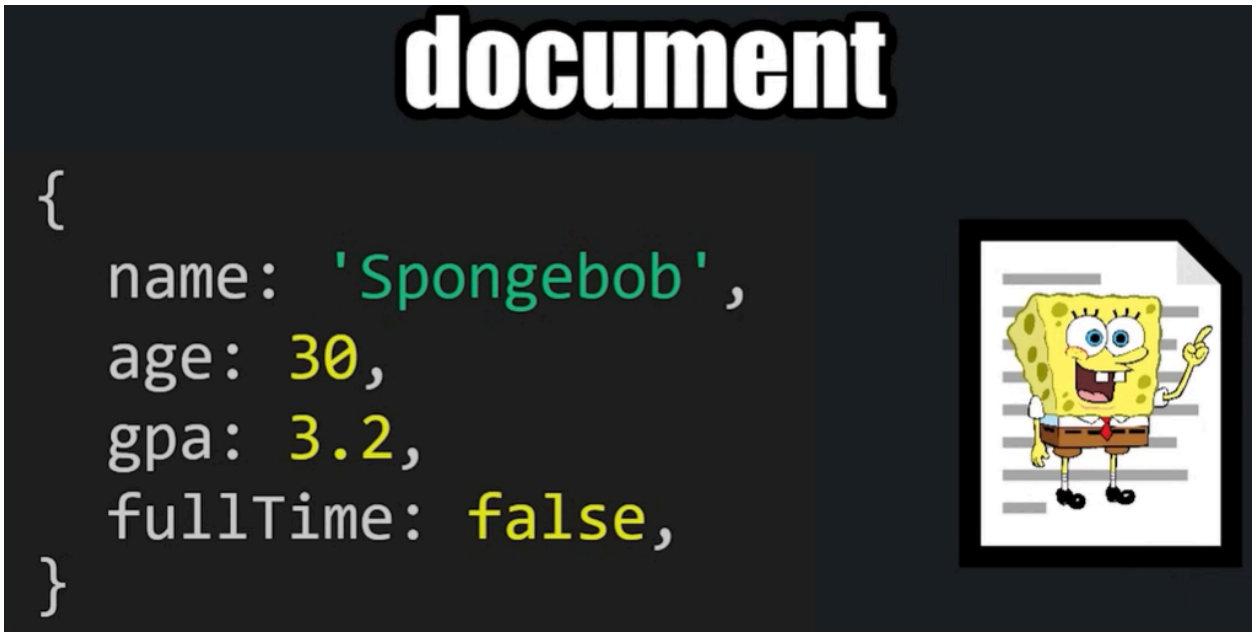
Consistency	Strong consistency	Eventual consistency (configurable in some DBs)
Flexibility	Less flexible for changes	Highly flexible
Handling Big Data	Less suitable	Highly suitable
Examples	MySQL, PostgreSQL, Oracle, SQL Server	MongoDB, Cassandra, Redis, CouchDB



In SQL Joints are in the form:

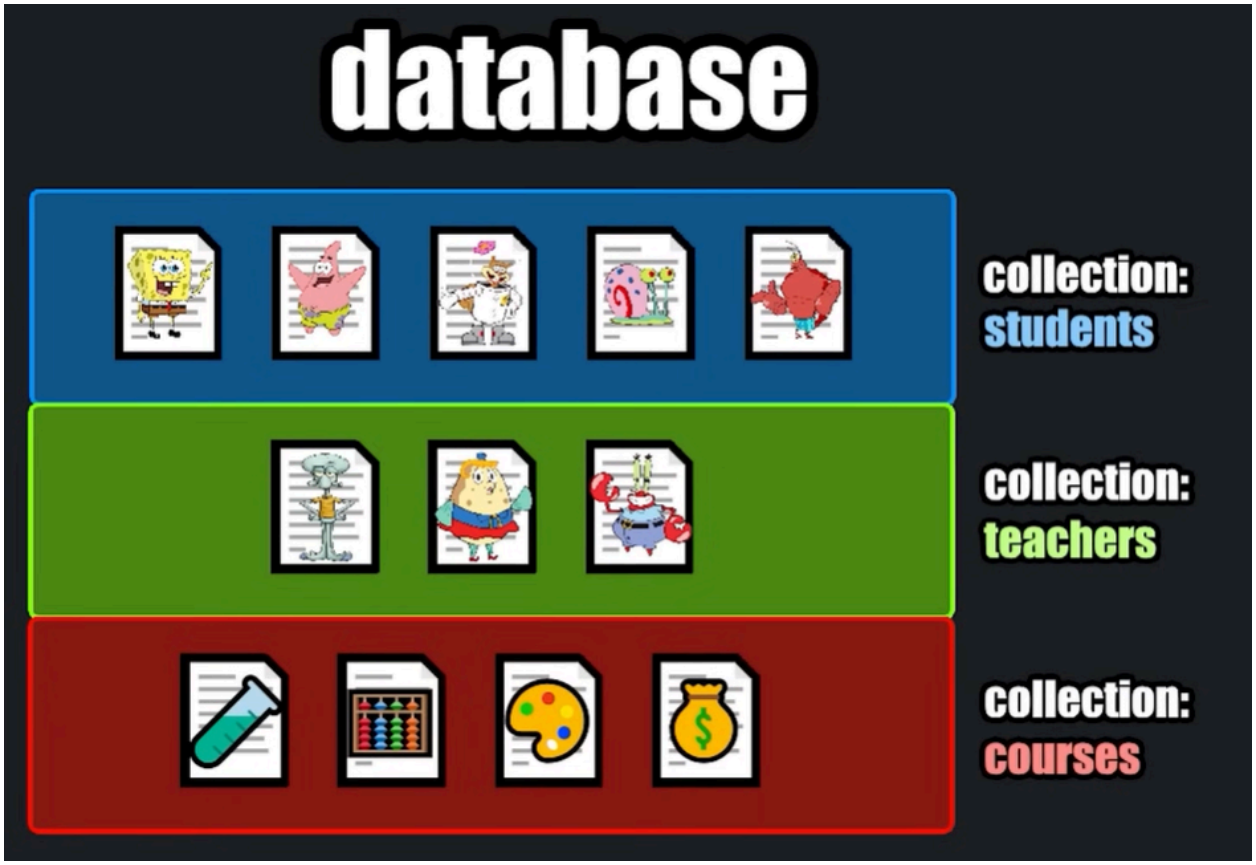


Which is quite difficult. The NoSQL is arranged as:
Document is a group of key value pairs to represent an object.



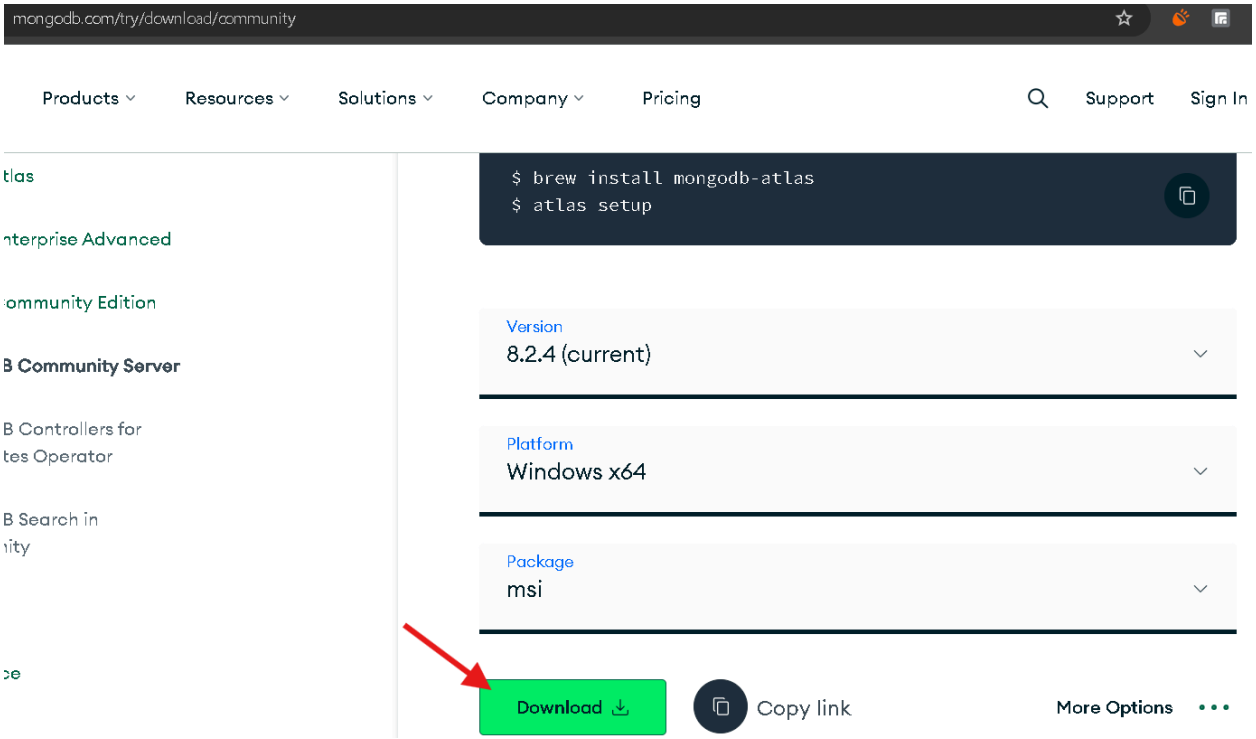
Collection is a group of one or more documents.

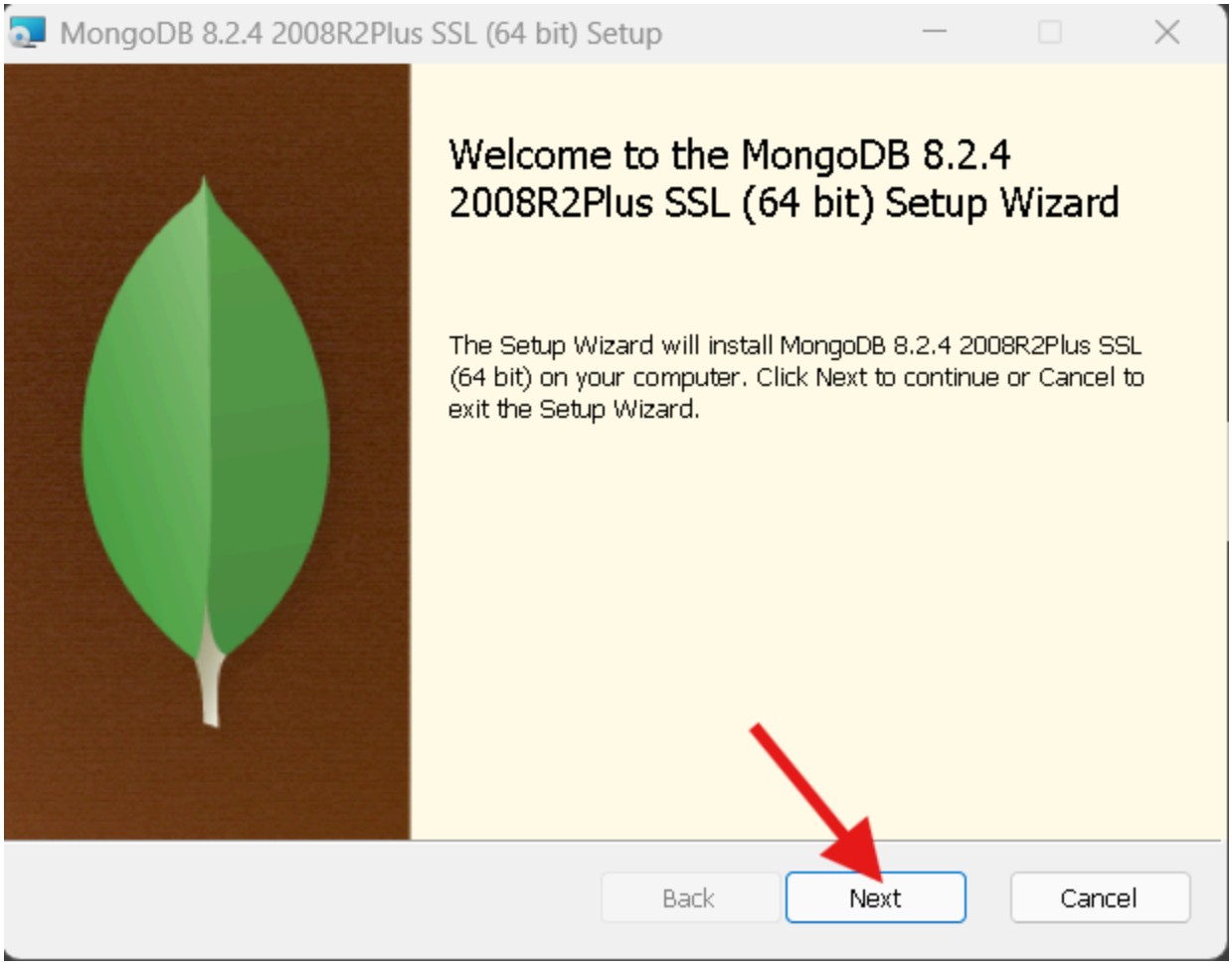
And, Database is a group of one or more collection

