

# edge\_gwas\_test\_run\_essential

December 26, 2025

```
[1]: # Cell 1: Clear cache and reinstall from main branch
!pip cache purge
!pip install --no-cache-dir git+https://github.com/nicenzhou/edge-gwas.git@main
```

WARNING: No matching packages

```
Files removed: 0
Collecting git+https://github.com/nicenzhou/edge-gwas.git@main
  Cloning https://github.com/nicenzhou/edge-gwas.git (to revision main) to
/private/var/folders/x/_6k45gs0x2110rxc3kvrlly80000gn/T/pip-req-build-1oij1v_j
    Running command git clone --filter=blob:none --quiet
https://github.com/nicenzhou/edge-gwas.git
/private/var/folders/x/_6k45gs0x2110rxc3kvrlly80000gn/T/pip-req-build-1oij1v_j
  Resolved https://github.com/nicenzhou/edge-gwas.git to commit
f7f4f1c5a16fba6c26dac101425aa0eaf00bcc1f
  Preparing metadata (setup.py) ... done
Requirement already satisfied: numpy<2.0.0,>=1.19.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(1.24.3)
Requirement already satisfied: pandas<3.0.0,>=1.2.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(2.3.3)
Requirement already satisfied: scipy<2.0.0,>=1.6.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(1.10.0)
Requirement already satisfied: statsmodels<1.0.0,>=0.12.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(0.13.5)
Requirement already satisfied: scikit-learn<2.0.0,>=0.24.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(1.2.1)
Requirement already satisfied: matplotlib<4.0.0,>=3.3.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(3.7.0)
Requirement already satisfied: pandas-plink<3.0.0,>=2.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(2.3.2)
Requirement already satisfied: sphinx<7.0.0,>=4.0.0 in
```

```
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(5.0.2)
Requirement already satisfied: sphinx-rtd-theme<2.0.0,>=1.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(1.3.0)
Requirement already satisfied: sphinxcontrib-napoleon>=0.7 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(0.7)
Requirement already satisfied: numpydoc>=1.1.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(1.5.0)
Requirement already satisfied: pytest<8.0.0,>=6.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(7.1.2)
Requirement already satisfied: pytest-cov<5.0.0,>=2.10.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(4.1.0)
Requirement already satisfied: black<24.0,>=21.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(22.6.0)
Requirement already satisfied: flake8<7.0.0,>=3.8.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(6.0.0)
Requirement already satisfied: mypy<2.0.0,>=0.900 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(1.19.1)
Requirement already satisfied: isort<6.0.0,>=5.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from edge-gwas==0.1.1)
(5.9.3)
Requirement already satisfied: pathspec>=0.9.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
black<24.0,>=21.0->edge-gwas==0.1.1) (0.10.3)
Requirement already satisfied: mypy-extensions>=0.4.3 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
black<24.0,>=21.0->edge-gwas==0.1.1) (1.1.0)
Requirement already satisfied: platformdirs>=2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
black<24.0,>=21.0->edge-gwas==0.1.1) (2.5.2)
Requirement already satisfied: tomli>=1.1.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
black<24.0,>=21.0->edge-gwas==0.1.1) (2.0.1)
Requirement already satisfied: click>=8.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
black<24.0,>=21.0->edge-gwas==0.1.1) (8.0.4)
Requirement already satisfied: pyflakes<3.1.0,>=3.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
flake8<7.0.0,>=3.8.0->edge-gwas==0.1.1) (3.0.1)
Requirement already satisfied: mccabe<0.8.0,>=0.7.0 in
```

```
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
flake8<7.0.0,>=3.8.0->edge-gwas==0.1.1) (0.7.0)
Requirement already satisfied: pycodestyle<2.11.0,>=2.10.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
flake8<7.0.0,>=3.8.0->edge-gwas==0.1.1) (2.10.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (1.4.4)
Requirement already satisfied: python-dateutil>=2.7 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (2.8.2)
Requirement already satisfied: pillow>=6.2.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (9.4.0)
Requirement already satisfied: packaging>=20.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (22.0)
Requirement already satisfied: contourpy>=1.0.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (1.0.5)
Requirement already satisfied: fonttools>=4.22.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (4.25.0)
Requirement already satisfied: pyparsing>=2.3.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (3.0.9)
Requirement already satisfied: cycler>=0.10 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
matplotlib<4.0.0,>=3.3.0->edge-gwas==0.1.1) (0.11.0)
Requirement already satisfied: librt>=0.6.2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
