Testing of Ml_models:Backend

1.recommender_models

```
12 passed in 0.46s
(.venv) jeelthummar@Jeels-MacBook-Air NewsXpress % pytest --cov=backend --cov-report=term-missing -q

............                            [100%]
==================== tests coverage ====================
____ coverage: platform darwin, python 3.13.5-final-0 ____

Name                                              Stmts   Miss  Cover   Missing
--------------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py              165     31    81%   54, 72, 95, 98-99, 131-133, 149, 152-153, 170-171, 207-211, 230, 261, 299-303, 320-330
backend/Ml_model/Retrain_scheduler.py                83     83     0%   5-141
backend/Ml_model/Train_modules.py                   186    186     0%   5-375
backend/Ml_model/__init__.py                          0      0   100%
backend/Ml_model/api_server.py                      136    136     0%   5-326
backend/Ml_model/cache_manager.py                   118    118     0%   5-203
backend/__init__.py                                   0      0   100%
backend/__tests__/test_recommender_models.py        122      0   100%
backend/__tests__/test_setup.py                       2      0   100%
--------------------------------------------------------------------------------
TOTAL                                               812    554    32%
12 passed in 0.46s
(.venv) jeelthummar@Jeels-MacBook-Air NewsXpress %
```

Initially coverage is 84%.

```
 (.venv) jeelthummar@Jeels-MacBook-Air NewsXpress % pytest --cov=backend --cov-report=term-missing -q

.............................            [100%]
==================== tests coverage ====================
____ coverage: platform darwin, python 3.13.5-final-0 ____

Name                                              Stmts   Miss  Cover   Missing
--------------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py              165     17    90%   149, 152-153, 207-211, 230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py                83     83     0%   5-141
backend/Ml_model/Train_modules.py                   186    186     0%   5-375
backend/Ml_model/__init__.py                          0      0   100%
backend/Ml_model/api_server.py                      136    136     0%   5-326
backend/Ml_model/cache_manager.py                   118    118     0%   5-203
backend/__init__.py                                   0      0   100%
backend/__tests__/test_recommender_models.py        277      0   100%
backend/__tests__/test_setup.py                       2      0   100%
--------------------------------------------------------------------------------
TOTAL                                               967    540    44%
```

After adding some more test cases coverage increases to 90%.

```
(.venv) jeelthummar@Jeels-MacBook-Air NewsXpress % pytest --cov=backend --cov-report=term-missing -q
.............................                          [100%]
=================== tests coverage ====================
____ coverage: platform darwin, python 3.13.5-final-0 ____

Name                                        Stmts   Miss  Cover   Missing
----------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py        165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py          83     83     0%   5-141
backend/Ml_model/Train_modules.py             186    186     0%   5-375
backend/Ml_model/__init__.py                    0      0   100%
backend/Ml_model/api_server.py                136    136     0%   5-326
backend/Ml_model/cache_manager.py             118    118     0%   5-203
backend/__init__.py                             0      0   100%
backend/__tests__/test_recommender_models.py  297      0   100%
backend/__tests__/test_setup.py                 2      0   100%
----------------------------------------------------------------------
TOTAL                                         987    532    46%
```

After adding 2 more important test cases coverage is at 95%.

Line 321-331 is the main code block. Unit tests are not necessary.

2.cache_manager.py

```
Name                                        Stmts   Miss  Cover   Missing
----------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py        165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py          83     83     0%   5-141
backend/Ml_model/Train_modules.py             186    186     0%   5-375
backend/Ml_model/__init__.py                    0      0   100%
backend/Ml_model/api_server.py                136    136     0%   5-326
backend/Ml_model/cache_manager.py             118     12    90%   185-203
backend/__init__.py                             0      0   100%
backend/__tests__/test_cache_manager.py       164      0   100%
backend/__tests__/test_recommender_models.py  297      0   100%
backend/__tests__/test_setup.py                 2      0   100%
----------------------------------------------------------------------
TOTAL                                        1151    426    63%
=================== 54 passed in 0.71s ====================
(.venv) jeelthummar@Jeels-MacBook-Air NewsXpress % 
```

Line 185-203 is the main code block. Unit tests are not necessary. Coverage is 90%.

3.api_server.py

There were some errors in the code. told the developer about issues.

1.Routes not registered

- `create_app()` creates an app with zero routes because `register_routes()` is empty.

2.Routes bound to global app

- All routes are attached to the module-level `app`, not the factory app, causing 404 errors in tests.

3.Hybrid endpoint incorrectly uses GET with JSON

- GET requests never contain JSON, so hybrid logic always receives empty data.

4.Path.exists() cannot be monkeypatched

- `/api/models/info` uses `metadata_path.exists()`, which is a read-only method → teardown errors.

After fixing the problems in code i ran test cases and no error occurred. And got coverage of 76% initially.

```
_____ coverage: platform darwin, python 3.13.5-final-0 _____
Name                                       Stmts   Miss  Cover   Missing
---------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py       165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py         83     83     0%   5-141
backend/Ml_model/Train_modules.py            186    186     0%   5-375
backend/Ml_model/__init__.py                   0      0   100%
backend/Ml_model/api_server.py               144     35    76%   34-36, 85-86, 137-138, 200, 257-259, 275-277, 297-302, 309-311, 322-336
backend/Ml_model/cache_manager.py            118     12    90%   185-203
backend/Ml_model/quickstart.py                52     52     0%   4-75
backend/__init__.py                            0      0   100%
backend/__tests__/test_api_server.py          97      0   100%
backend/__tests__/test_cache_manager.py      164      0   100%
backend/__tests__/test_recommender_models.py 297      0   100%
backend/__tests__/test_setup.py                2      0   100%
---------------------------------------------------------------------------
TOTAL                                       1308    377    71%
Coverage HTML written to dir htmlcov
======================================================= 68 passed in 1.02s =======================================================
(.venv) jeelthummar@Jeels-MacBook-Air NewsXpress % █
```

After adding some more test cases I got coverage of 91%. Lines 322-336 is the main block code which we don't unit test.

```
---------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py       165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py         83     83     0%   5-141
backend/Ml_model/Train_modules.py            186    186     0%   5-375
backend/Ml_model/__init__.py                   0      0   100%
backend/Ml_model/api_server.py               144     13    91%   200, 322-336
backend/Ml_model/cache_manager.py            118     12    90%   185-203
backend/Ml_model/quickstart.py                52     52     0%   4-75
backend/__init__.py                            0      0   100%
backend/__tests__/test_api_server.py         181      0   100%
backend/__tests__/test_cache_manager.py      164      0   100%
backend/__tests__/test_recommender_models.py 297      0   100%
backend/__tests__/test_setup.py                2      0   100%
---------------------------------------------------------------------------
TOTAL                                       1392    355    74%
Coverage HTML written to dir htmlcov
======================================================= 77 passed in 0.72s =======================================================
(.venv) jeelthummar@Jeels-MacBook-Air NewsXpress % ▯
```

4.Quickstart

```
_____ coverage: platform darwin, python 3.13.5-final-0 _____
Name                                       Stmts   Miss  Cover   Missing
---------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py       165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py         83     83     0%   5-141
backend/Ml_model/Train_modules.py            186    186     0%   5-375
backend/Ml_model/__init__.py                   0      0   100%
backend/Ml_model/api_server.py               144     13    91%   200, 322-336
backend/Ml_model/cache_manager.py            118     12    90%   185-203
backend/Ml_model/quickstart.py                52      7    87%   37-38, 55-56, 59-60, 75
backend/__init__.py                            0      0   100%
backend/__tests__/test_api_server.py         181      0   100%
backend/__tests__/test_cache_manager.py      164      0   100%
backend/__tests__/test_quickstart.py          53      1    98%   80
backend/__tests__/test_recommender_models.py 297      0   100%
backend/__tests__/test_setup.py                2      0   100%
---------------------------------------------------------------------------
TOTAL                                       1445    311    78%
======================================================= 82 passed in 0.64s =======================================================
(.venv) jeelthummar@Jeels-MacBook-Air NewsXpress % pytest --cov=. --cov-report=term-missing
```

Coverage was 87% percent before.

```
_____ tests coverage _____
_____ coverage: platform darwin, python 3.13.5-final-0 _____

Name                                            Stmts   Miss  Cover   Missing
-----------------------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py           165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py             83     83     0%   5-141
backend/Ml_model/Train_modules.py                186    186     0%   5-375
backend/Ml_model/__init__.py                       0      0   100%
backend/Ml_model/api_server.py                   144     13    91%   200, 322-336
backend/Ml_model/cache_manager.py                118     12    90%   185-203
backend/Ml_model/quickstart.py                    52      3    94%   37-38, 75
backend/__init__.py                                0      0   100%
backend/__tests__/test_api_server.py             181      0   100%
backend/__tests__/test_cache_manager.py          164      0   100%
backend/__tests__/test_quickstart.py              82      2    98%   110, 156
backend/__tests__/test_recommender_models.py     297      0   100%
backend/__tests__/test_setup.py                    2      0   100%
-----------------------------------------------------------------------------------------
TOTAL                                           1474    308    79%
================================================ 84 passed in 0.69s ==========================
(.venv) jeelthummar@jeels-MacBook-Air NewsXpress %
```

After adding test cases we got 94% of coverage.

5.Retrain_schedular

```
_____ coverage: platform darwin, python 3.13.5-final-0 _____

Name                                            Stmts   Miss  Cover   Missing
-----------------------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py           165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py             83     17    80%   92-100, 116-119, 122-125, 142
backend/Ml_model/Train_modules.py                186    150    19%   46-98, 102-123, 127-188, 192-321, 325-335, 339-364, 369-371, 375
backend/Ml_model/__init__.py                       0      0   100%
backend/Ml_model/api_server.py                   144     13    91%   200, 322-336
backend/Ml_model/cache_manager.py                118     12    90%   185-203
backend/Ml_model/quickstart.py                    52      3    94%   37-38, 75
backend/__init__.py                                0      0   100%
backend/__tests__/test_Retrain_scheduler.py      110      0   100%
backend/__tests__/test_api_server.py             181      0   100%
backend/__tests__/test_cache_manager.py          164      0   100%
backend/__tests__/test_quickstart.py              82      2    98%   96, 142
backend/__tests__/test_recommender_models.py     297      0   100%
backend/__tests__/test_setup.py                    2      0   100%
```

initially coverage was 80%.

```
================================================ tests coverage ==============================
_____ coverage: platform darwin, python 3.13.5-final-0 _____

Name                                            Stmts   Miss  Cover   Missing
-----------------------------------------------------------------------------------------
backend/Ml_model/Recommender_Models.py           165      9    95%   230, 261, 321-331
backend/Ml_model/Retrain_scheduler.py             83      1    99%   142
backend/Ml_model/Train_modules.py                186    150    19%   46-98, 102-123, 127-188, 192-321, 325-335, 339-364, 369-371, 375
backend/Ml_model/__init__.py                       0      0   100%
backend/Ml_model/api_server.py                   144     13    91%   200, 322-336
backend/Ml_model/cache_manager.py                118     12    90%   185-203
backend/Ml_model/quickstart.py                    52      3    94%   37-38, 75
backend/__init__.py                                0      0   100%
backend/__tests__/test_Retrain_scheduler.py      143      0   100%
backend/__tests__/test_api_server.py             181      0   100%
backend/__tests__/test_cache_manager.py          164      0   100%
backend/__tests__/test_quickstart.py              82      2    98%   96, 142
backend/__tests__/test_recommender_models.py     297      0   100%
backend/__tests__/test_setup.py                    2      0   100%
-----------------------------------------------------------------------------------------
TOTAL                                           1617    190    88%
================================================ 97 passed in 1.32s ==========================
```

After adding some test cases we got 99% of the coverage.