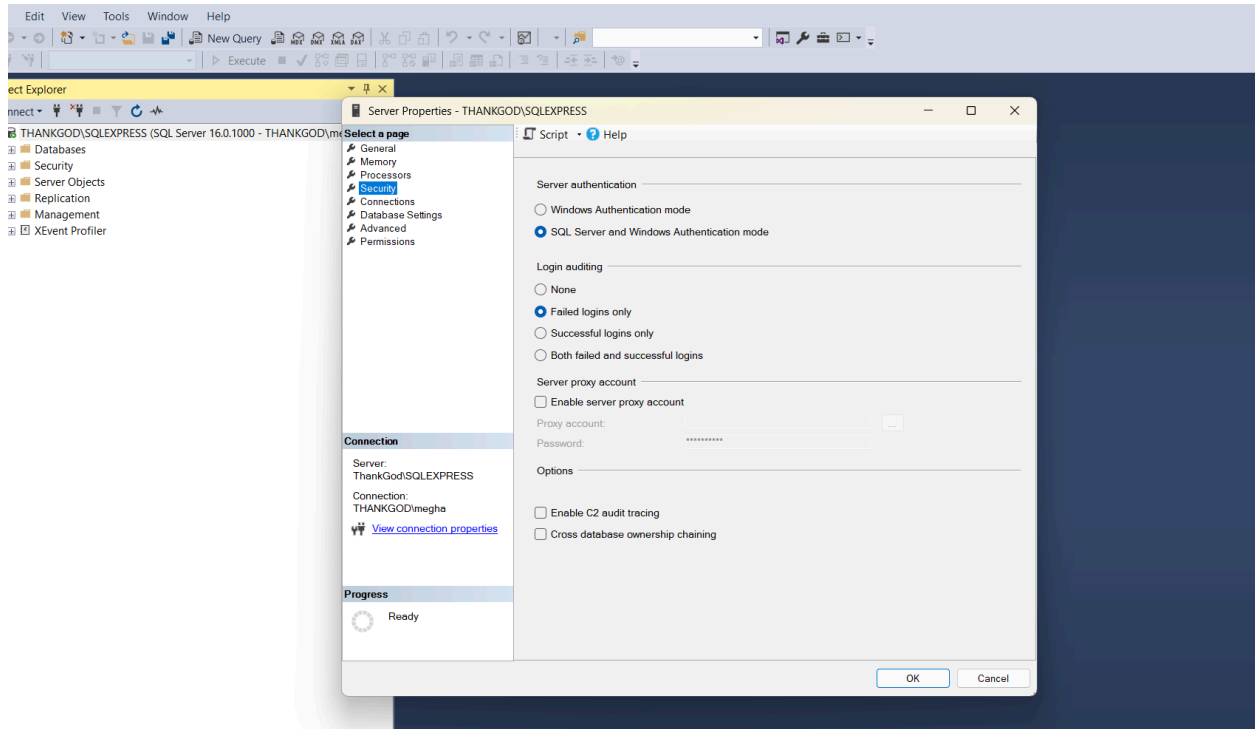


Requirements

- Works for python 3.12 and lower. It doesnt support for version 3.13 and above
- Make sure to configure the authentication in ssms as I am using Microsoft SQL



- Bypass the certificates if needed from the profiles.yml

Installation

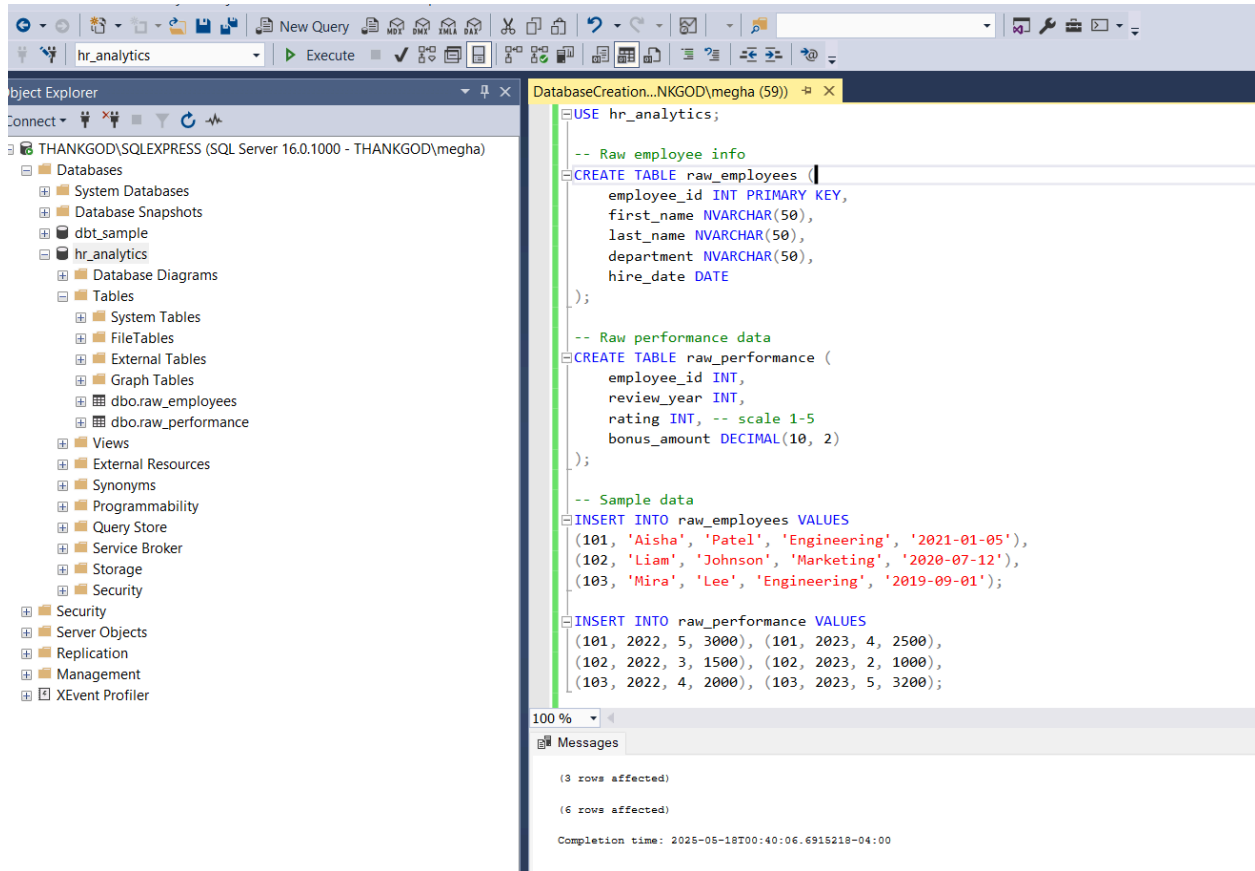
Make Sure Microsoft sql is installed and running