mypy<2.0.0,>=0.900->edge-gwas==0.1.1) (0.7.5)
Requirement already satisfied: typing_extensions>=4.6.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
mypy<2.0.0,>=0.900->edge-gwas==0.1.1) (4.15.0)
Requirement already satisfied: Jinja2>=2.10 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from numpydoc>=1.1.0->edge-
gwas==0.1.1) (3.1.2)
Requirement already satisfied: tzdata>=2022.7 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandas<3.0.0,>=1.2.0->edge-gwas==0.1.1) (2025.3)
Requirement already satisfied: pytz>=2020.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandas<3.0.0,>=1.2.0->edge-gwas==0.1.1) (2022.7)
Requirement already satisfied: cffi>=1.17 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2.0.0)
Requirement already satisfied: tqdm<5.0,>=4.67 in
```

```
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (4.67.1)
Requirement already satisfied: xarray in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2022.11.0)
Requirement already satisfied: zstandard<0.24,>=0.23 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (0.23.0)
Requirement already satisfied: pandera[dask,mypy] in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (0.27.1)
Requirement already satisfied: dask[dataframe] in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2022.7.0)
Requirement already satisfied: deprecated<2.0,>=1.2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (1.3.1)
Requirement already satisfied: attrs>=19.2.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pytest<8.0.0,>=6.0.0->edge-gwas==0.1.1) (22.1.0)
Requirement already satisfied: configparser in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pytest<8.0.0,>=6.0.0->edge-gwas==0.1.1) (1.1.1)
Requirement already satisfied: pluggy<2.0,>=0.12 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pytest<8.0.0,>=6.0.0->edge-gwas==0.1.1) (1.0.0)
Requirement already satisfied: py>=1.8.2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pytest<8.0.0,>=6.0.0->edge-gwas==0.1.1) (1.11.0)
Requirement already satisfied: coverage[toml]>=5.2.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pytest-
cov<5.0.0,>=2.10.0->edge-gwas==0.1.1) (7.13.0)
Requirement already satisfied: threadpoolctl>=2.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from scikit-
learn<2.0.0,>=0.24.0->edge-gwas==0.1.1) (2.2.0)
Requirement already satisfied: joblib>=1.1.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from scikit-
learn<2.0.0,>=0.24.0->edge-gwas==0.1.1) (1.1.1)
Requirement already satisfied: sphinxcontrib-htmlhelp>=2.0.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (2.0.0)
Requirement already satisfied: sphinxcontrib-jsmath in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (1.0.1)
Requirement already satisfied: imagesize in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (1.4.1)
Requirement already satisfied: snowballstemmer>=1.1 in
```

```
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (2.2.0)
Requirement already satisfied: docutils<0.19,>=0.14 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (0.18.1)
Requirement already satisfied: requests>=2.5.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (2.28.1)
Requirement already satisfied: babel>=1.3 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (2.11.0)
Requirement already satisfied: sphinxcontrib-devhelp in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (1.0.2)
Requirement already satisfied: alabaster<0.8,>=0.7 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (0.7.12)
Requirement already satisfied: sphinxcontrib-qthelp in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (1.0.3)
Requirement already satisfied: Pygments>=2.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (2.18.0)
Requirement already satisfied: sphinxcontrib-serializinghtml>=1.1.5 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (1.1.5)
Requirement already satisfied: sphinxcontrib-applehelp in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (1.0.2)
Requirement already satisfied: sphinxcontrib-jquery<5,>=4 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from sphinx-rtd-
theme<2.0.0,>=1.0.0->edge-gwas==0.1.1) (4.1)
Requirement already satisfied: pockets>=0.3 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from sphinxcontrib-
napoleon>=0.7->edge-gwas==0.1.1) (0.9.1)
Requirement already satisfied: six>=1.5.2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from sphinxcontrib-
napoleon>=0.7->edge-gwas==0.1.1) (1.16.0)
Requirement already satisfied: patsy>=0.5.2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
statsmodels<1.0.0,>=0.12.0->edge-gwas==0.1.1) (0.5.3)
Requirement already satisfied: pycparser in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from cffi>=1.17->pandas-
plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2.21)
Requirement already satisfied: wrapt<3,>=1.10 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
