



Documentation for Running the Microwave Jupyter Notebook and Generating Associated Documentation

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VERSION 1.23.1



Overview

Microwave is a Jupyter notebook designed to help companies comply with the auditing requirements of New York City’s Local Law 144. Specifically, Microwave performs the bias tests on model¹ outputs required by the law, as specified by the municipal Department of Consumer and Worker Protection’s December 2022 guidance available [here](#). Read the instructions below to learn more about using the Microwave notebook.

Freely Available Web-Based Example

If you are not familiar with Python, Jupyter, and virtual environments, consider using our freely available web-based Microwave example available [here](#).

The freely available web-based Microwave example relies on Google Colab and Workspaces. If you would like to try the example, but do not have a Gmail address or Google Workspace account, you may follow instructions to create an account for free [here](#). Log into the new account; then access the freely available web-based example link above.

Local Installation

For users who are familiar with Python, Jupyter, and virtual environments and plan to install the Microwave notebook locally, please follow the installation and usage instructions in this document. **The installation steps on the next page are required for the notebook to function properly.**

Support note: Please reach out to BNH.AI Luminos support at luminos@bnh.ai with any questions.

¹ “Model” is used synonymously with “automated employment decision tool (AEDT)” in this document and the Microwave notebook.

Quickstart Steps

1. Download the zip file containing the Microwave notebook and associated artifacts by clicking on the hyperlink on the first bullet: “Microwave notebook v1.23.1 is available to download here.”
2. Unzip the downloaded zip file.
3. Run the setup file.
 - a. On Mac or Linux:
 - i. Open a terminal window. Change directories into the unzipped folder.
 - ii. Change directories into the `scripts` folder:
`cd scripts`
 - iii. To start the notebook (for the first time and in the future), run: `./setup.sh`
(You may need to run the following command to enable execution of the `setup.sh` file: `chmod +x ./setup.sh`)
 - b. On Windows:
 - i. Open a PowerShell window. Change directories into the unzipped folder.
 - ii. Change directories into the `scripts` folder:
`cd scripts`
 - iii. To start the notebook (for the first time and in the future), run: `./Setup.ps1`
(You may need to enable PowerShell scripts to run and to unblock `Setup.ps1`:
`powershell -ExecutionPolicy Bypass -File Setup.ps1`)
4. Running the setup script should install a virtual environment based on `requirements.txt`, start a Jupyter notebook server, and open a browser tab.
5. In that browser tab, click on `microwave`, then `Microwave.ipynb`.
 - a. The first time you use the notebook, you may need to confirm that the kernel is trusted. You will then need to restart the kernel.
 - i. If Jupyter indicates the notebook is not trusted, click on: `Not Trusted`. Then click on: `Trust`.
 - b. Click on: `Kernel`. Then click on: `Restart & Run All`.
 - c. The notebook should now resemble a form-fill questionnaire and be ready for use.

Support Note: Python 3.9 with associated `distutils` package installed is preferred.

Support Note: If you are familiar with Python virtual environments, in place of running the setup script you may instead create a virtual environment, activate it, use `requirements.txt` to install the required dependencies, and start the `Microwave.ipynb` notebook. You may also need to trust the notebook, restart the kernel, and run all cells.

Using the Notebook

Upon starting the notebook, you will see a header with the BNH.AI logo. The first time you use the notebook, you may need to confirm that the Jupyter kernel is trusted by clicking on the “Not Trusted” button and then the “Trust” button. See Figure 1.

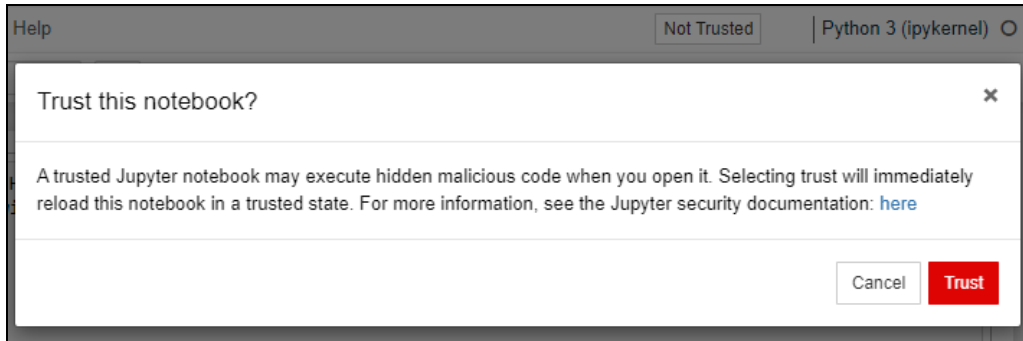


Figure 1. Trusting the notebook.

You may also see what appears to be code under the header, in which case you will need to restart the kernel by selecting “Kernel” and then “Restart & Run All.” See Figure 2. After restarting the kernel and running all cells, you will be presented with a basic interface to load data for bias testing.

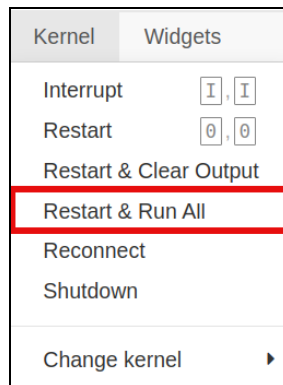


Figure 2. Using the Kernel Menu to Restart & Run All cells in the notebook.

To conduct bias testing, the notebook requires a dataset with the following properties:

- The dataset must be in the form of a CSV file.
- The variable which contains the model output must either be a binary variable containing the value 0 or 1 (reflecting a binary classification or selection) or be continuously valued (reflecting a model used for scoring).

- A variable encoding selection should use the value 1 to reflect selection (and 0 otherwise).
- Increasing values of a variable that encodes scores are assumed to reflect more favorable results.
- The dataset must contain at least 100, but no more than 10,000, observations and be no greater than 25 MB in size.
- There must be at least two binary demographic variables that are indicators of race which encode demographic category membership with a value of 1 reflecting category membership (and 0 otherwise).
- The same applies for demographic variables that are indicators of gender.
- There may be no null values in the model output or demographic variables.

Once you have this dataset and know its location on your computer, click the blue Upload button and select the dataset for testing. See Figure 3.

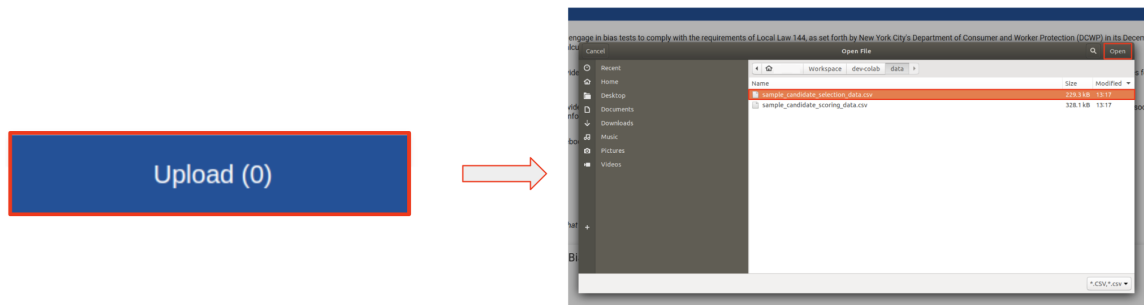


Figure 3. Using the Upload Button to select a dataset for bias testing.

Once the dataset has been loaded, select the variable containing the model output. Column names are populated from the dataset you upload and may appear differently than in Figure 4.

Please select the variable used to store the model output:

- ☐ id
- ☐ male
- ☐ female
- ☐ white
- ☐ asian
- ☐ hispanic
- ☐ black
- ☒ model_output

Figure 4. Selecting the variable that contains model output.

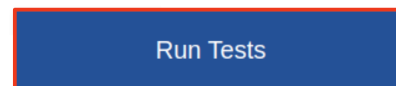
Then specify the names of the demographic marker variables in the dataset. Column names are populated from the dataset you upload and may appear differently than in Figure 5.

Please identify which variables encode gender or racial information. The variables should be binary, with 0 or 1 indicating category membership.

Variable Name	Race	Gender
id	<input type="checkbox"/>	<input type="checkbox"/>
male	<input type="checkbox"/>	<input checked="" type="checkbox"/>
female	<input type="checkbox"/>	<input checked="" type="checkbox"/>
white	<input checked="" type="checkbox"/>	<input type="checkbox"/>
asian	<input checked="" type="checkbox"/>	<input type="checkbox"/>
hispanic	<input checked="" type="checkbox"/>	<input type="checkbox"/>
black	<input checked="" type="checkbox"/>	<input type="checkbox"/>
model_output	<input type="checkbox"/>	<input type="checkbox"/>

Figure 5. Selecting variables with demographic group markers.

Run the bias tests by pressing the blue Run Tests button.



The notebook will then display the bias testing results aligned to the Department of Consumer and Worker Protection's December 2022 guidance.

Traditionally, test result values below 0.8 have been regarded as evidence of potential bias in model outputs.² However, values above 0.8 do not necessarily indicate a lack of bias in model outputs.

Support note: Should you have any questions or seek additional information related to any of the above, please reach out to BNH.AI Luminos support at luminos@bnh.ai.

Disclaimer: This notebook is being provided under the [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/) license.

² See U.S. Equal Opportunity Employment Commission (1978), available [here](#).