Please run this command in the terminal to install:

```
pip install dbt-core  
pip install dbt-sqlserver
```

Step 1: Creating a database in SQL Studio

Created a database hr_analytics with two tables raw_employees and raw_performance



Step 2: Initialising a DBT project

Here I am using windows authentication. We can use SQL authentication as well, we have to create profiles for that

```
C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial>dbt init dbt_tutorial
04:47:33 Running with dbt=1.8.9
04:47:33
Your new dbt project "dbt_tutorial" was created!

For more information on how to configure the profiles.yml file,
please consult the dbt documentation here:

https://docs.getdbt.com/docs/configure-your-profile

One more thing:

Need help? Don't hesitate to reach out to us via GitHub issues or on Slack:

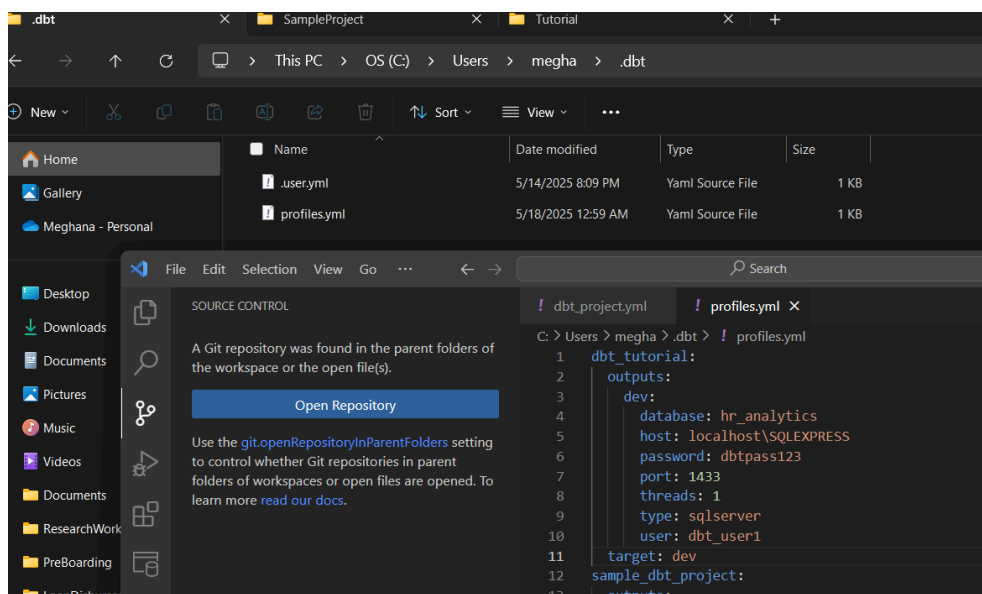
https://community.getdbt.com/

Happy modeling!

04:47:33 Setting up your profile.
Which database would you like to use?
[1] fabric
[2] sqlserver
```

```
dbt init project_name
```

As I am using windows authentication, just press enter when asked about user and password details.



Editing the profiles.yml to windows authentication. Now navigate to the project folder and then run dbt debug to check if everything is working or not.

```
C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial>cd dbt_tutorial

C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>dbt debug
05:14:45 Running with dbt=1.8.9
05:14:45 dbt version: 1.8.9
05:14:45 python version: 3.12.10
05:14:45 python path: C:\Users\megha\AppData\Local\Programs\Python\Python312\python.exe
05:14:45 os info: Windows-11-10.0.26100-SP0
05:14:45 Using profiles dir at C:\Users\megha\.dbt
05:14:45 Using profiles.yml file at C:\Users\megha\.dbt\profiles.yml
05:14:45 Using dbt_project.yml file at C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial\dbt_project.yml
05:14:45 adapter type: sqlserver
05:14:45 adapter version: 1.8.7
05:14:46 Configuration:
05:14:46   profiles.yml file [OK found and valid]
05:14:46   dbt_project.yml file [OK found and valid]
05:14:46 Required dependencies:
05:14:46   - git [OK found]

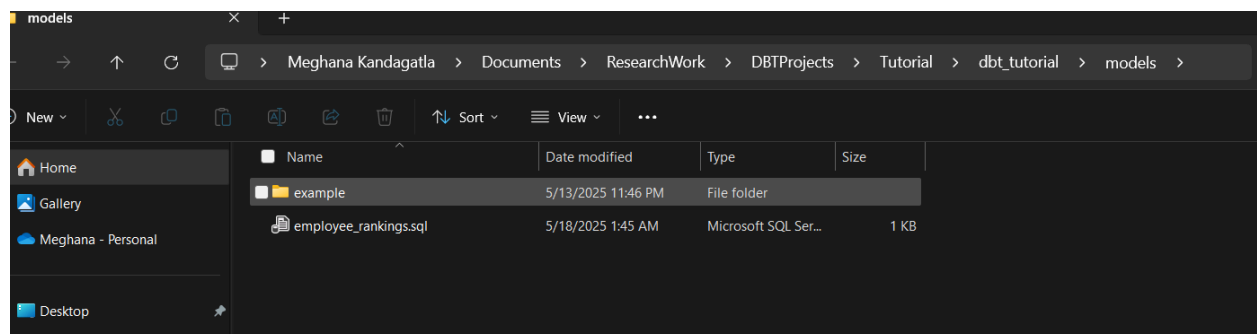
05:14:46 Connection:
05:14:46   server: localhost\SQLEXPRESS
05:14:46   database: hr_analytics
05:14:46   schema: dbo
05:14:46   UID: None
05:14:46   client_id: None
05:14:46   authentication: Windows Login
05:14:46   encrypt: True
05:14:46   trust_cert: True
05:14:46   retries: 3
05:14:46   login_timeout: 0
05:14:46   query_timeout: 0
05:14:46   trace_flag: False
05:14:46   port: 1433
05:14:46 Registered adapter: sqlserver=1.8.7
05:14:46 Connection test: [OK connection ok]

05:14:46 All checks passed!

C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>
```

Step 3: Creating Models and testing them

Creating a SQL script for ranking. I am placing that in the models folder. We can update the same in the schema.yml about the models.



Using dbt run. I am running all the scripts in the models folder.

```
C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>dbt run
05:53:07 Running with dbt=1.8.9
05:53:08 Registered adapter: sqlserver=1.8.7
05:53:08 Unable to do partial parsing because saved manifest not found. Starting full parse.
05:53:10 [WARNING]: Deprecated functionality
The 'tests' config has been renamed to 'data_tests'. Please see
https://docs.getdbt.com/docs/build/data-tests#new-data_tests-syntax for more
information.
05:53:10 Found 3 models, 7 data tests, 504 macros
05:53:10
05:53:11 Concurrency: 1 threads (target='dev')
05:53:11
05:53:11 1 of 3 START sql view model dbo.employee_rankings ..... [RUN]
05:53:11 1 of 3 OK created sql view model dbo.employee_rankings ..... [OK in 0.45s]
05:53:11 2 of 3 START sql table model dbo.my_first_dbt_model ..... [RUN]
05:53:11 2 of 3 OK created sql table model dbo.my_first_dbt_model ..... [OK in 0.23s]
05:53:11 3 of 3 START sql view model dbo.my_second_dbt_model ..... [RUN]
05:53:11 3 of 3 OK created sql view model dbo.my_second_dbt_model ..... [OK in 0.07s]
05:53:11
05:53:11 Finished running 2 view models, 1 table model in 0 hours 0 minutes and 0.97 seconds (0.97s).
05:53:12 Completed successfully
05:53:12
05:53:12 Done. PASS=3 WARN=0 ERROR=0 SKIP=0 TOTAL=3
C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>
```

Now, I am checking ssms to check if the new table is created. It's saved as view.