deprecated<2.0,>=1.2->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (1.14.1)
Requirement already satisfied: MarkupSafe>=2.0 in
```

```
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
Jinja2>=2.10->numpydoc>=1.1.0->edge-gwas==0.1.1) (2.1.1)
Requirement already satisfied: idna<4,>=2.5 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
requests>=2.5.0->sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (3.4)
Requirement already satisfied: certifi>=2017.4.17 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
requests>=2.5.0->sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (2024.2.2)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
requests>=2.5.0->sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (1.26.14)
Requirement already satisfied: charset-normalizer<3,>=2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
requests>=2.5.0->sphinx<7.0.0,>=4.0.0->edge-gwas==0.1.1) (2.0.4)
Requirement already satisfied: partd>=0.3.10 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
dask[dataframe]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (1.2.0)
Requirement already satisfied: fsspec>=0.6.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
dask[dataframe]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2024.6.1)
Requirement already satisfied: cloudpickle>=1.1.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
dask[dataframe]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2.0.0)
Requirement already satisfied: toolz>=0.8.2 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
dask[dataframe]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (0.12.0)
Requirement already satisfied: pyyaml>=5.3.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
dask[dataframe]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (6.0)
Requirement already satisfied: typeguard in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (4.4.4)
Requirement already satisfied: typing_inspect>=0.6.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (0.9.0)
Requirement already satisfied: pydantic in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2.8.2)
Requirement already satisfied: scipy-stubs in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (1.15.3.0)
Requirement already satisfied: pandas-stubs in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2.3.3.251219)
Requirement already satisfied: distributed in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (2022.7.0)
Requirement already satisfied: locket in
```

```
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
partd>=0.3.10->dask[dataframe]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(1.0.0)
Requirement already satisfied: tornado<6.2,>=6.0.3 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
distributed->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(6.1)
Requirement already satisfied: zict>=0.1.3 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
distributed->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(2.1.0)
Requirement already satisfied: tbllib>=1.6.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
distributed->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(1.7.0)
Requirement already satisfied: sortedcontainers!=2.0.0,!>2.0.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
distributed->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(2.4.0)
Requirement already satisfied: psutil>=5.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
distributed->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(5.9.5)
Requirement already satisfied: msgpack>=0.6.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
distributed->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(1.0.3)
Requirement already satisfied: types-pytz>=2022.1.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from pandas-
stubs->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(2025.2.0.20251108)
Requirement already satisfied: pydantic-core==2.20.1 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pydantic->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(2.20.1)
Requirement already satisfied: annotated-types>=0.4.0 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
pydantic->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1)
(0.7.0)
Requirement already satisfied: optype>=0.9.3 in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from scipy-
stubs->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-gwas==0.1.1) (0.9.3)
Requirement already satisfied: heapdict in
/Users/nicen/anaconda3/lib/python3.10/site-packages (from
zict>=0.1.3->distributed->pandera[dask,mypy]->pandas-plink<3.0.0,>=2.0.0->edge-
gwas==0.1.1) (1.0.1)
```

```
[2]: # Cell 2: Load the functions from package
from edge_gwas import *
import pandas as pd
from IPython.display import Image, display
```

```
[3]: # Cell 3: Download test files to default 'tests' directory
download_test_files(version='main', overwrite=True)
```