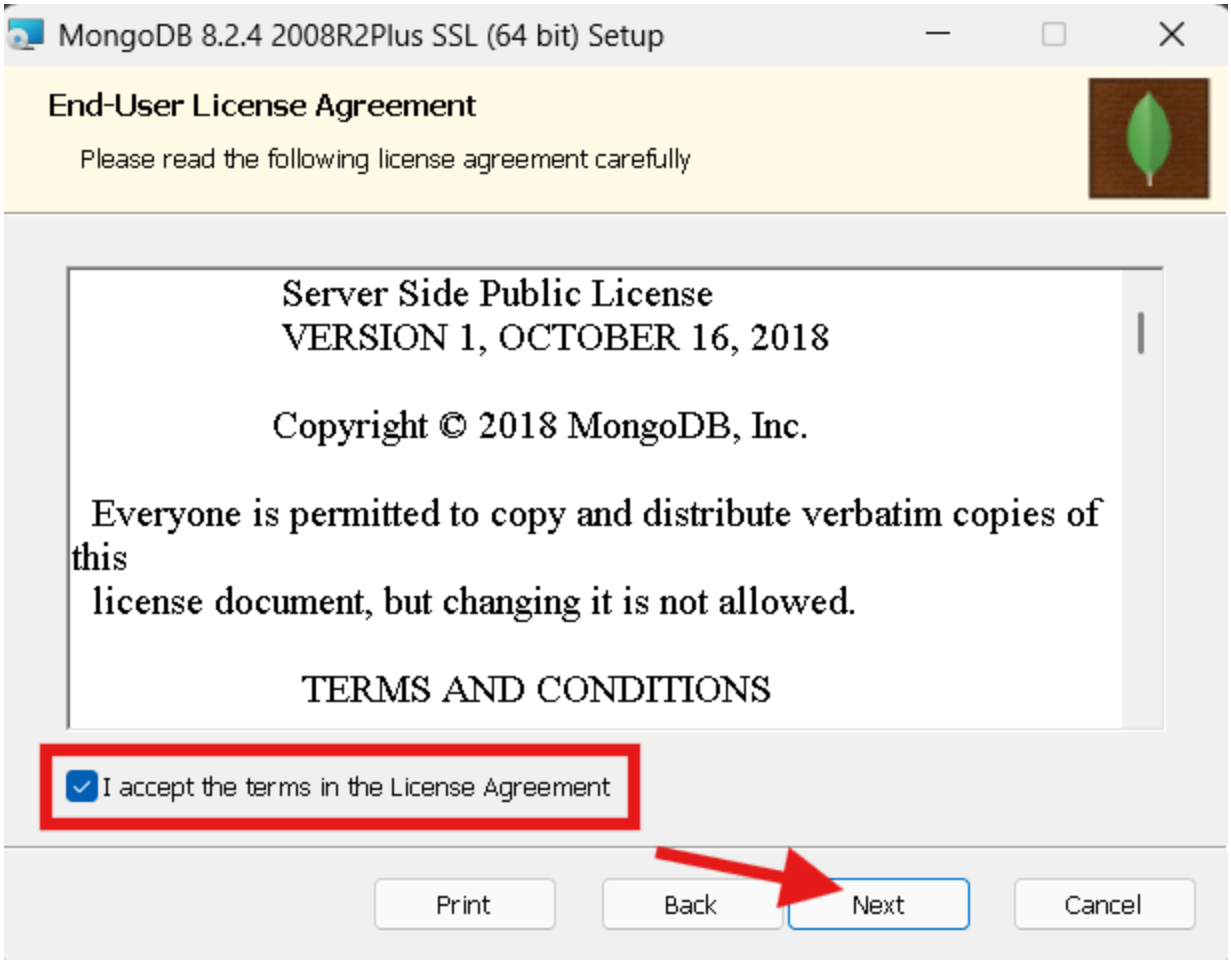


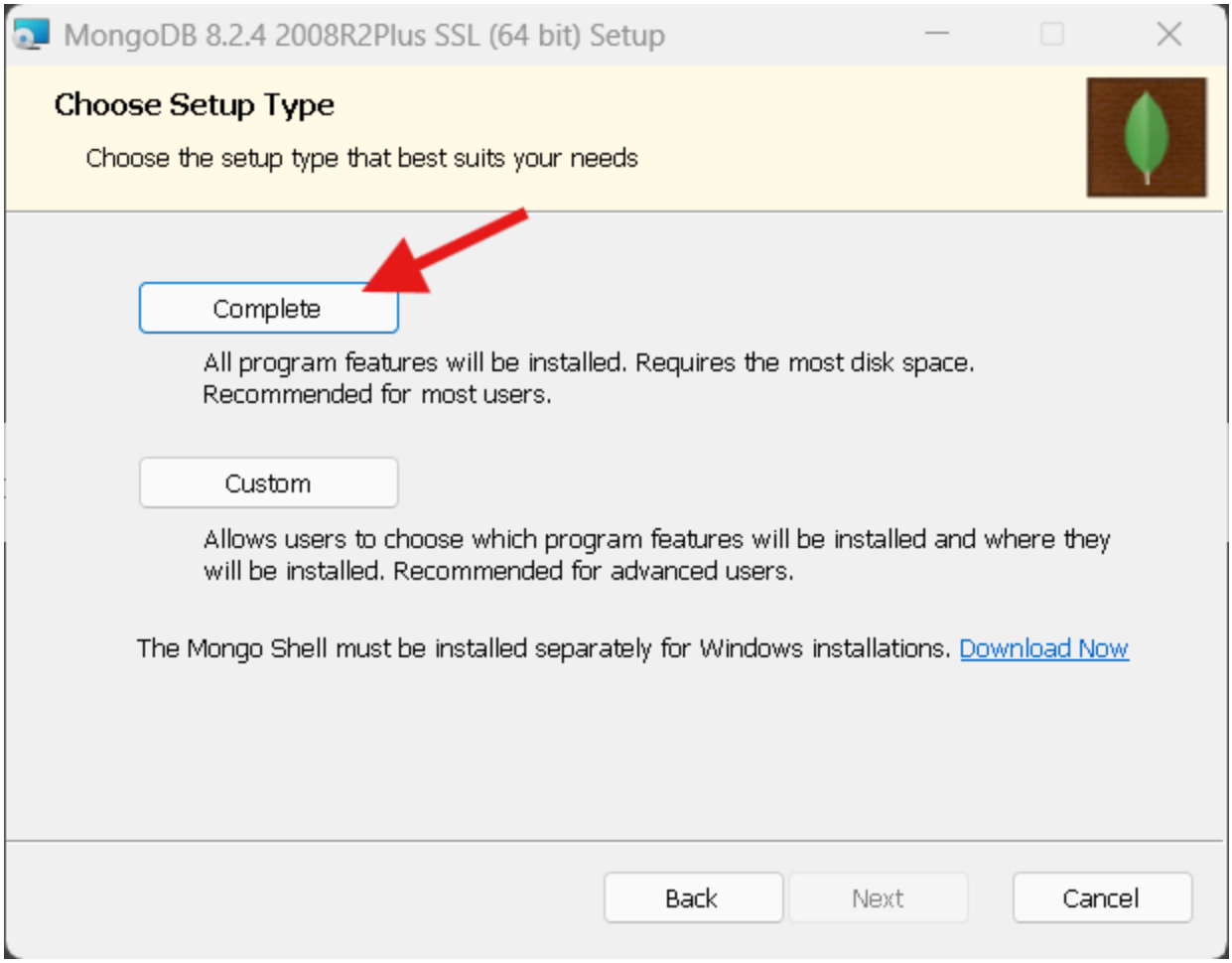
Installation:

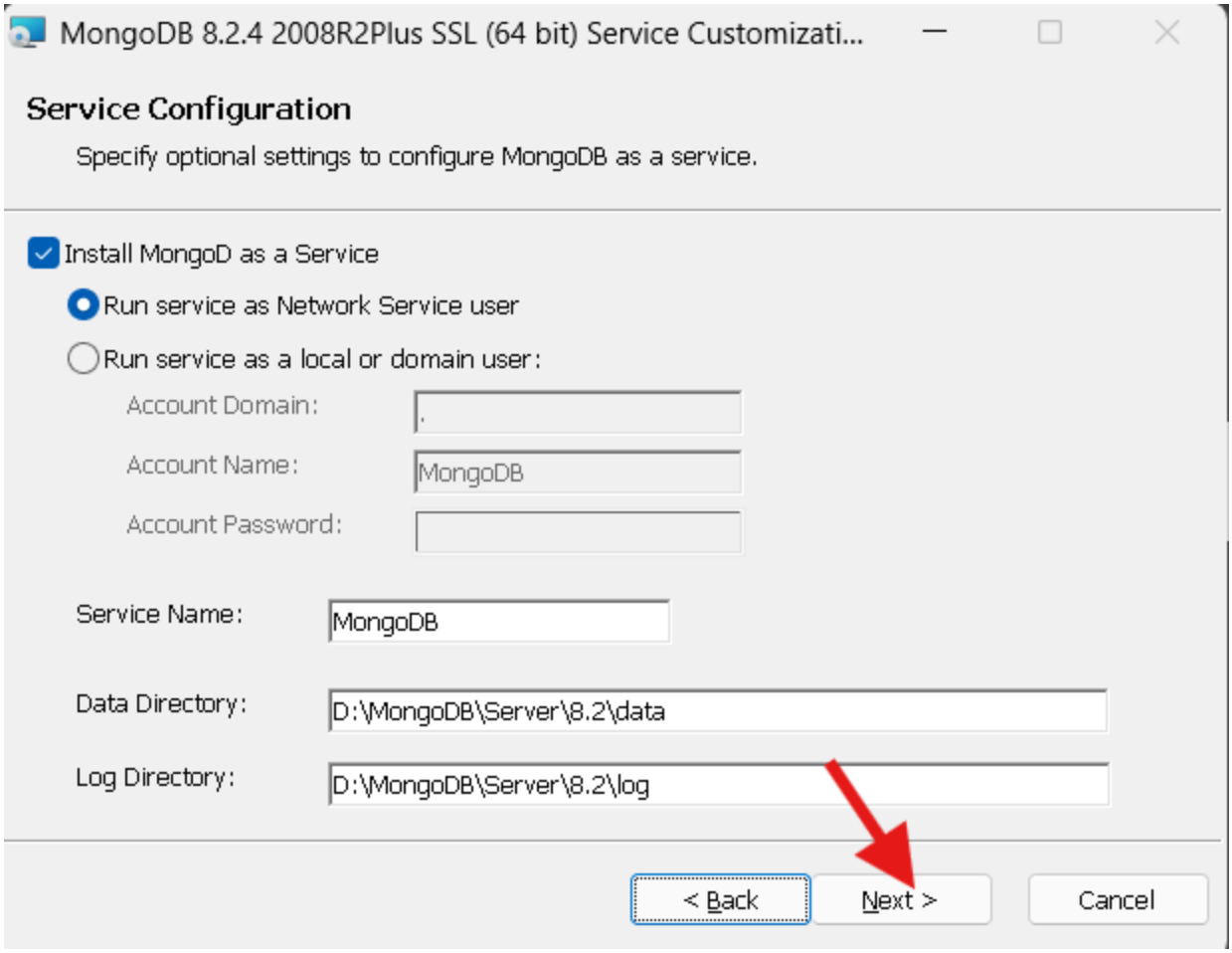
1. Go to: **https://www.mongodb.com/try/download/community**