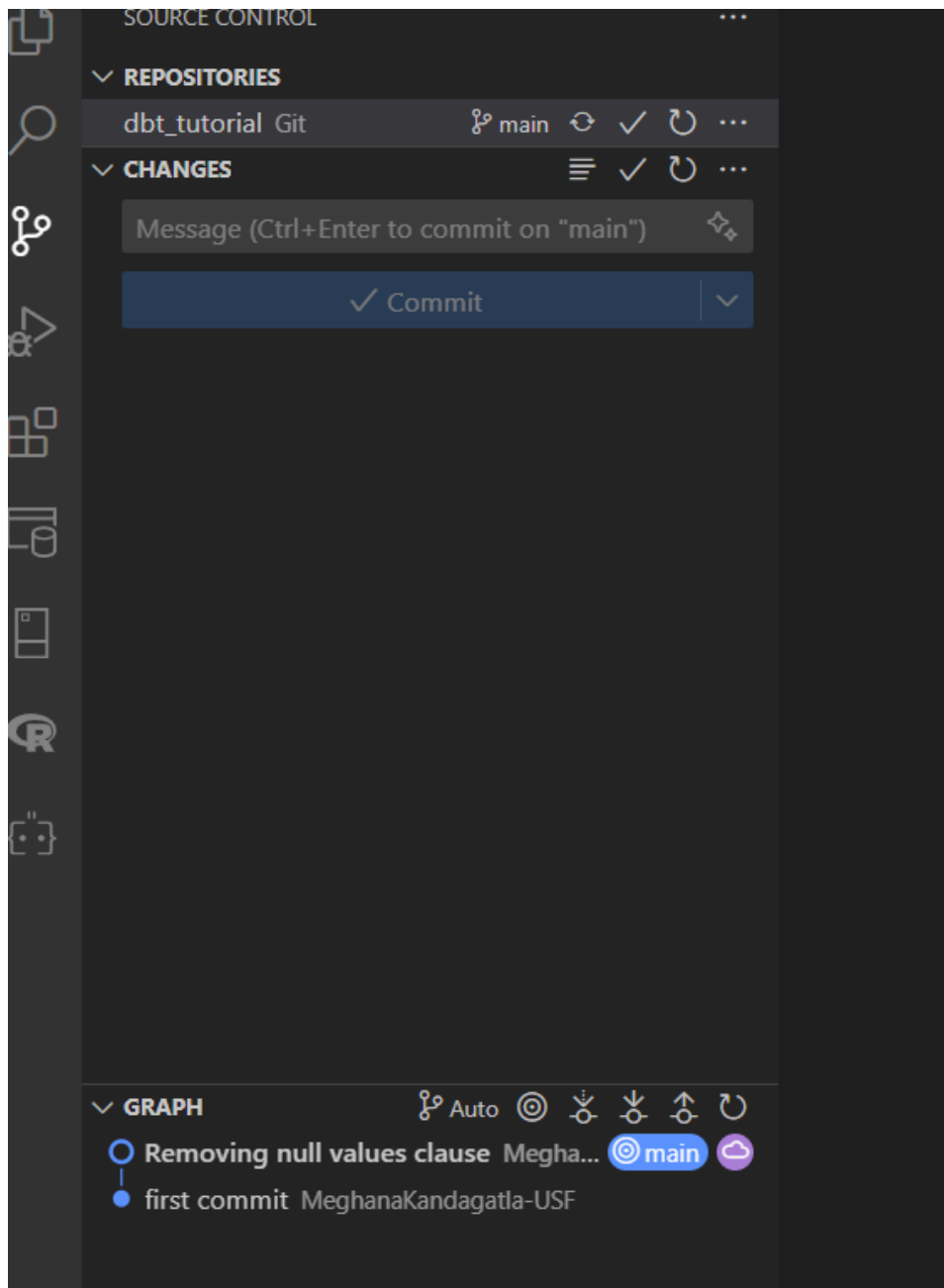
The screenshot shows the SQL Server Enterprise Manager interface. On the left, the 'Object Explorer' pane displays the database structure for 'THANKGOD\SQLEXPRESS (SQL Server 16.0.1000 - THANKGOD\megha)'. The 'Views' folder is expanded, showing 'dbo.employee_rankings' and 'dbo.my_second_dbt_model'. On the right, the 'SQLQuery3.sql' window shows a query that selects the top 1000 rows from the 'employee_rankings' view, displaying columns: employee_id, first_name, last_name, department, avg_rating, total_bonus, and performance_tier. Below the query, the 'Results' pane shows the output of the query, which is a table with 3 rows and 7 columns.

	employee_id	first_name	last_name	department	avg_rating	total_bonus	performance_tier
1	101	Aisha	Patel	Engineering	4	5500.00	Rank2
2	102	Liam	Johnson	Marketing	2	2500.00	Rank4
3	103	Mira	Lee	Engineering	4	5200.00	Rank2

Now testing the models using dbt run

```
C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>dbt test
05:58:43 Running with dbt=1.8.9
05:58:43 Registered adapter: sqlserver=1.8.7
05:58:44 Found 3 models, 7 data tests, 504 macros
05:58:44
05:58:44 Concurrency: 1 threads (target='dev')
05:58:44
05:58:44 1 of 7 START test accepted_values_employee_rankings_performance_tier__Rank1__Rank2__Rank3__Rank4 [RUN]
05:58:44 1 of 7 PASS accepted_values_employee_rankings_performance_tier__Rank1__Rank2__Rank3__Rank4 [PASS in 0.12s]
05:58:44 2 of 7 START test not_null_employee_rankings_employee_id ..... [RUN]
05:58:44 2 of 7 PASS not_null_employee_rankings_employee_id ..... [PASS in 0.04s]
05:58:44 3 of 7 START test not_null_my_first_dbt_model_id ..... [RUN]
05:58:44 3 of 7 FAIL 1 not_null_my_first_dbt_model_id ..... [FAIL 1 in 0.07s]
05:58:44 4 of 7 START test not_null_my_second_dbt_model_id ..... [RUN]
05:58:44 4 of 7 PASS not_null_my_second_dbt_model_id ..... [PASS in 0.03s]
05:58:45 5 of 7 START test unique_employee_rankings_employee_id ..... [RUN]
05:58:45 5 of 7 PASS unique_employee_rankings_employee_id ..... [PASS in 0.04s]
05:58:45 6 of 7 START test unique_my_first_dbt_model_id ..... [RUN]
05:58:45 6 of 7 PASS unique_my_first_dbt_model_id ..... [PASS in 0.04s]
05:58:45 7 of 7 START test unique_my_second_dbt_model_id ..... [RUN]
05:58:45 7 of 7 PASS unique_my_second_dbt_model_id ..... [PASS in 0.03s]
05:58:45
05:58:45 Finished running 7 data tests in 0 hours 0 minutes and 0.57 seconds (0.57s).
05:58:45
05:58:45 Completed with 1 error and 0 warnings:
05:58:45
05:58:45 Failure in test not_null_my_first_dbt_model_id (models\example\schema.yml)
05:58:45 Got 1 result, configured to fail if != 0
05:58:45
05:58:45   compiled code at target\compiled\dbt_tutorial\models\example\schema.yml\not_null_my_first_dbt_model_id.sql
05:58:45
05:58:45 Done. PASS=6 WARN=0 ERROR=1 SKIP=0 TOTAL=7
```

As in the my_second_dbt_model, we included null as well. It's throwing errors. Before correcting this error. I am creating a git repo.



Committed to the new change I removed the null values line from the second_model. Now running the models and again using the dbt run command.

```

C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>dbt test
06:08:48 Running with dbt=1.8.9
06:08:49 Registered adapter: sqlserver=1.8.7
06:08:50 Found 3 models, 7 data tests, 504 macros
06:08:50
06:08:50 Concurrency: 1 threads (target='dev')
06:08:50
06:08:50 1 of 7 START test accepted_values_employee_rankings_performance_tier__Rank1_Rank2_Rank3_Rank4 [RUN]
06:08:50 1 of 7 PASS accepted_values_employee_rankings_performance_tier__Rank1_Rank2_Rank3_Rank4 [PASS in 0.10s]
06:08:50 2 of 7 START test not_null_employee_rankings_employee_id ..... [RUN]
06:08:50 2 of 7 PASS not_null_employee_rankings_employee_id ..... [PASS in 0.04s]
06:08:50 3 of 7 START test not_null_my_first_dbt_model_id ..... [RUN]
06:08:50 3 of 7 PASS not_null_my_first_dbt_model_id ..... [PASS in 0.02s]
06:08:50 4 of 7 START test not_null_my_second_dbt_model_id ..... [RUN]
06:08:50 4 of 7 PASS not_null_my_second_dbt_model_id ..... [PASS in 0.03s]
06:08:50 5 of 7 START test unique_employee_rankings_employee_id ..... [RUN]
06:08:50 5 of 7 PASS unique_employee_rankings_employee_id ..... [PASS in 0.04s]
06:08:50 6 of 7 START test unique_my_first_dbt_model_id ..... [RUN]
06:08:50 6 of 7 PASS unique_my_first_dbt_model_id ..... [PASS in 0.04s]
06:08:50 7 of 7 START test unique_my_second_dbt_model_id ..... [RUN]
06:08:50 7 of 7 PASS unique_my_second_dbt_model_id ..... [PASS in 0.03s]
06:08:50
06:08:50 Finished running 7 data tests in 0 hours 0 minutes and 0.44 seconds (0.44s).
06:08:50
06:08:50 Completed successfully
06:08:50
06:08:50 Done. PASS=7 WARN=0 ERROR=0 SKIP=0 TOTAL=7
C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>

```

Step 4: Generating the documents

Using dbt commands we can create.

dbt docs generate

dbt docs serve

```

C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>dbt docs generate
06:17:11 Running with dbt=1.8.9
06:17:12 Registered adapter: sqlserver=1.8.7
06:17:12 Found 3 models, 7 data tests, 504 macros
06:17:12
06:17:12 Concurrency: 1 threads (target='dev')
06:17:12
06:17:12 Building catalog
06:17:12 Catalog written to C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial\target\catalog.json

C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>dbt docs serve
06:17:30 Running with dbt=1.8.9
Serving docs at 8080
To access from your browser, navigate to: http://localhost:8080

Press Ctrl+C to exit.
127.0.0.1 - - [18/May/2025 02:17:31] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [18/May/2025 02:17:32] "GET /manifest.json?cb=1747549052393 HTTP/1.1" 200 -
127.0.0.1 - - [18/May/2025 02:17:32] "GET /catalog.json?cb=1747549052393 HTTP/1.1" 200 -

```

see all of the models that are used to build, or are built from, the model you're exploring.

This generated me

The screenshot shows the dbt interface for the 'employee_rankings' view. The left sidebar displays the 'Overview' section with a tree view of the database structure, including 'hr_analytics', 'dbo', and 'employee_rankings'. The main panel shows the 'employee_rankings' view details, including a table of columns (total_bonus, performance_tier) and their data types (decimal, varchar). Below this, the 'Referenced By' section lists data tests: 'not_null_employee_rankings_employee_id', 'unique_employee_rankings_employee_id', and 'accepted_values_employee_rankings_performance_tier__Rank1__Rank2__Rank3__Rank4'. The 'Code' section shows the SQL code for the view, which includes a 'WITH' clause for 'review_summary' and a 'SELECT' statement with columns 'employee_id', 'avg_rating', and 'total_bonus'.

Here I can navigate through the database and the tables. All the data tests can be reused again using the commands in the terminal.

Step 5: Creating a custom test

how dbt tests are designed to work:

- Tests pass when they return zero rows (no violations found)
- Tests fail when they return one or more rows (violations found)

I am creating a custom test that checks if the department is engineering or not and also if avg_rating < 3.5 or not. If such rows are found then test is failed or else test is passed

The screenshot shows a terminal window with the following SQL code for a custom test:

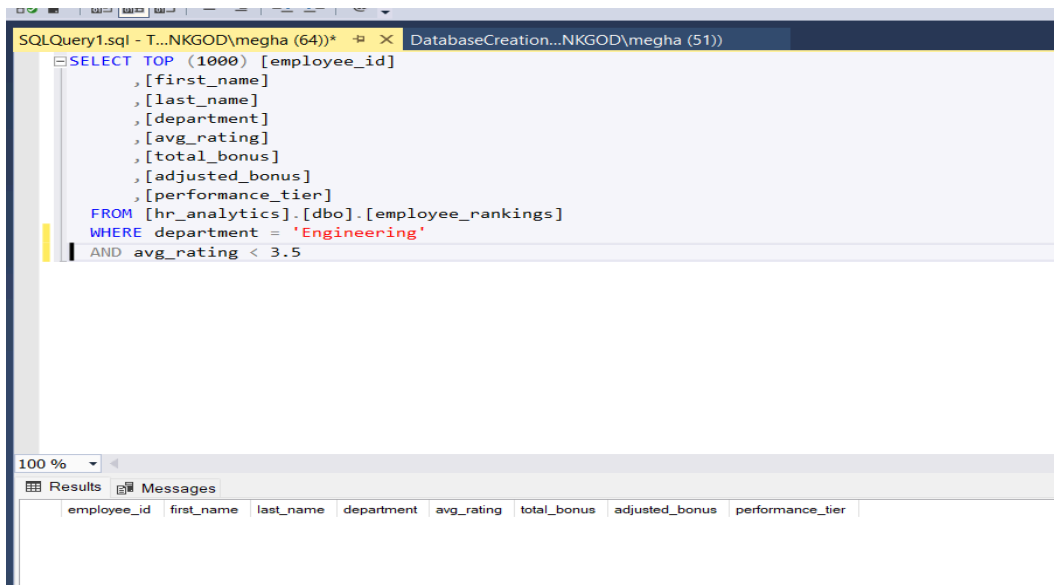
```
tests > engineering_rating_check.sql
1 SELECT *
2 FROM {{ ref('employee_rankings') }}
3 WHERE department = 'Engineering' AND avg_rating < 3.5
4
```

```

PS C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial> dbt test
15:21:23 Running with dbt=1.8.9
15:21:23 Registered adapter: sqlserver=1.8.7
15:21:24 Found 3 models, 9 data tests, 506 macros
15:21:24 Concurrency: 1 threads (target='dev')
15:21:24
15:21:24 1 of 9 START test accepted_values_employee_rankings_performance_tier_Rank1_Rank2_Rank3_Rank4 [RUN]
15:21:24 1 of 9 PASS accepted_values_employee_rankings_performance_tier_Rank1_Rank2_Rank3_Rank4 [PASS in 0.08s]
15:21:24 2 of 9 START test engineering_rating_check ..... [RUN]
15:21:24 2 of 9 PASS engineering_rating_check ..... [PASS in 0.02s]
15:21:24 3 of 9 START test engineering_rating_check_macro_employee_rankings_ ..... [RUN]
15:21:24 3 of 9 PASS engineering_rating_check_macro_employee_rankings_ ..... [PASS in 0.06s]
15:21:24 4 of 9 START test not_null_employee_rankings_employee_id ..... [RUN]
15:21:24 4 of 9 PASS not_null_employee_rankings_employee_id ..... [PASS in 0.02s]
15:21:24 5 of 9 START test not_null_my_first_dbt_model_id ..... [RUN]
15:21:24 5 of 9 PASS not_null_my_first_dbt_model_id ..... [PASS in 0.02s]
15:21:24 6 of 9 START test not_null_my_second_dbt_model_id ..... [RUN]
15:21:24 6 of 9 PASS not_null_my_second_dbt_model_id ..... [PASS in 0.02s]
15:21:24 7 of 9 START test unique_employee_rankings_employee_id ..... [RUN]
15:21:24 7 of 9 PASS unique_employee_rankings_employee_id ..... [PASS in 0.03s]
15:21:24 8 of 9 START test unique_my_first_dbt_model_id ..... [RUN]
15:21:24 8 of 9 PASS unique_my_first_dbt_model_id ..... [PASS in 0.03s]
15:21:24 9 of 9 START test unique_my_second_dbt_model_id ..... [RUN]
15:21:24 9 of 9 PASS unique_my_second_dbt_model_id ..... [PASS in 0.03s]
15:21:24
15:21:24 Finished running 9 data tests in 0 hours 0 minutes and 0.41 seconds (0.41s).
15:21:24
15:21:24 Completed successfully
15:21:24
15:21:24 Done. PASS=9 WARN=0 ERROR=0 SKIP=0 TOTAL=9
PS C:\Users\megha\Documents\ResearchWork\DBTProjects\Tutorial\dbt_tutorial>

```

Test is passed because no such rows are found. We can see the same from the ssms as well.



The screenshot shows a SQL query window in SQL Server Enterprise Manager. The query is a SELECT statement with a TOP clause, filtering for employees in the 'Engineering' department with an average rating less than 3.5. The results pane below the query shows an empty table with the following columns: employee_id, first_name, last_name, department, avg_rating, total_bonus, adjusted_bonus, and performance_tier.

```

SELECT TOP (1000) [employee_id]
, [first_name]
, [last_name]
, [department]
, [avg_rating]
, [total_bonus]
, [adjusted_bonus]
, [performance_tier]
FROM [hr_analytics].[dbo].[employee_rankings]
WHERE department = 'Engineering'
AND avg_rating < 3.5

```

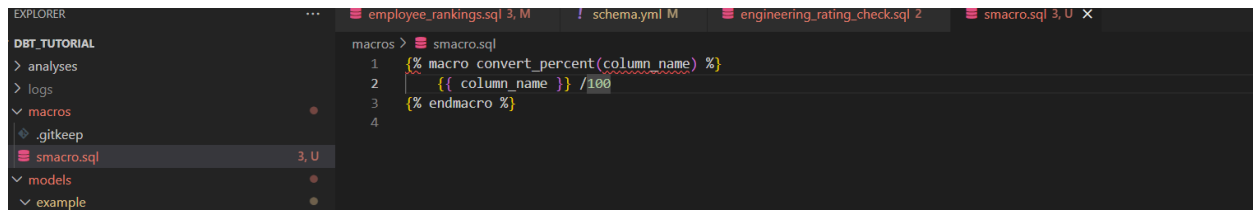
employee_id	first_name	last_name	department	avg_rating	total_bonus	adjusted_bonus	performance_tier
-------------	------------	-----------	------------	------------	-------------	----------------	------------------

As this file is in the tests folder, it automatically performs this test. If a test has to be included in the schema it has to be defined as a macro.

Step 6: Macros

Macro is a reusable block of logic.

Here I am adding a simple macro that converts into percent to the given column.

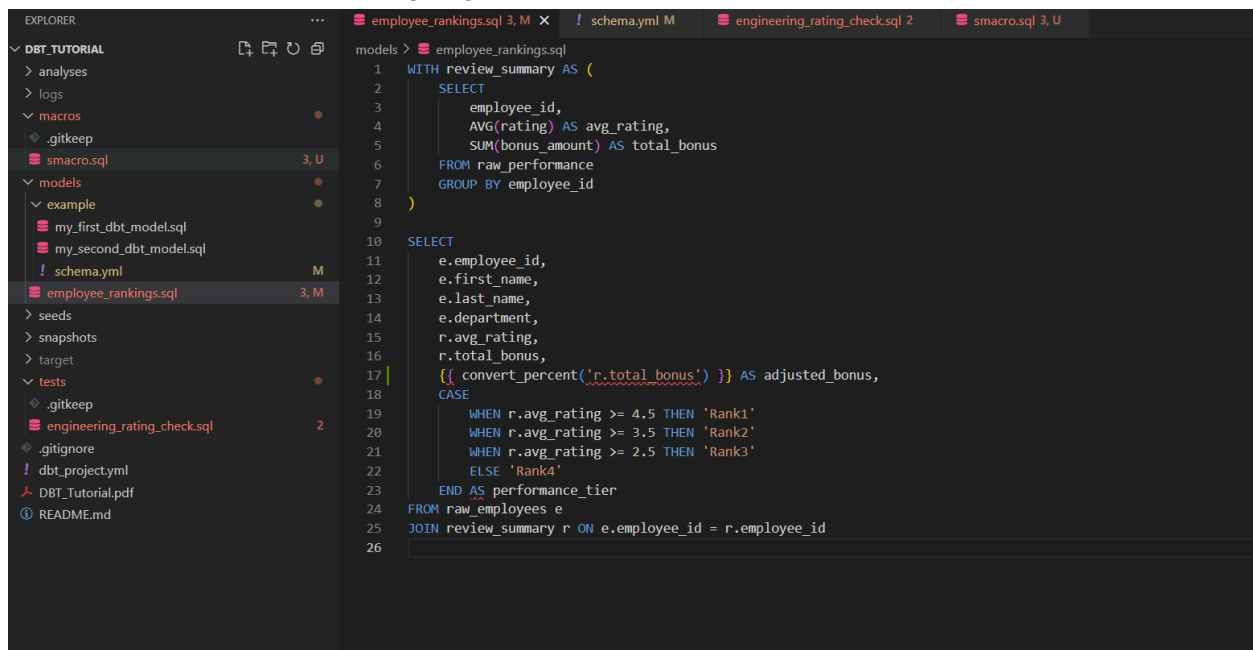


The screenshot shows a code editor with a sidebar on the left displaying a file explorer for a project named 'DBT_TUTORIAL'. The sidebar shows folders for 'analyses', 'logs', 'macros', and 'models'. The 'macros' folder is expanded, showing a file named 'smacro.sql'. The main editor area shows the content of 'smacro.sql', which contains a macro definition for 'convert_percent'.

```
1 {% macro convert_percent(column_name) %}  
2   {{ column_name }} /100  
3 {% endmacro %}  
4
```

As we can see all of these macros are kept in macros folder

Now let's look into how we are going to use this macro in the models.