INFO:edge\_gwas.io\_handlers:Downloading test files to tests  
 Downloading test files to: tests  
 Downloading: test.bed...  
 INFO:edge\_gwas.io\_handlers:Downloaded test.bed from  
<https://raw.githubusercontent.com/nicenzhou/edge-gwas/main/tests/test.bed>  
 INFO:edge\_gwas.io\_handlers:Downloaded test.bim from  
<https://raw.githubusercontent.com/nicenzhou/edge-gwas/main/tests/test.bim>  
 INFO:edge\_gwas.io\_handlers:Downloaded test.fam from  
[\(0.94 MB\)](https://raw.githubusercontent.com/nicenzhou/edge-gwas/main/tests/test.fam)  
 Downloading: test.bim... (0.03 MB)  
 Downloading: test.fam... (0.07 MB)  
 Downloading: test.phen...  
 INFO:edge\_gwas.io\_handlers:Downloaded test.phen from  
[\(0.09 MB\)](https://raw.githubusercontent.com/nicenzhou/edge-gwas/main/tests/test.phen)

=====

Summary:  
 Downloaded: 4  
 Skipped: 0  
 Failed: 0

=====

```
[3]: {'downloaded': ['test.bed', 'test.bim', 'test.fam', 'test.phen'],
      'skipped': [],
      'failed': []}
```

```
[4]: # Cell 4: Load data
geno, info = load_plink_data('tests/test.bed', 'tests/test.bim', 'tests/test.  

                                ↵fam')
```

INFO:edge\_gwas.utils:Loading PLINK data from tests/test.bed  
 Mapping files: 100% | 3/3 [00:00<00:00, 42.02it/s]  
 INFO:edge\_gwas.utils:Loaded 3925 samples and 1000 variants

```
[5]: # Cell 5: Prepare phenotype (adjust column names as needed)
# First, check what columns are in test.pheno
pheno_raw = pd.read_csv('tests/test.phen', sep='\t')

# Then prepare phenotype with correct column names
pheno = prepare_phenotype_data(
    'tests/test.phen',
    outcome_col='disease',
    covariate_cols=[], # Empty list - no covariates
    sep=' '
)
```

INFO:edge\_gwas.utils:Loading phenotype data from tests/test.phen  
INFO:edge\_gwas.utils:Prepared phenotype data for 3925 samples

```
[6]: # Cell 6: Split data
from edge_gwas.utils import stratified_train_test_split
train_g, test_g, train_p, test_p = stratified_train_test_split(
    geno, pheno, 'disease',
    test_size=0.5,
    random_state=42,
    geno_id_col='sample_id',
    pheno_id_col='IID',
    is_binary=False
)
```

INFO:edge\_gwas.utils:Splitting data into train/test (50%/50%)  
INFO:edge\_gwas.utils:Found 3925 common samples (dropped 0 from genotype, 0 from phenotype)  
INFO:edge\_gwas.utils:Training set: 1962 samples  
INFO:edge\_gwas.utils:Test set: 1963 samples

```
[7]: # Cell 7: Run EDGE analysis
edge = EDGEAnalysis(outcome_type='continuous', n_jobs=-1)
alpha_df, gwas_df = edge.run_full_analysis(
    train_g, train_p, test_g, test_p,
    outcome='disease',
    covariates=[]
)
```