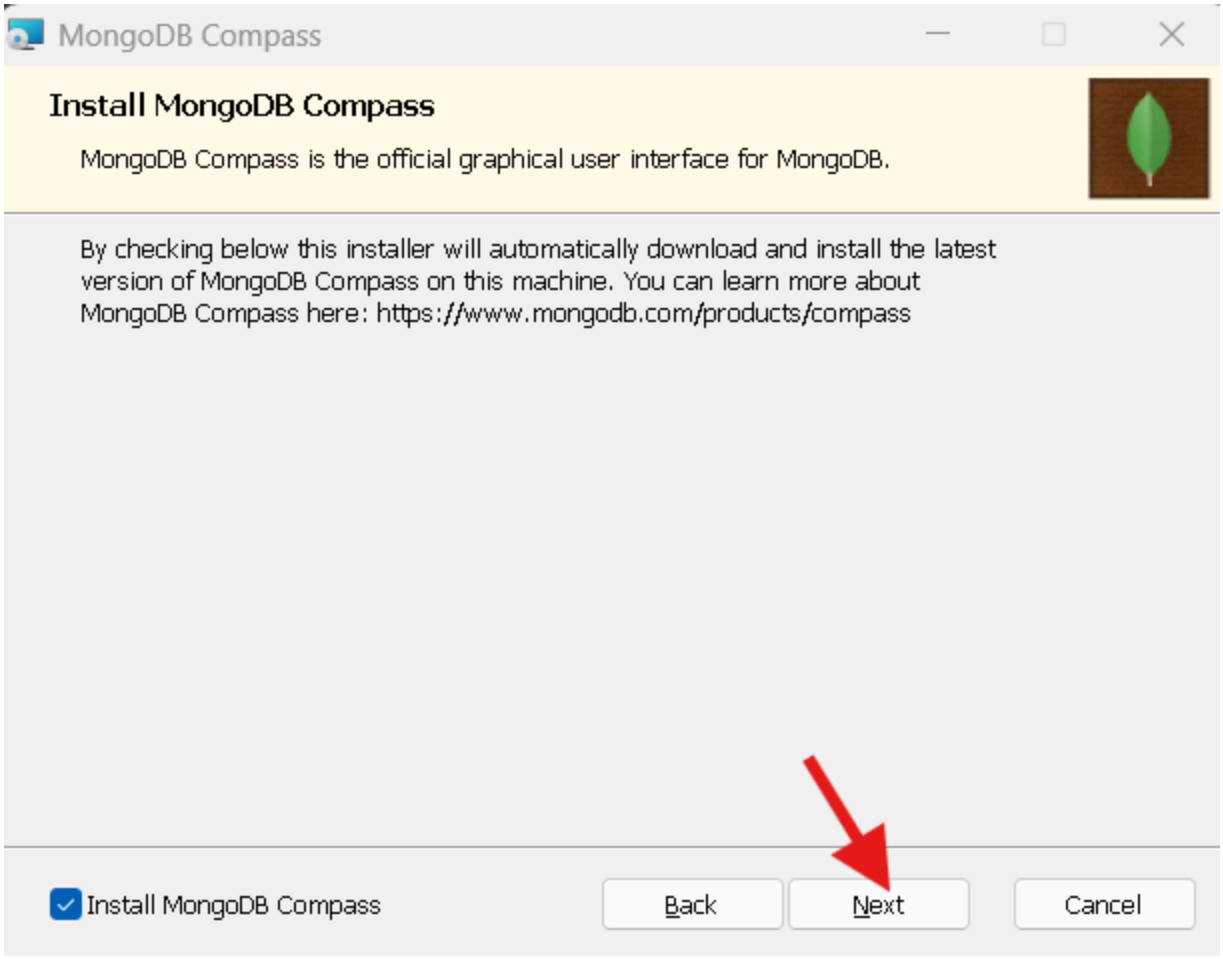

mongodb.com/try/download/community
Products
Resources
Solutions
Company
Pricing
Support
Sign In
tlas
nterprise Advanced
ommunity Edition
B Community Server
B Controllers for
tes Operator
B Search in
ity
ce
$ brew install mongodb-atlas
$ atlas setup
Version
8.2.4 (current)
Platform
Windows x64
Package
msi
Download
Copy link
More Options

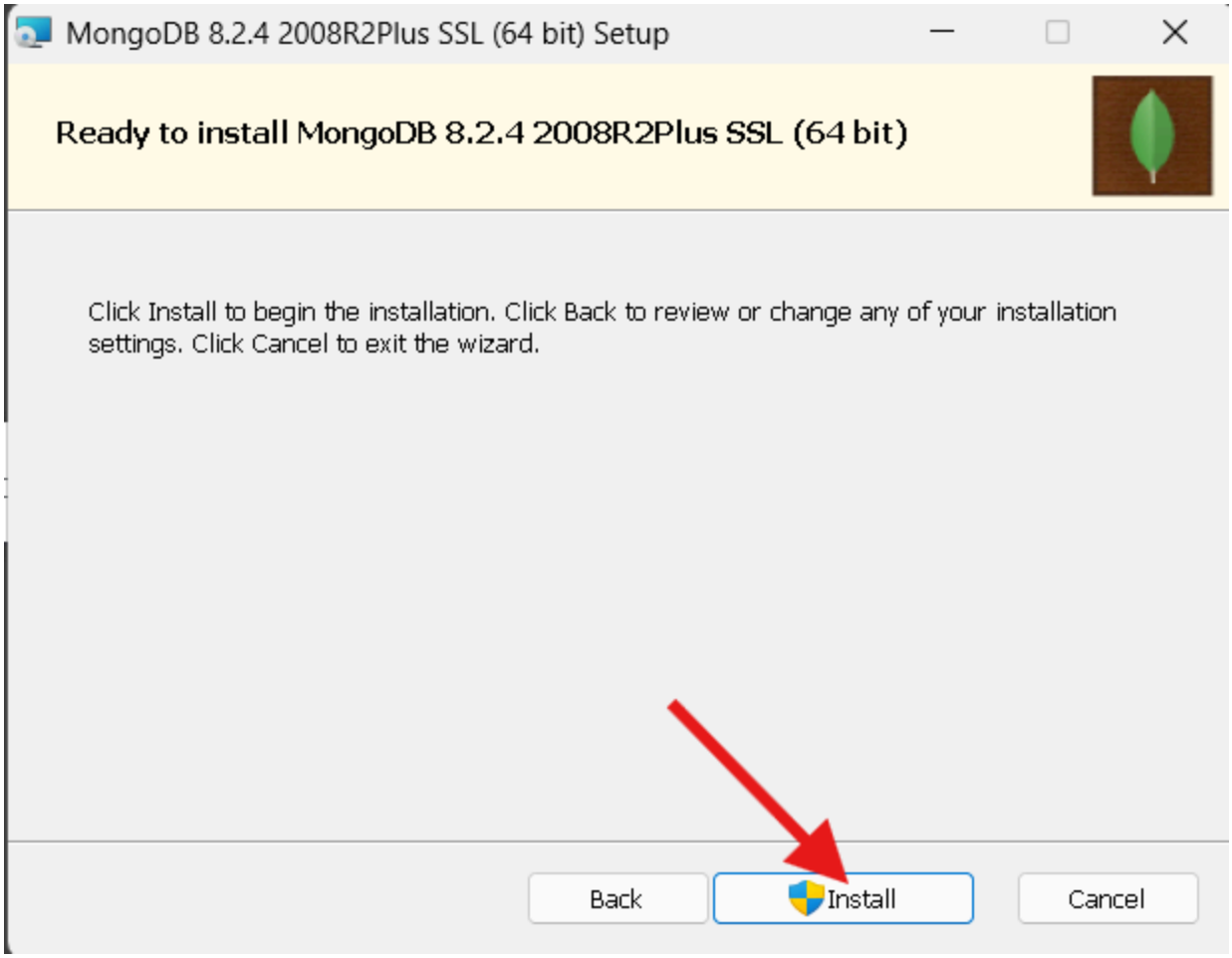

MongoDB 8.2.4 2008R2Plus SSL (64 bit) Setup
Welcome to the MongoDB 8.2.4 2008R2Plus SSL (64 bit) Setup Wizard
The Setup Wizard will install MongoDB 8.2.4 2008R2Plus SSL (64 bit) on your computer. Click Next to continue or Cancel to exit the Setup Wizard.
Back
Next
Cancel


MongoDB 8.2.4 2008R2Plus SSL (64 bit) Setup
End-User License Agreement
Please read the following license agreement carefully
Server Side Public License
VERSION 1, OCTOBER 16, 2018
Copyright © 2018 MongoDB, Inc.
Everyone is permitted to copy and distribute verbatim copies of this
license document, but changing it is not allowed.
TERMS AND CONDITIONS
I accept the terms in the License Agreement
Print
Back
Next
Cancel

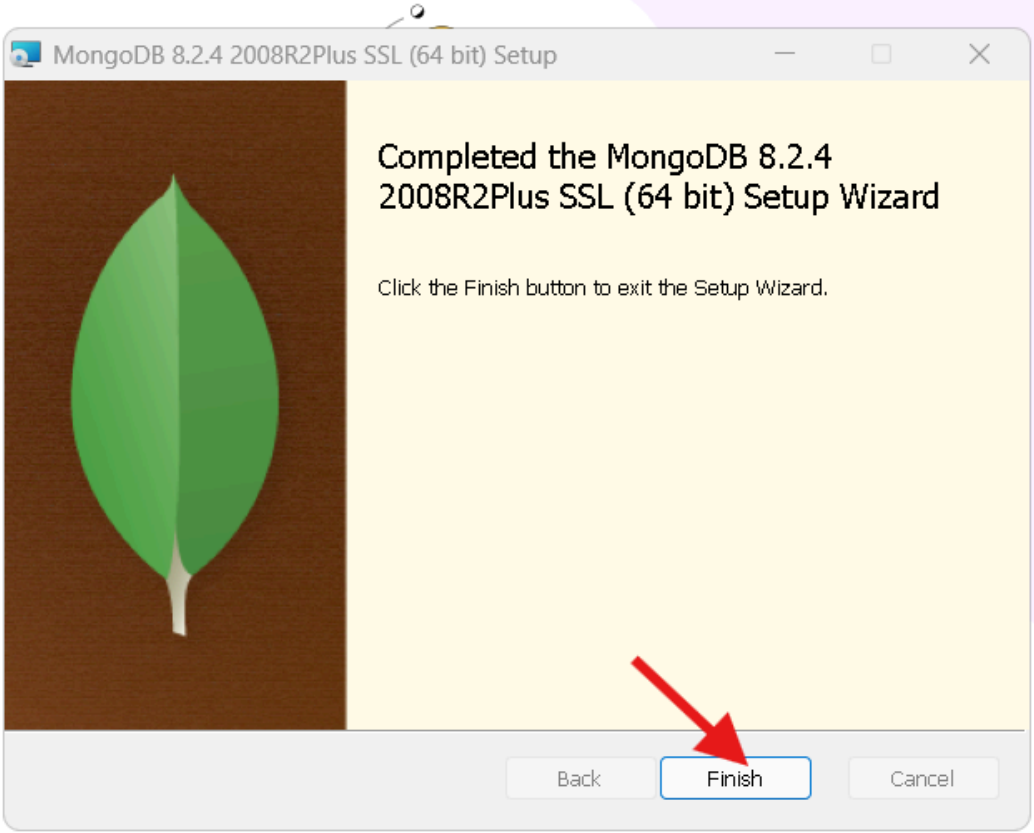

MongoDB 8.2.4 2008R2Plus SSL (64 bit) Setup
Choose Setup Type
Choose the setup type that best suits your needs
Complete
All program features will be installed. Requires the most disk space.
Recommended for most users.
Custom
Allows users to choose which program features will be installed and where they will be installed. Recommended for advanced users.
The Mongo Shell must be installed separately for Windows installations. Download Now
Back
Next
Cancel


MongoDB 8.2.4 2008R2Plus SSL (64 bit) Service Customizati...
Service Configuration
Specify optional settings to configure MongoDB as a service.
Install MongoD as a Service
Run service as Network Service user
Run service as a local or domain user:
Account Domain:
.
Account Name:
MongoDB
Account Password:
Service Name:
MongoDB
Data Directory:
D:\MongoDB\Server\8.2\data
Log Directory:
D:\MongoDB\Server\8.2\log
< Back
Next >
Cancel

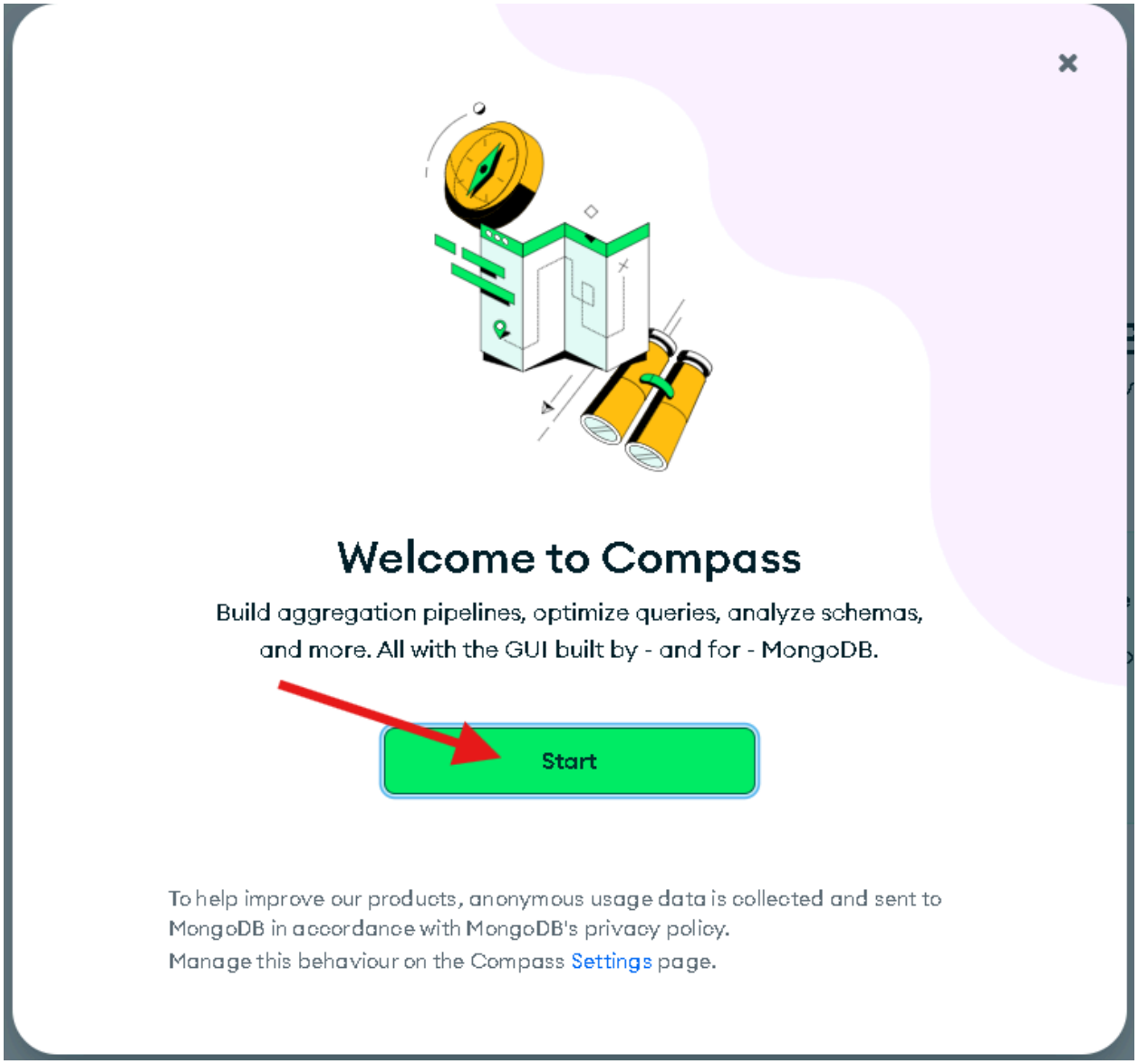

MongoDB Compass
Install MongoDB Compass
MongoDB Compass is the official graphical user interface for MongoDB.
By checking below this installer will automatically download and install the latest version of MongoDB Compass on this machine. You can learn more about MongoDB Compass here: https://www.mongodb.com/products/compass
Install MongoDB Compass
Back
Next
Cancel