The screenshot shows a code editor with a sidebar on the left displaying a file explorer for a project named 'DBT_TUTORIAL'. The sidebar shows folders for 'analyses', 'logs', 'macros', and 'models'. The 'models' folder is expanded, showing a file named 'employee_rankings.sql'. The main editor area shows the content of 'employee_rankings.sql', which contains a SQL query that uses the 'convert_percent' macro.

```
1 WITH review_summary AS (  
2   SELECT  
3     employee_id,  
4     AVG(rating) AS avg_rating,  
5     SUM(bonus_amount) AS total_bonus  
6   FROM raw_performance  
7   GROUP BY employee_id  
8 )  
9  
10 SELECT  
11   e.employee_id,  
12   e.first_name,  
13   e.last_name,  
14   e.department,  
15   r.avg_rating,  
16   r.total_bonus,  
17   (( convert_percent('r.total_bonus') )) AS adjusted_bonus,  
18   CASE  
19     WHEN r.avg_rating >= 4.5 THEN 'Rank1'  
20     WHEN r.avg_rating >= 3.5 THEN 'Rank2'  
21     WHEN r.avg_rating >= 2.5 THEN 'Rank3'  
22     ELSE 'Rank4'  
23   END AS performance_tier  
24 FROM raw_employees e  
25 JOIN review_summary r ON e.employee_id = r.employee_id  
26
```

Here we can see that we have replaced the column name as r.total_bonus in the macro and saved it as adjusted_bonus

SQLQuery1.sql - T...NKGOD\megha (58)

```

SELECT TOP (1000) [employee_id]
, [first_name]
, [last_name]
, [department]
, [avg_rating]
, [total_bonus]
, [adjusted_bonus]
, [performance_tier]
FROM [hr_analytics].[dbo].[employee_rankings]

```

100 %

Results Messages

	employee_id	first_name	last_name	department	avg_rating	total_bonus	adjusted_bonus	performance_tier
1	101	Aisha	Patel	Engineering	4	5500.00	55.000000	Rank2
2	102	Liam	Johnson	Marketing	2	2500.00	25.000000	Rank4
3	103	Mira	Lee	Engineering	4	5200.00	52.000000	Rank2

Here we can see that adjusted_bonus is created.

Step 7 : Macros for Tests

EXPLORER

DBT_TUTORIAL

- analyses
- logs
- macros
 - .gitkeep
 - smacro.sql 3
 - test_engineering_rating_check.sql 5, U
- models

macros > test_engineering_rating_check.sql

```

1  {% test engineering_rating_check_macro(model) %}
2  SELECT *
3  FROM {{ model }}
4  WHERE department = 'Engineering' AND avg_rating < 3.5
5  {% endtest %}

```

We can define tests like this in the macros folder and then use in the schema.yml file.

```
... employee_rankings.sql 3 ! schema.yml M X test_engineering_rating_check.sql 5, U
models > example > ! schema.yml
3 models:
13 - name: my_second_dbt_model
21
22 - name: employee_rankings
23 description: "Aggregates employee performance and categorizes them
24 columns:
25 - name: employee_id
26 description: "Unique employee ID"
27 tests:
28 - not_null
29 - unique
30
31 - name: avg_rating
32 description: "Average of all yearly performance ratings"
33
34 - name: performance_tier
35 description: "Performance category based on average rating"
36 tests:
37 - accepted_values:
38 values: ['Rank1', 'Rank2', 'Rank3', 'Rank4']
39
40 data_tests:
41 - engineering_rating_check_macro: {}
```

```
15:21:23 Registered adapter: sqlserver=1.8.7
15:21:24 Found 3 models, 9 data tests, 506 macros
15:21:24
15:21:24 Concurrency: 1 threads (target='dev')
15:21:24
15:21:24 1 of 9 START test accepted_values_employee_rankings_performance_tier_Rank1_Rank2_Rank3_Rank4 [RUN]
15:21:24 1 of 9 PASS accepted_values_employee_rankings_performance_tier_Rank1_Rank2_Rank3_Rank4 [PASS in 0.08s]
15:21:24 2 of 9 START test engineering_rating_check ..... [RUN]
15:21:24 2 of 9 PASS engineering_rating_check ..... [PASS in 0.02s]
15:21:24 3 of 9 START test engineering_rating_check_macro_employee_rankings_ ..... [RUN]
15:21:24 3 of 9 PASS engineering_rating_check_macro_employee_rankings_ ..... [PASS in 0.06s]
15:21:24 4 of 9 START test not_null_employee_rankings_employee_id ..... [RUN]
15:21:24 4 of 9 PASS not_null_employee_rankings_employee_id ..... [PASS in 0.02s]
15:21:24 5 of 9 START test not_null_my_first_dbt_model_id ..... [RUN]
15:21:24 5 of 9 PASS not_null_my_first_dbt_model_id ..... [PASS in 0.02s]
15:21:24 6 of 9 START test not_null_my_second_dbt_model_id ..... [RUN]
15:21:24 2 of 9 PASS engineering_rating_check ..... [PASS in 0.02s]
15:21:24 3 of 9 START test engineering_rating_check_macro_employee_rankings_ ..... [RUN]
15:21:24 3 of 9 PASS engineering_rating_check_macro_employee_rankings_ ..... [PASS in 0.06s]
15:21:24 4 of 9 START test not_null_employee_rankings_employee_id ..... [RUN]
15:21:24 4 of 9 PASS not_null_employee_rankings_employee_id ..... [PASS in 0.02s]
15:21:24 5 of 9 START test not_null_my_first_dbt_model_id ..... [RUN]
15:21:24 5 of 9 PASS not_null_my_first_dbt_model_id ..... [PASS in 0.02s]
15:21:24 6 of 9 START test not_null_my_second_dbt_model_id ..... [RUN]
```

We can see the same test performing well as a macro and the normal test from the tests folder.