INFO:edge\_gwas.core:Starting EDGE analysis...  
INFO:edge\_gwas.core:Step 1: Calculating alpha values on training data...  
INFO:edge\_gwas.core:Processing variant 100/1000  
INFO:edge\_gwas.core:Processing variant 200/1000  
INFO:edge\_gwas.core:Processing variant 300/1000  
WARNING:edge\_gwas.core:Alpha calculation failed for rs6656245: coef\_hom too close to zero  
INFO:edge\_gwas.core:Processing variant 400/1000

```

INFO:edge_gwas.core:Processing variant 500/1000
WARNING:edge_gwas.core:Alpha calculation failed for rs945322: coef_hom too close
to zero
INFO:edge_gwas.core:Processing variant 600/1000
INFO:edge_gwas.core:Processing variant 700/1000
INFO:edge_gwas.core:Processing variant 800/1000
INFO:edge_gwas.core:Processing variant 900/1000
WARNING:edge_gwas.core:Alpha calculation failed for rs9803645: coef_hom too
close to zero
INFO:edge_gwas.core:Processing variant 1000/1000
INFO:edge_gwas.core:Alpha calculation complete. Processed 1000 variants.
INFO:edge_gwas.core:Skipped 0 variants due to convergence issues.
INFO:edge_gwas.core:Step 2: Applying alpha values on test data...
INFO:edge_gwas.core:Processing variant 100/1000
INFO:edge_gwas.core:Processing variant 200/1000
INFO:edge_gwas.core:Processing variant 300/1000
WARNING:edge_gwas.core:Alpha value is NaN for rs6656245, skipping.
INFO:edge_gwas.core:Processing variant 400/1000
INFO:edge_gwas.core:Processing variant 500/1000
WARNING:edge_gwas.core:Alpha value is NaN for rs945322, skipping.
INFO:edge_gwas.core:Processing variant 600/1000
INFO:edge_gwas.core:Processing variant 700/1000
INFO:edge_gwas.core:Processing variant 800/1000
INFO:edge_gwas.core:Processing variant 900/1000
WARNING:edge_gwas.core:Alpha value is NaN for rs9803645, skipping.
INFO:edge_gwas.core:Processing variant 1000/1000
INFO:edge_gwas.core:EDGE GWAS complete. Analyzed 997 variants.
INFO:edge_gwas.core:Skipped 3 variants.
INFO:edge_gwas.core:EDGE analysis complete!

```

```
[8]: # Cell 8: Display results
print("\nTop significant SNPs:")
print(gwas_df.nsmallest(10, 'pval'))
```

Top significant SNPs:

	snp	coef	std_err	stat	pval	conf_int_low	\
883	rs6664000	-0.257674	0.067214	-3.833641	0.000131	-0.389501	
877	rs10864366	-0.297638	0.079924	-3.724039	0.000202	-0.454392	
36	rs2474460	-0.230496	0.067313	-3.424254	0.000629	-0.362507	
869	rs4908773	-0.279175	0.083914	-3.326927	0.000894	-0.443745	
359	rs1710421	-0.036058	0.010943	-3.295020	0.001002	-0.057520	
828	rs9434617	-0.114979	0.035086	-3.277081	0.001067	-0.183788	
850	rs6678140	-0.165603	0.050958	-3.249802	0.001174	-0.265541	
108	rs897615	-0.068608	0.021687	-3.163558	0.001582	-0.111140	
743	rs2796477	0.168514	0.057374	2.937123	0.003355	0.055987	
892	rs11121247	-0.118142	0.040310	-2.930823	0.003420	-0.197198	