Allow the app to change the device

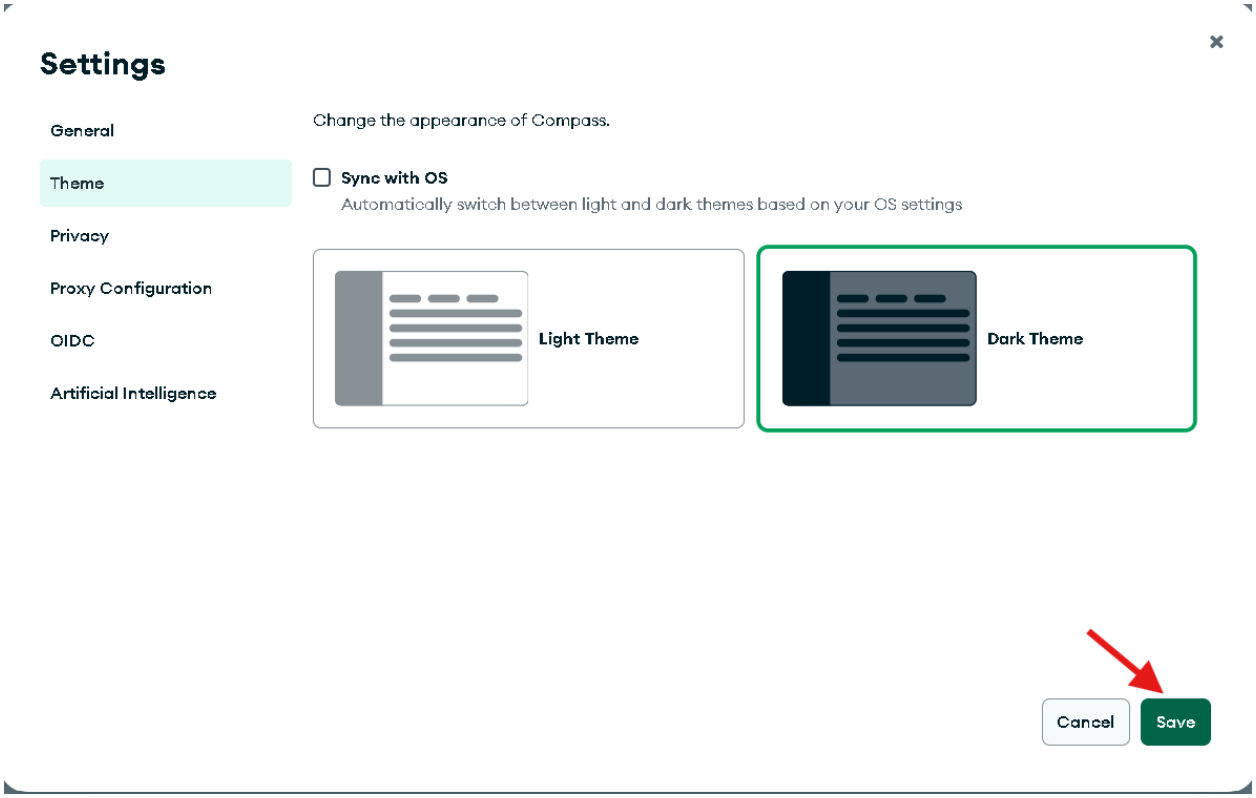


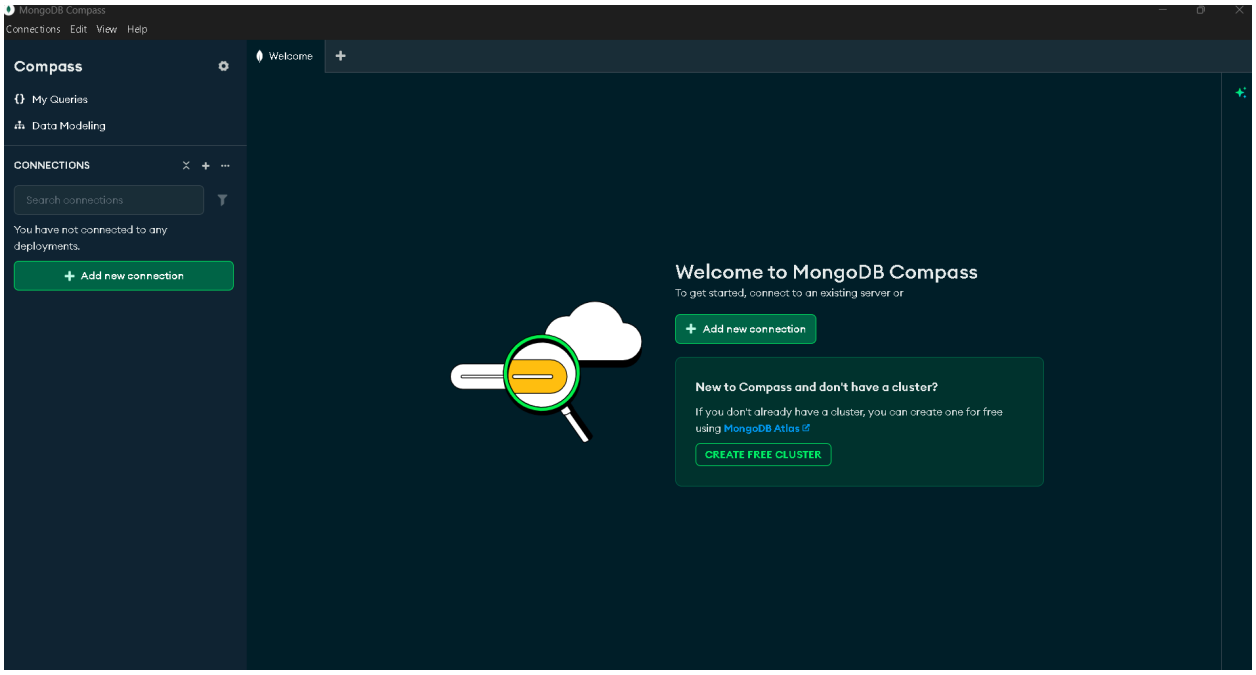
To help improve our products, anonymous usage data is collected and sent to MongoDB in accordance with MongoDB's privacy policy.
Manage this behaviour on the Compass Settings page.



Convert into dark theme:

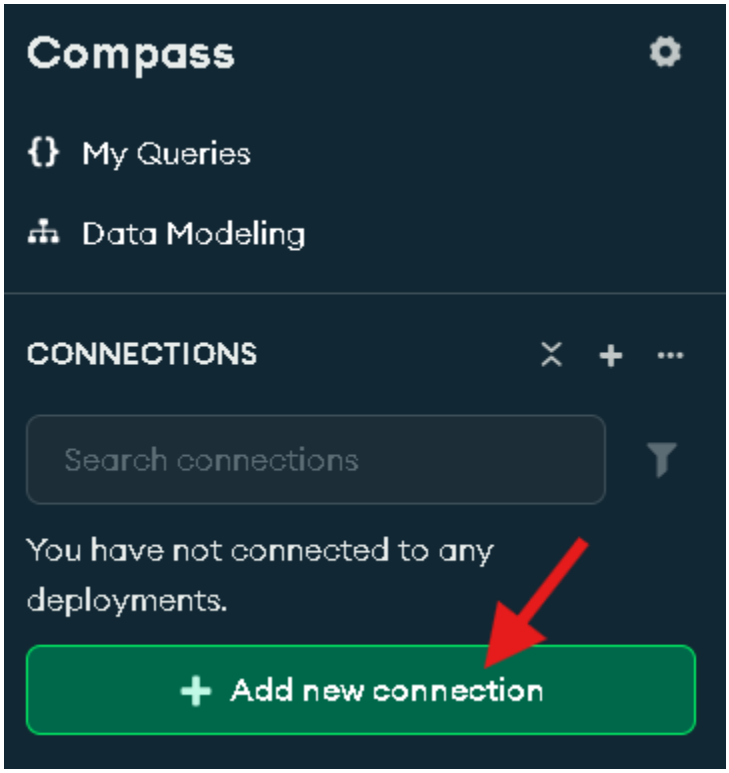
Edit -> settings -> Theme ->

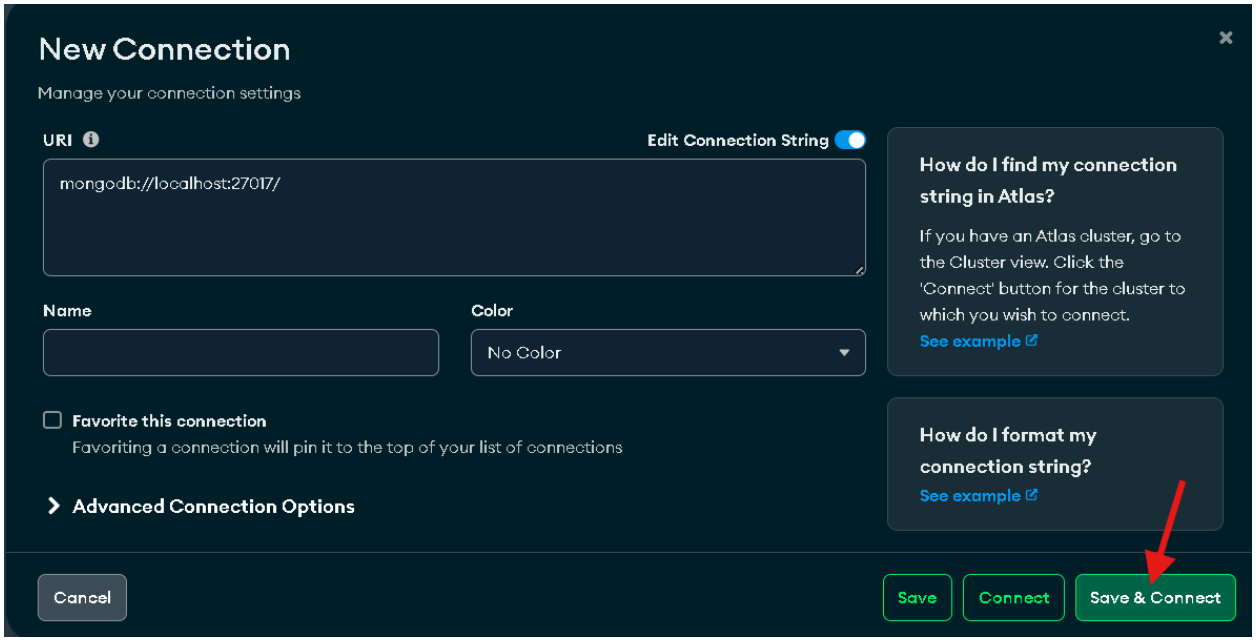




Compass is the GUI,

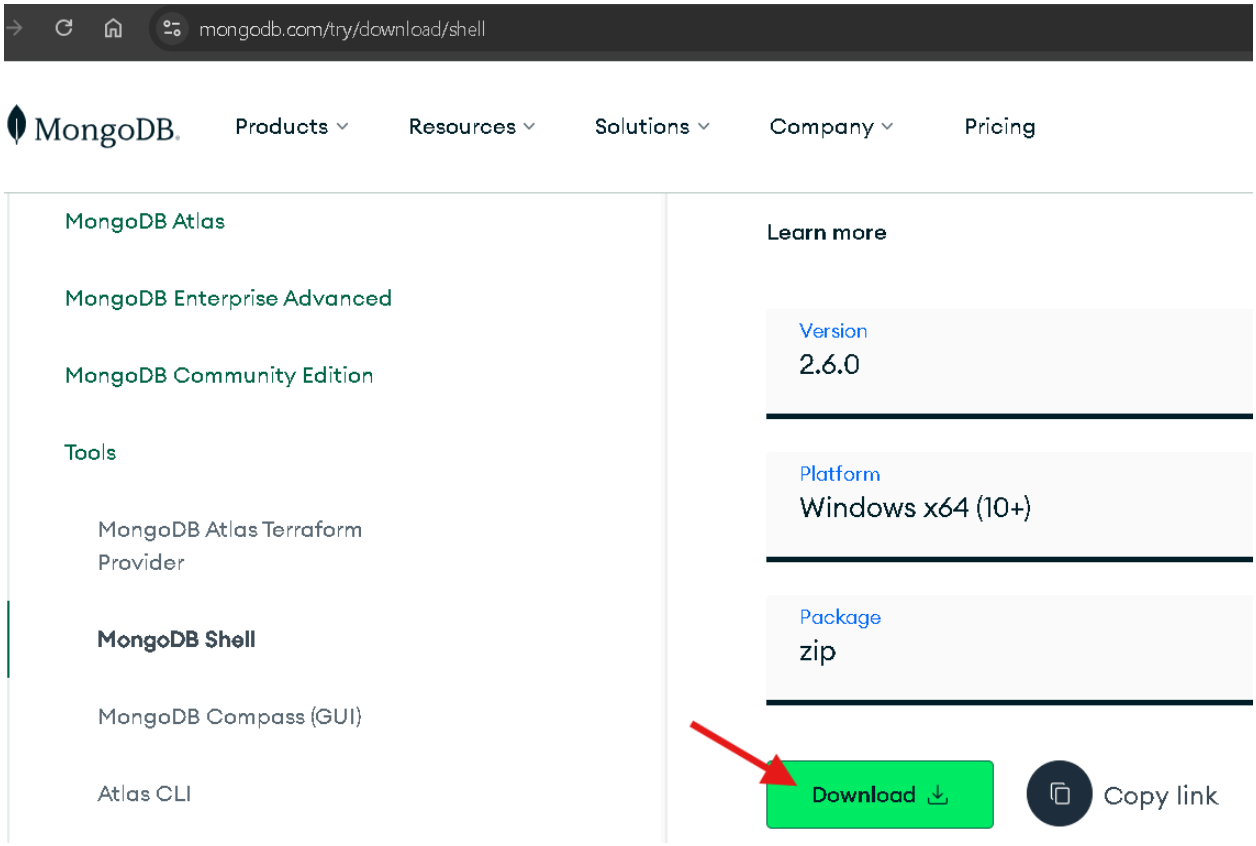
Create Connection:





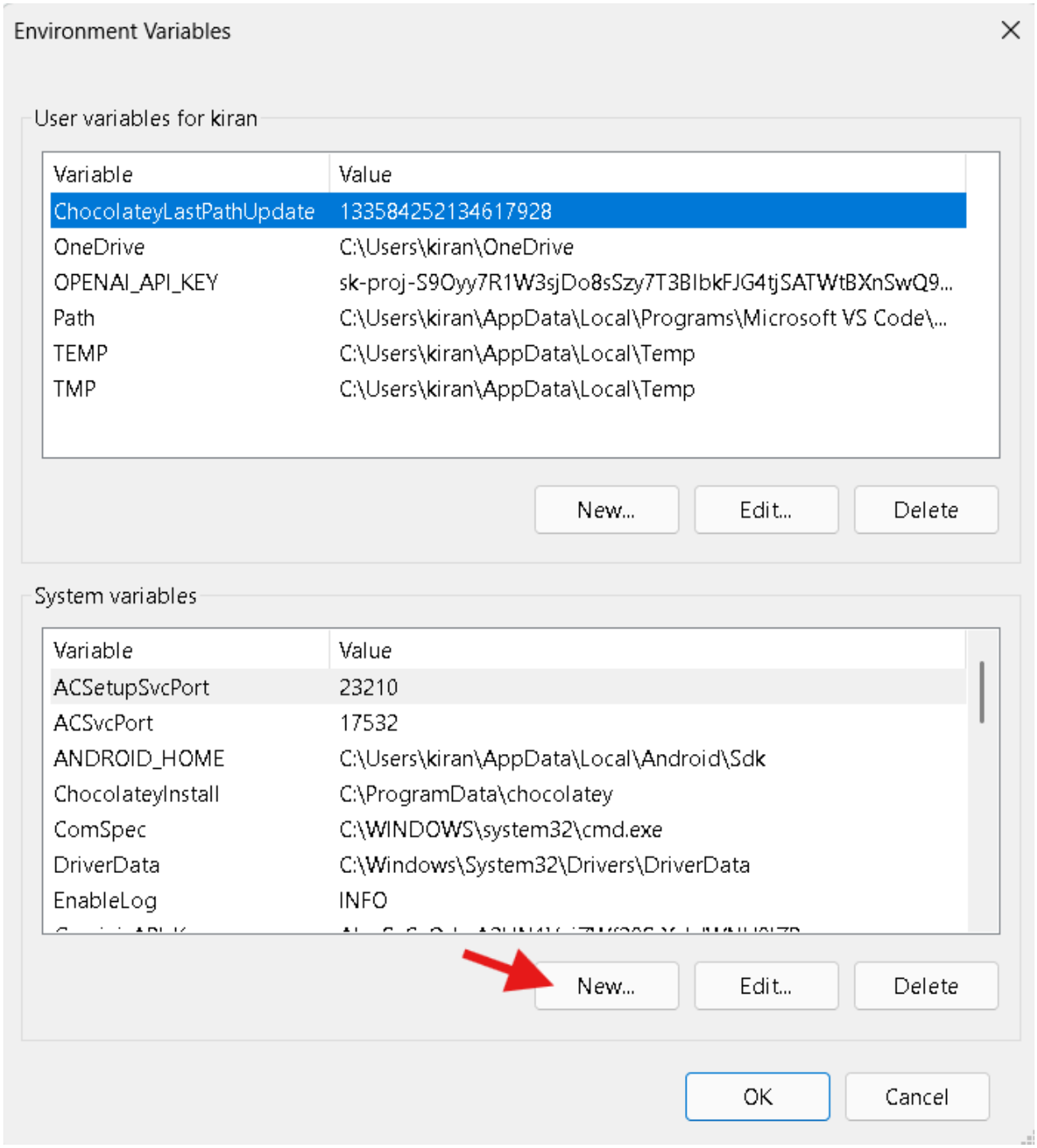
Install MongoDB Shell:

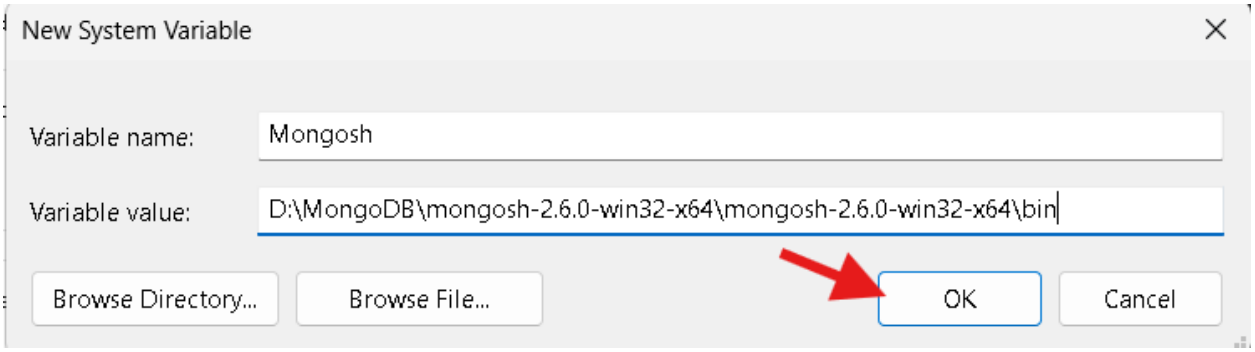
1. Visit: https://www.mongodb.com/try/download/shell
2. Click Download

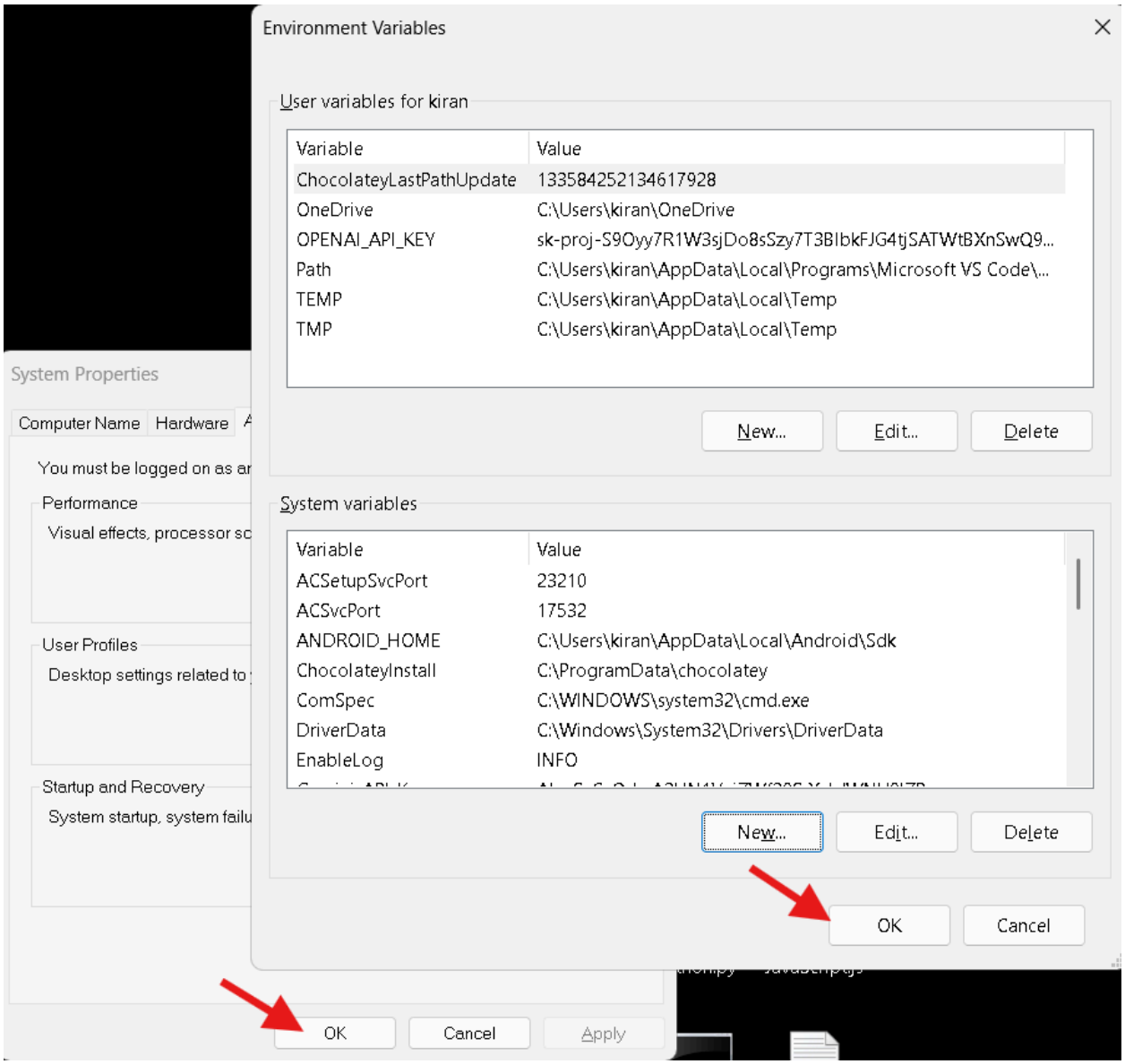


Extract -> Visit D:\MongoDB\mongosh-2.6.0-win32-x64\mongosh-2.6.0-win32-x64\bin
Where you have extracted, above is the path where mongosh.exe is available.
Now let's save it in environmental Variable.

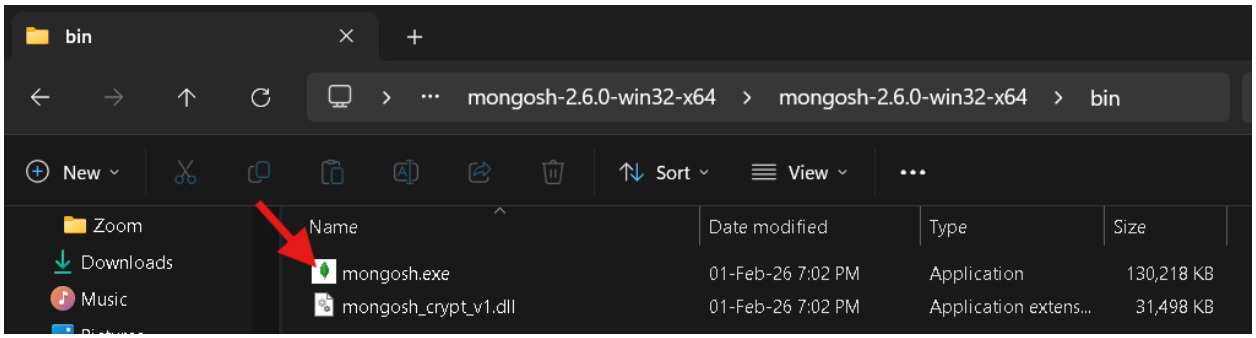
1. **Press `Win + R`**
2. **Type: `sysdm.cpl`**
3. **Press Enter**
4. **Go to the Advanced tab**
5. **Click Environment Variables**

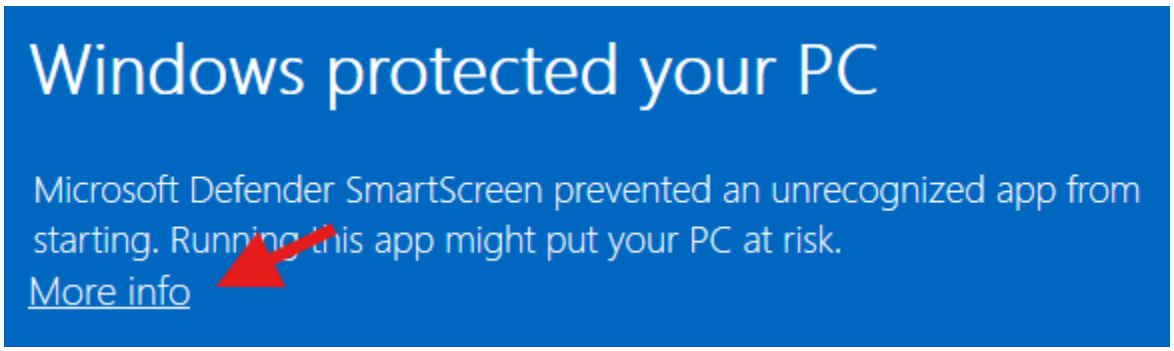

Environment Variables
User variables for kiran
Variable
Value
ChocolateyLastPathUpdate
133584252134617928
OneDrive
C:\Users\kiran\OneDrive
OPENAI_API_KEY
sk-proj-S9Oyy7R1W3sjDo8sSzy7T3BlbkFJG4tjSATWtBXnSwQ9...
Path
C:\Users\kiran\AppData\Local\Programs\Microsoft VS Code\...
TEMP
C:\Users\kiran\AppData\Local\Temp
TMP
C:\Users\kiran\AppData\Local\Temp
New...
Edit...
Delete
System variables
Variable
Value
ACSetupSvcPort
23210
ACSvcPort
17532
ANDROID_HOME
C:\Users\kiran\AppData\Local\Android\Sdk
ChocolateyInstall
C:\ProgramData\chocolatey
ComSpec
C:\WINDOWS\system32\cmd.exe
DriverData
C:\Windows\System32\Drivers\DriverData
EnableLog
INFO
New...
Edit...
Delete
OK
Cancel

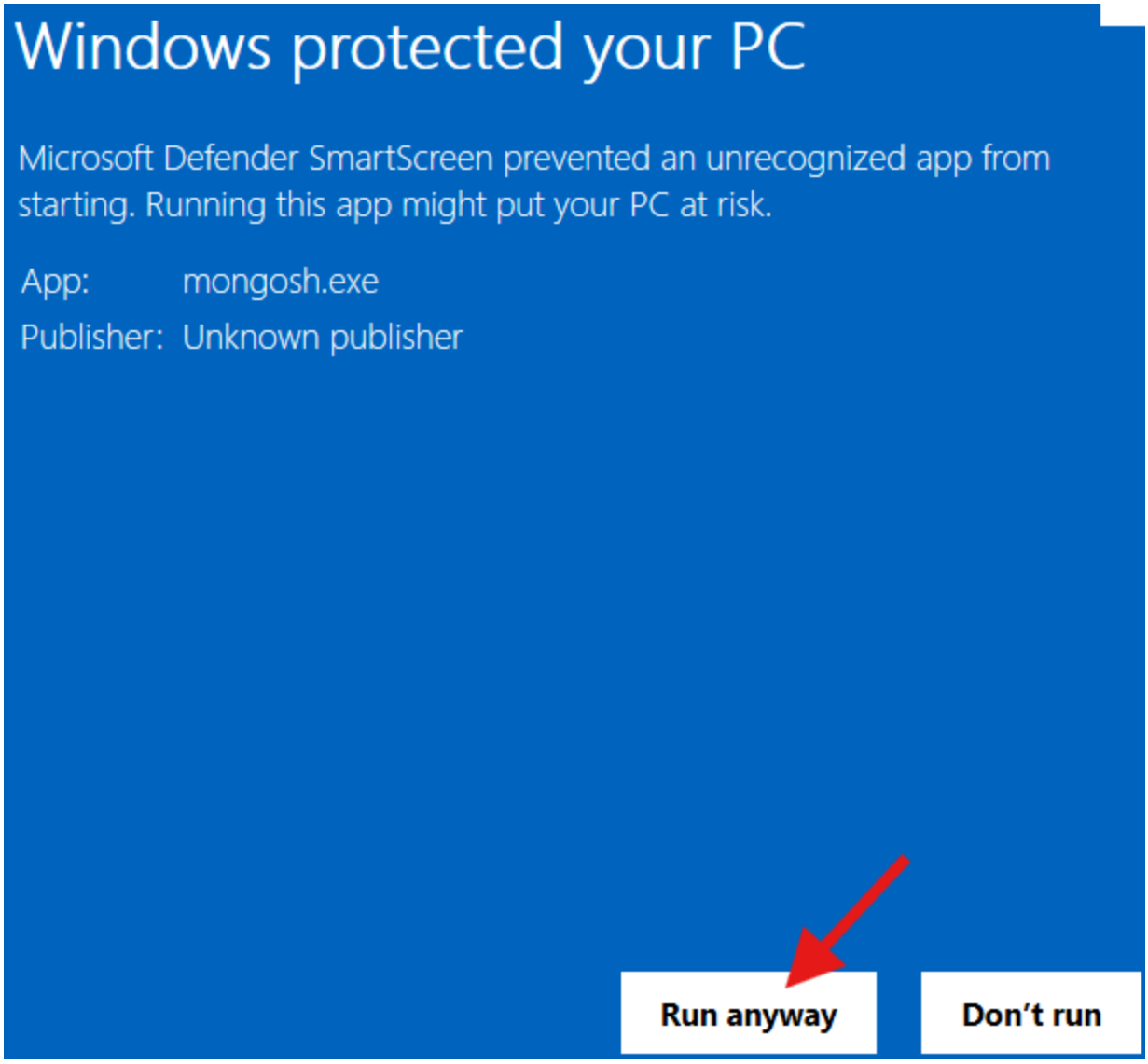

New System Variable
Variable name:
Mongosh
Variable value:
D:\MongoDB\mongosh-2.6.0-win32-x64\mongosh-2.6.0-win32-x64\bin
Browse Directory...
Browse File...
OK
Cancel


Environment Variables
User variables for kiran
Variable
Value
ChocolateyLastPathUpdate
133584252134617928
OneDrive
C:\Users\kiran\OneDrive
OPENAI_API_KEY
sk-proj-S9Oyy7R1W3sjDo8sSzy7T3BlbkFJG4tjSATWtBXnSwQ9...
Path
C:\Users\kiran\AppData\Local\Programs\Microsoft VS Code\...
TEMP
C:\Users\kiran\AppData\Local\Temp
TMP
C:\Users\kiran\AppData\Local\Temp
New...
Edit...
Delete
System variables
Variable
Value
ACSetupSvcPort
23210
ACSvcPort
17532
ANDROID_HOME
C:\Users\kiran\AppData\Local\Android\Sdk
ChocolateyInstall
C:\ProgramData\chocolatey
ComSpec
C:\WINDOWS\system32\cmd.exe
DriverData
C:\Windows\System32\Drivers\DriverData
EnableLog
INFO
New...
Edit...
Delete
OK
Cancel
System Properties
Computer Name
Hardware
You must be logged on as ar
Performance
Visual effects, processor sc
User Profiles
Desktop settings related to
Startup and Recovery
System startup, system failu
OK
Cancel
Apply

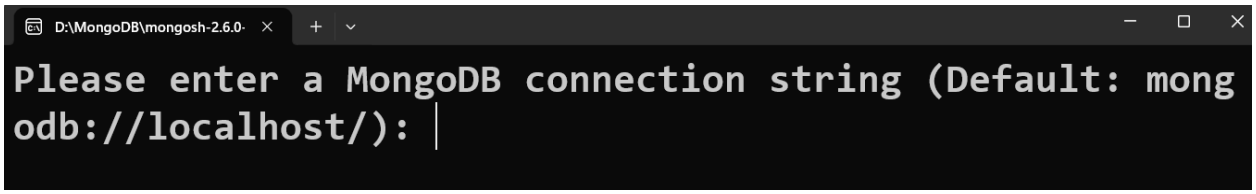
Opening the MongoDB Shell:







Ctrl + mouse scroll -> To increase and decrease the font size.



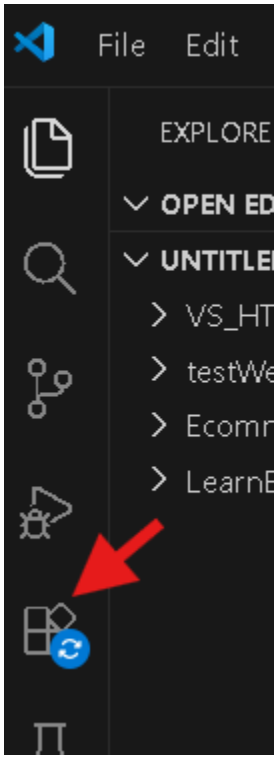
To establish the connection to the database: type mongosh

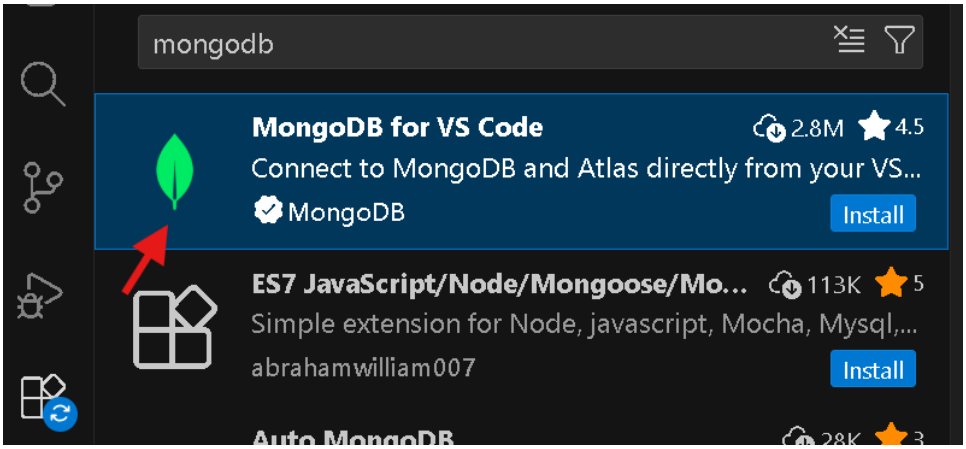
```
Please enter a MongoDB connection string (Default: mongodb://localhost/): mongosh
mongosh
Current Mongosh Log ID: 697f59576f03778324628c9f
Connecting to:          mongodb://127.0.0.1:27017/mongosh?directConnection=true&s
nTimeoutMS=2000&appName=mongosh+2.6.0
Using MongoDB:          8.2.4
Using Mongosh:          2.6.0

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/


To help improve our products, anonymous usage data is collected and sent to Mongo
ly (https://www.mongodb.com/legal/privacy-policy).
You can opt-out by running the disableTelemetry() command.

------
   The server generated these startup warnings when booting
   2026-02-01T18:43:44.005+05:30: Access control is not enabled for the database.
te access to data and configuration is unrestricted
------

mongosh>
```

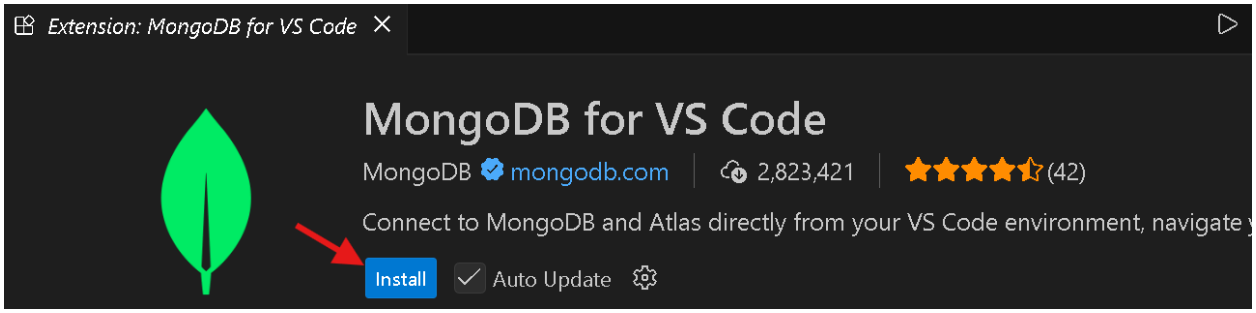
Commands:

1. To connect: **mongosh**
2. To clear the screen: **cls**
3. To exit type: **exit**

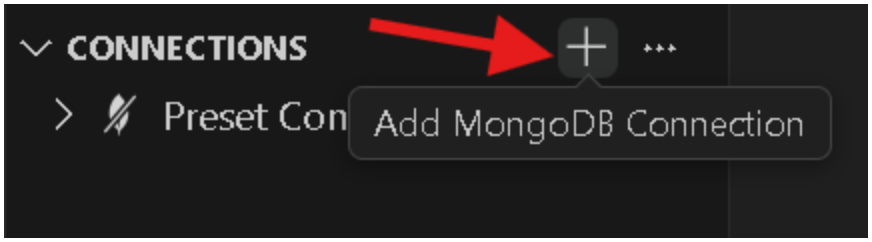
To open the shell using VS Code:

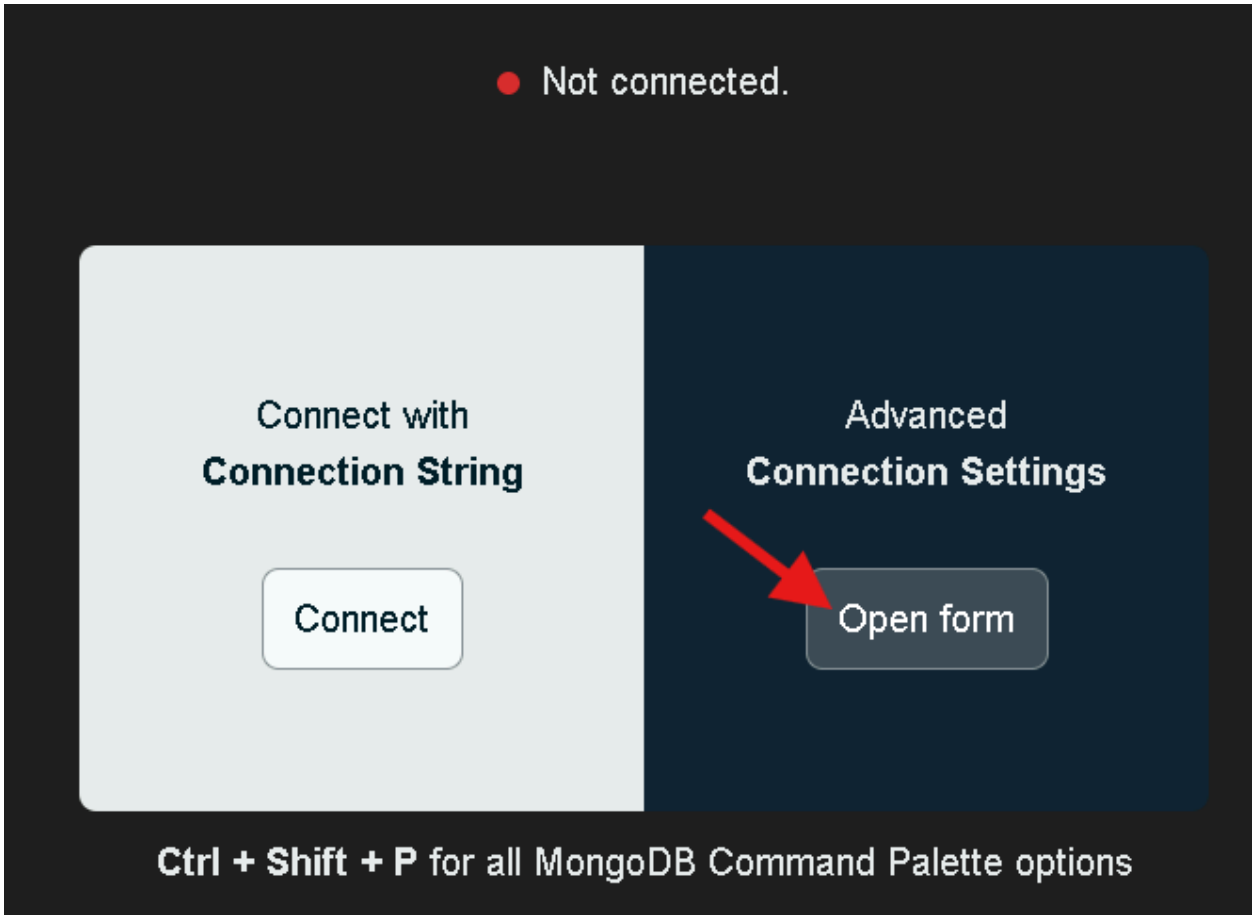


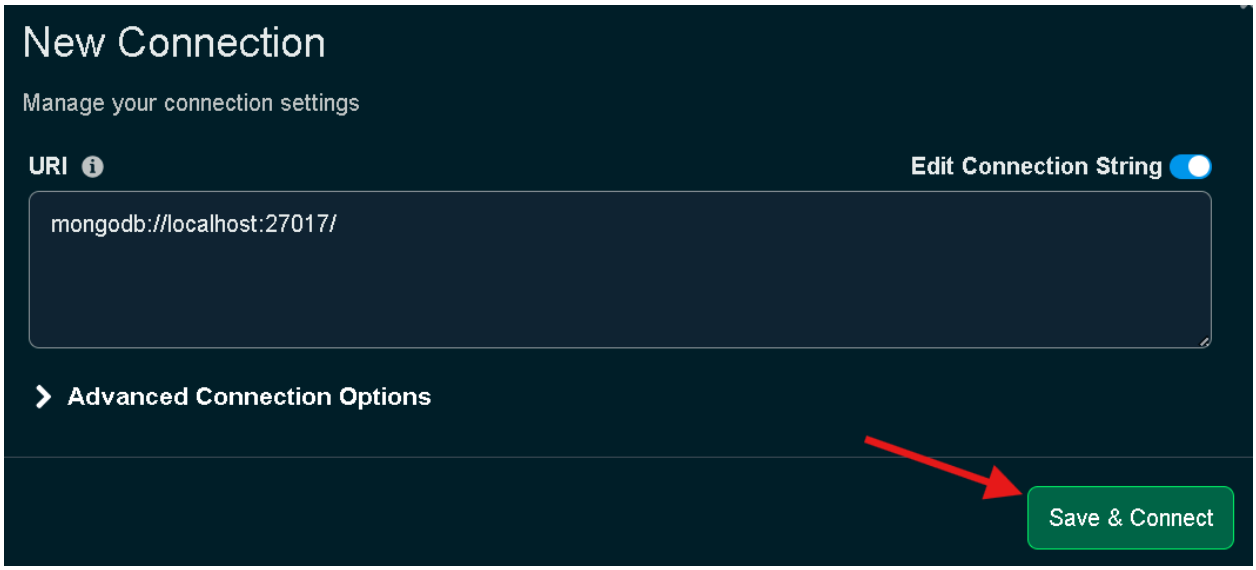


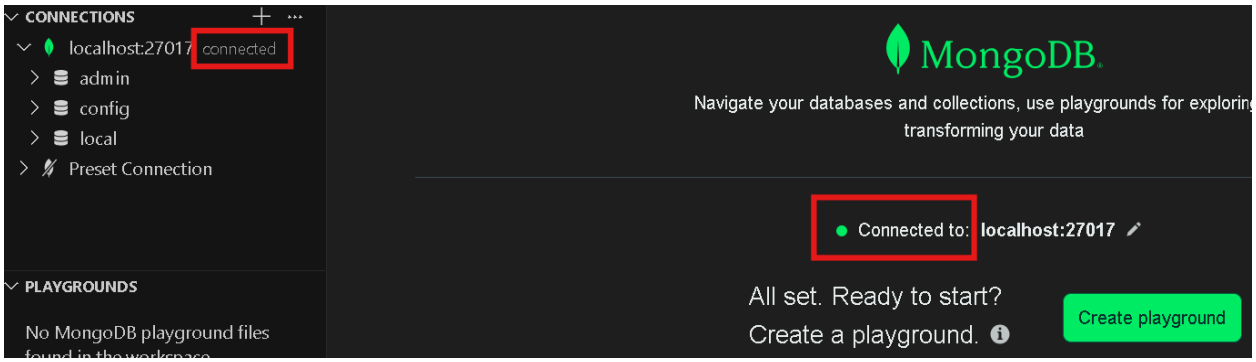


To Create connection:

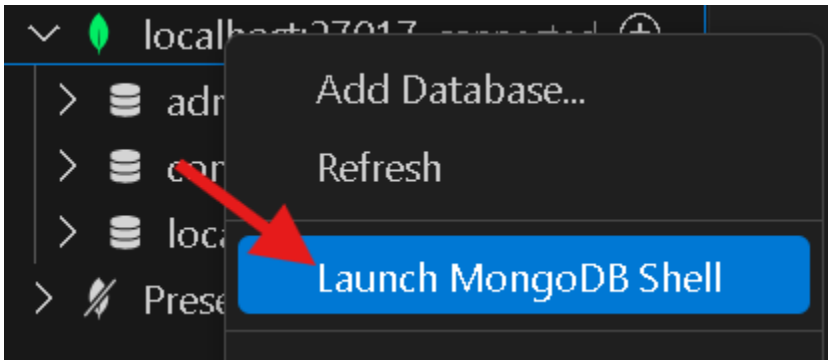

CONNECTIONS
Preset Con
Add MongoDB Connection


Not connected.
Connect with
Connection String
Connect
Advanced
Connection Settings
Open form
Ctrl + Shift + P for all MongoDB Command Palette options





Right click on localhost

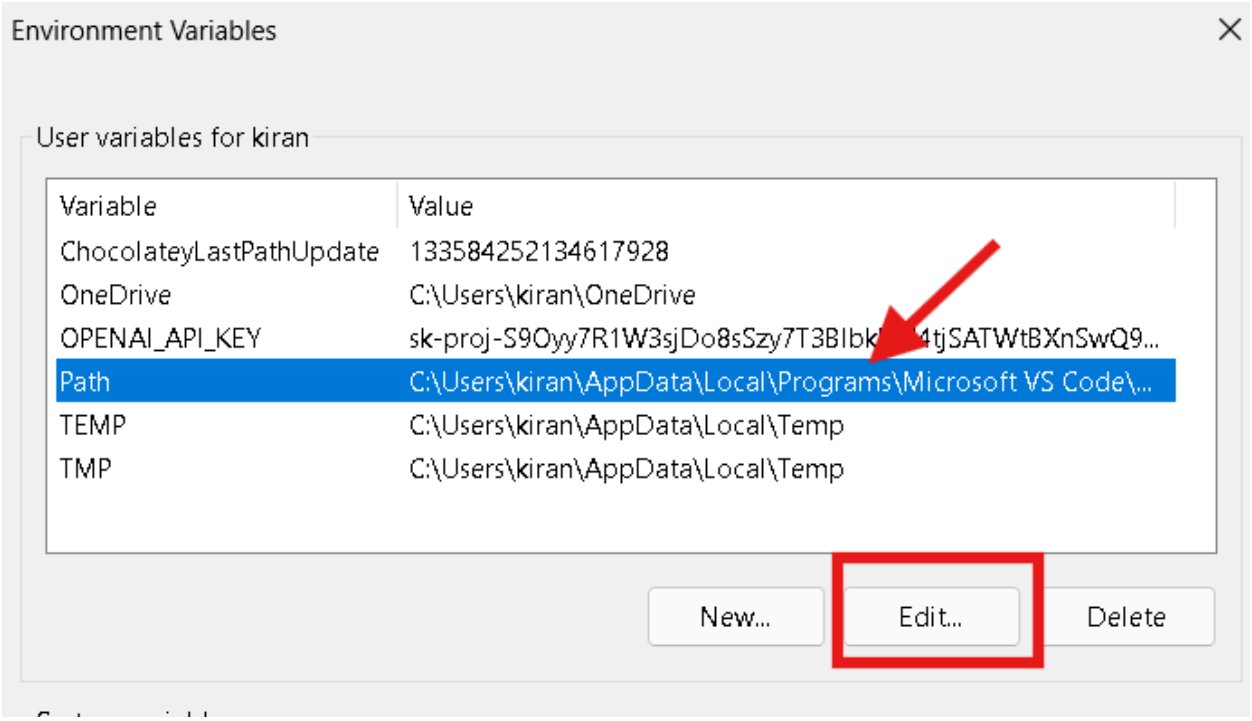


If there's an error like:

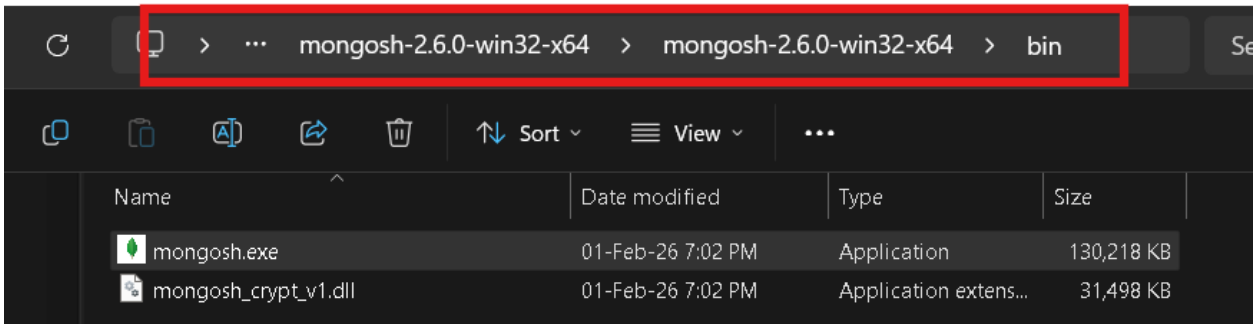
```
PS C:\Users\kiran> mongosh $Env:MDB_CONNECTION_STRING;
mongosh : The term 'mongosh' is not recognized as the name of a cmdlet, function, script file, or operable program. Check the
spelling of the name, or if a path was included, verify that the path is correct and try again.
At line:1 char:1
+ mongosh $Env:MDB_CONNECTION_STRING;
+ ~~~~~~~
    + CategoryInfo          : ObjectNotFound: (mongosh:String) [], CommandNotFoundException
    + FullyQualifiedErrorId : CommandNotFoundException
```

1. **Press `Win + R`**
2. **Type: `sysdm.cpl`**

3. **Press Enter**
4. **Go to the Advanced tab**
5. **Click Environment Variables**

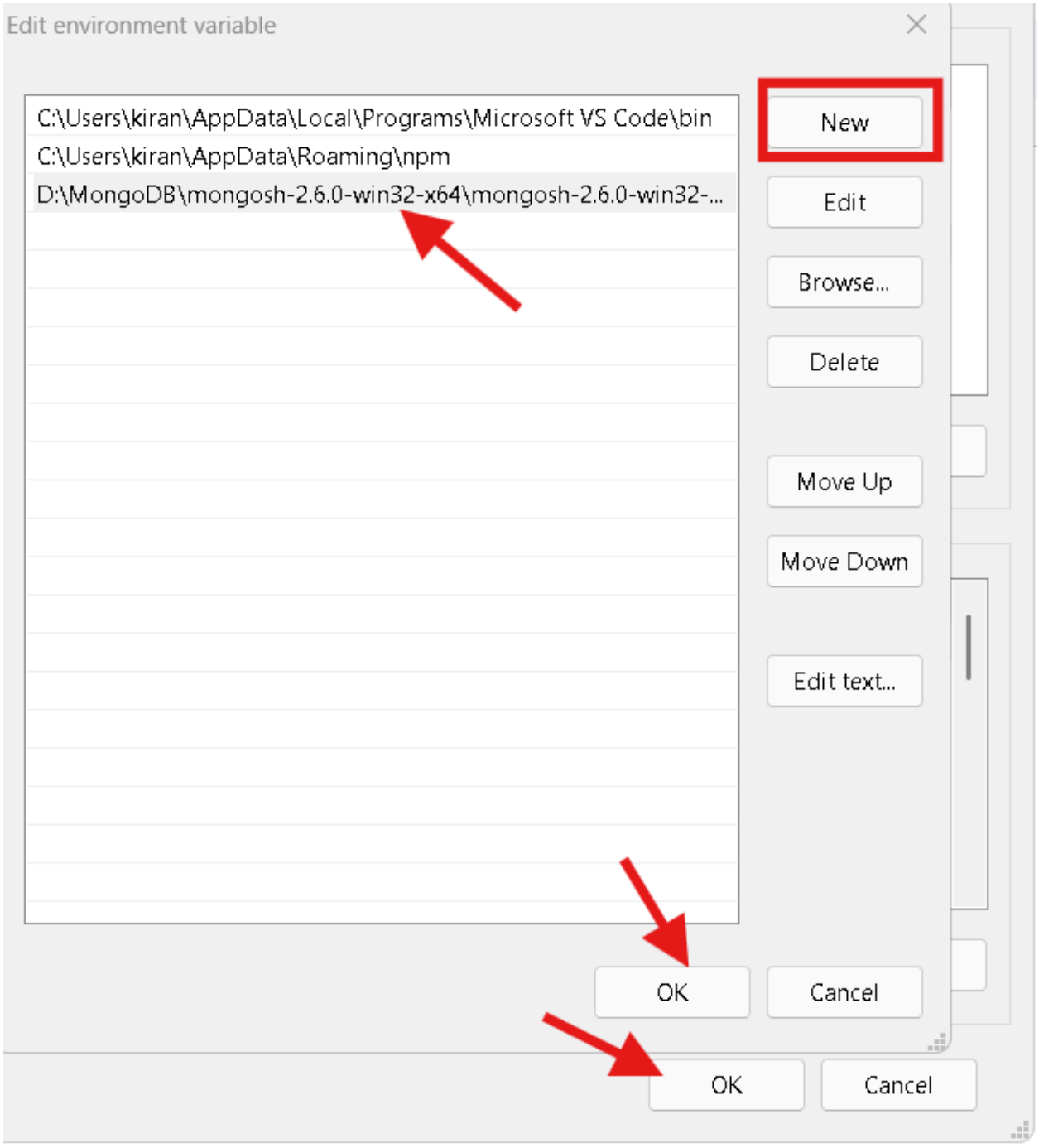


Copy the path where mongosh.exe is available:

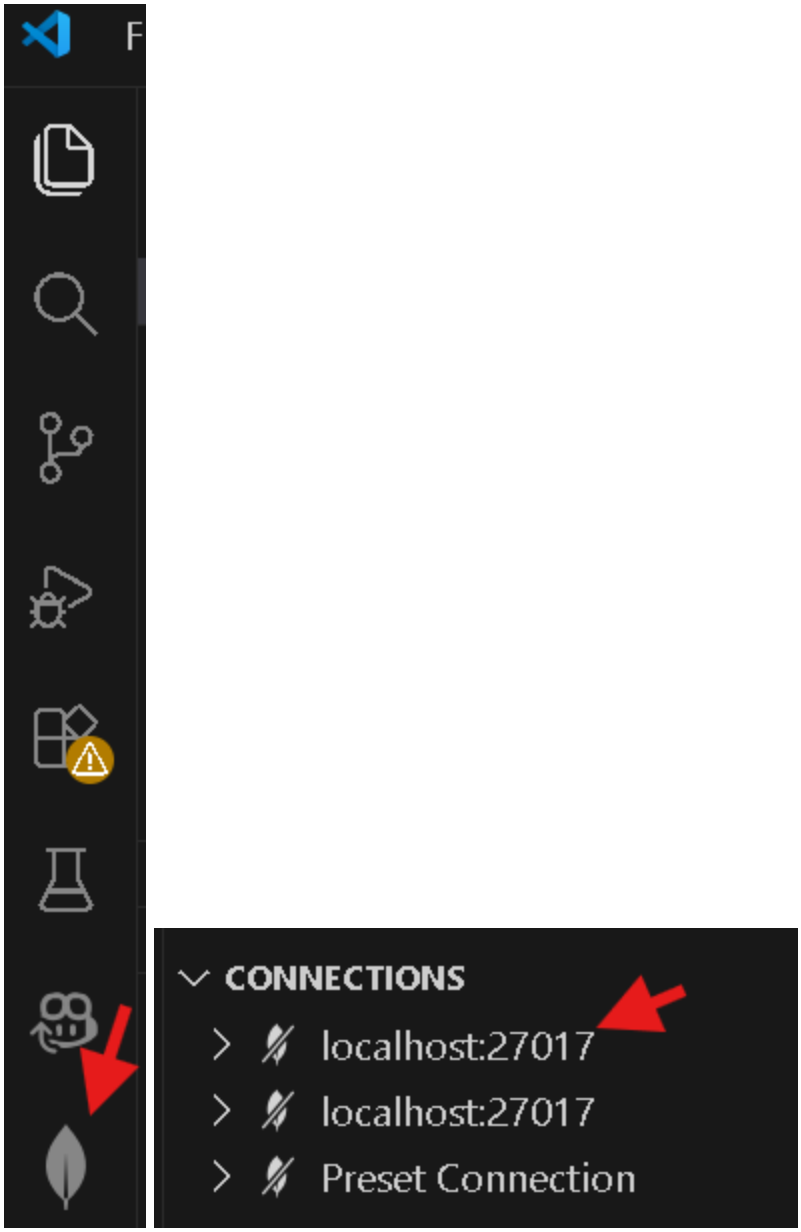


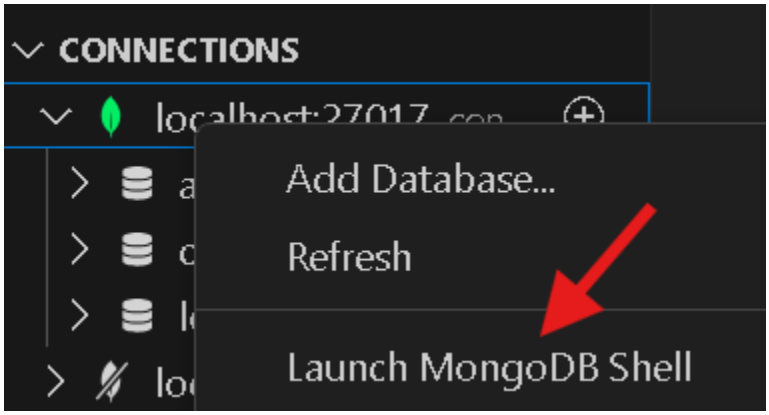
Path: D:\MongoDB\mongosh-2.6.0-win32-x64\mongosh-2.6.0-win32-x64\bin

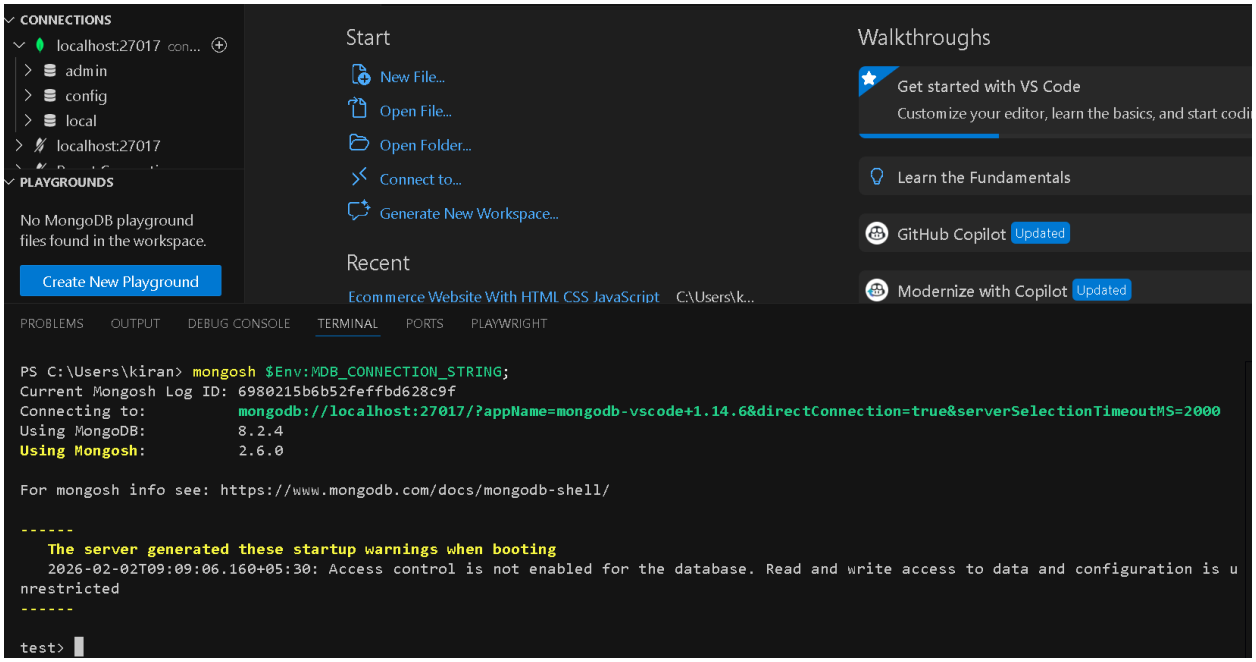
Click New Button -> paste the path -> Click 3 * OK



Close and Open VS code once again.


CONNECTIONS
localhost:27017
localhost:27017
Preset Connection


CONNECTIONS
Add Database...
Refresh
Launch MongoDB Shell



Successfully Installed, Start using either in VS Code or in mongosh.exe.

To Clear: cls

To exit: exit

To Enter: mongosh