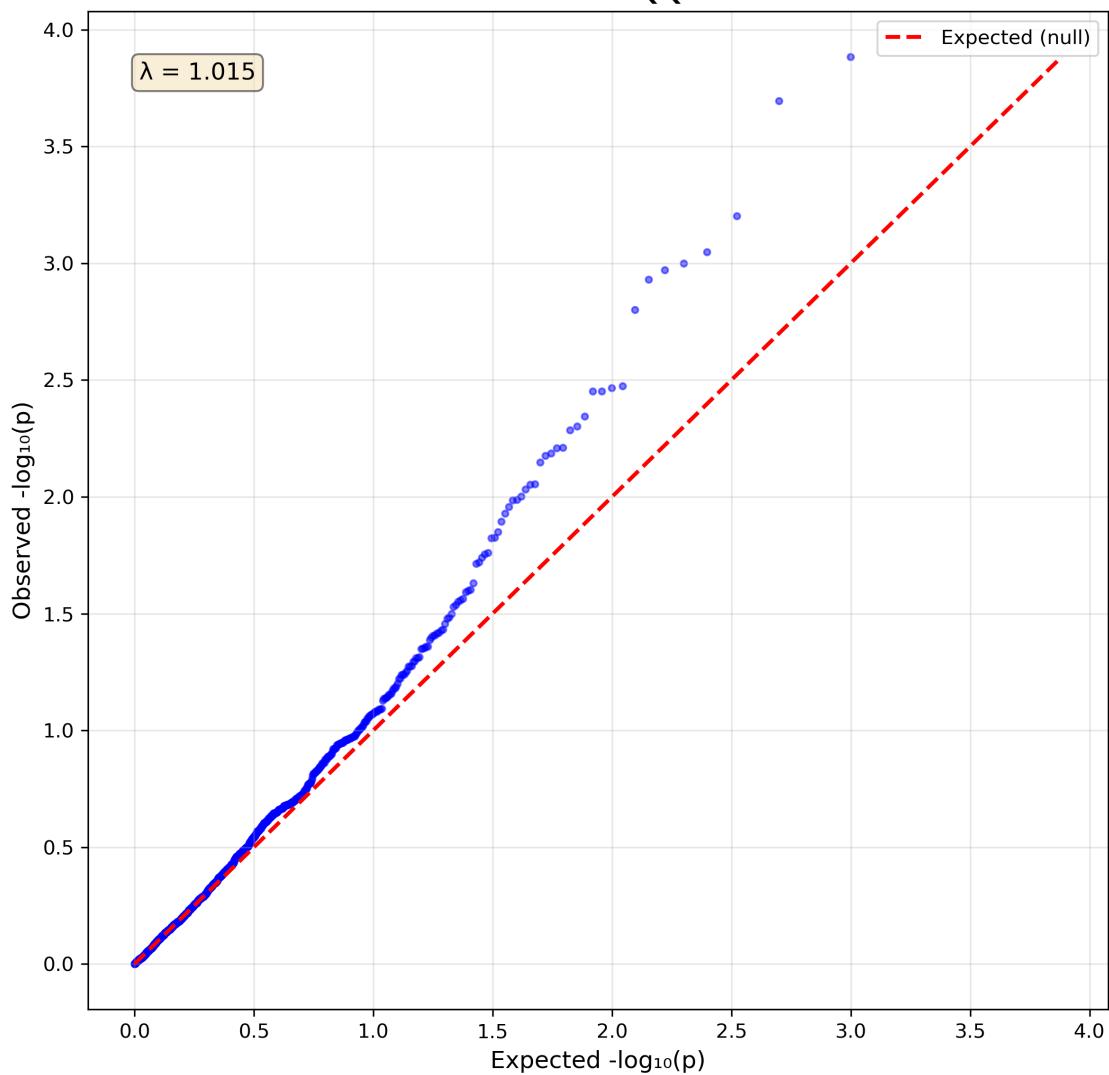
	conf_int_high	n_samples	alpha_value	variant_id
883	-0.125848	1780	-0.672885	rs6664000
877	-0.140884	1779	-0.520977	rs10864366
36	-0.098484	1962	0.450262	rs2474460
869	-0.114606	1963	-0.437075	rs4908773
359	-0.014597	1963	-4.414777	rs1710421
828	-0.046170	1961	-0.987025	rs9434617
850	-0.065666	1962	-0.515014	rs6678140
108	-0.026076	1962	2.405202	rs897615
743	0.281042	1781	0.814711	rs2796477
892	-0.039087	1963	-1.174839	rs11121247

```
[9]: # Cell 9: Visualize
# NO CHROM INFO DO NOT RUN
#manhattan_plot(gwas_df, 'manhattan.png')
#display(Image('manhattan.png'))

lambda_gc = qq_plot(gwas_df, 'qq.png')
print(f"Lambda GC: {lambda_gc:.3f}")
display(Image('qq.png'))
```

QQ plot saved to qq.png  
Genomic inflation factor (): 1.015  
Lambda GC: 1.015

### EDGE GWAS QQ Plot



[ ]: