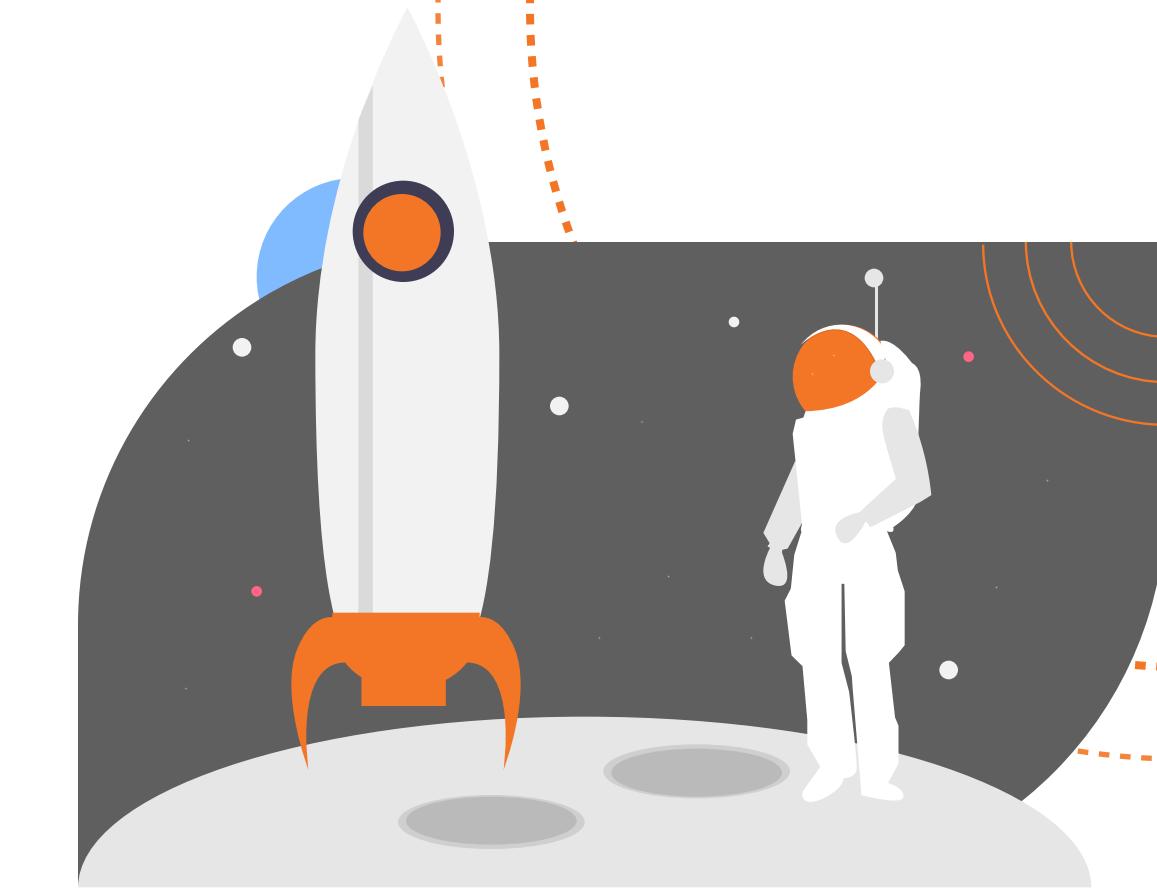




# File System Redesign

## Heuristic Evaluation



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- 2** Executive Summary
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- 5** Categories
- 6** Findings & Recommendations
- 28** Findings Summary
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# Executive Summary

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Our research reveals that while JupyterLab excels in the data analysis and coding tasks for which it was built, the very basis from which a user begins his or her work in JupyterLab relies on a well-designed file browser. In our evaluation, we identified several recurring themes which point to fundamental limitations of the current file browser: **system and documentation, recognition, functionality, and editing / revisions**. These heuristic issues pose significant usability challenges for a user's chronological journey through their data, as we explain in the competitive analysis that accompanies this heuristic analysis.



# Method Introduction & Justification

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## Overview

In this report, we identify the key usability weaknesses and strengths within the “File Browser” feature of the JupyterLab application. In addition, we deliver our recommendations for remediating the usability weaknesses we found.

Our analysis revealed **2 key strengths** and **16 key weaknesses**, discussed below.

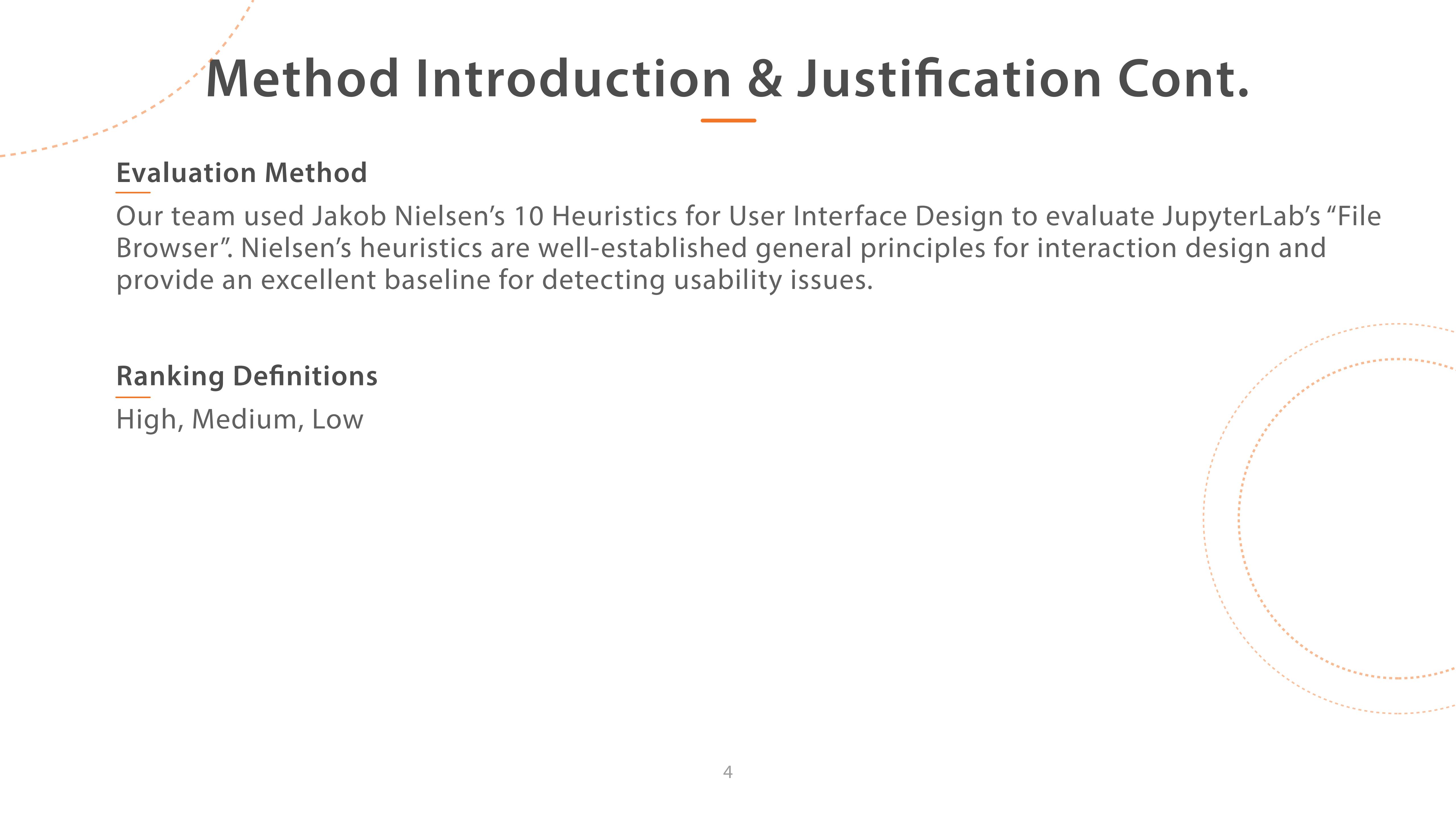
## Audience

This document is intended for the JupyterLab design and development team.

## Target Users

JupyterLab is an open source project available to the public. As it currently stands, the system is heavily geared towards data scientists and tech-savvy users. JupyterLab is attempting to shift that and open the application towards more mid-level users.

# Method Introduction & Justification Cont.

A decorative element consisting of a dashed orange line that starts at the top left, curves upwards and to the right, then descends towards the bottom right corner of the slide.

## Evaluation Method

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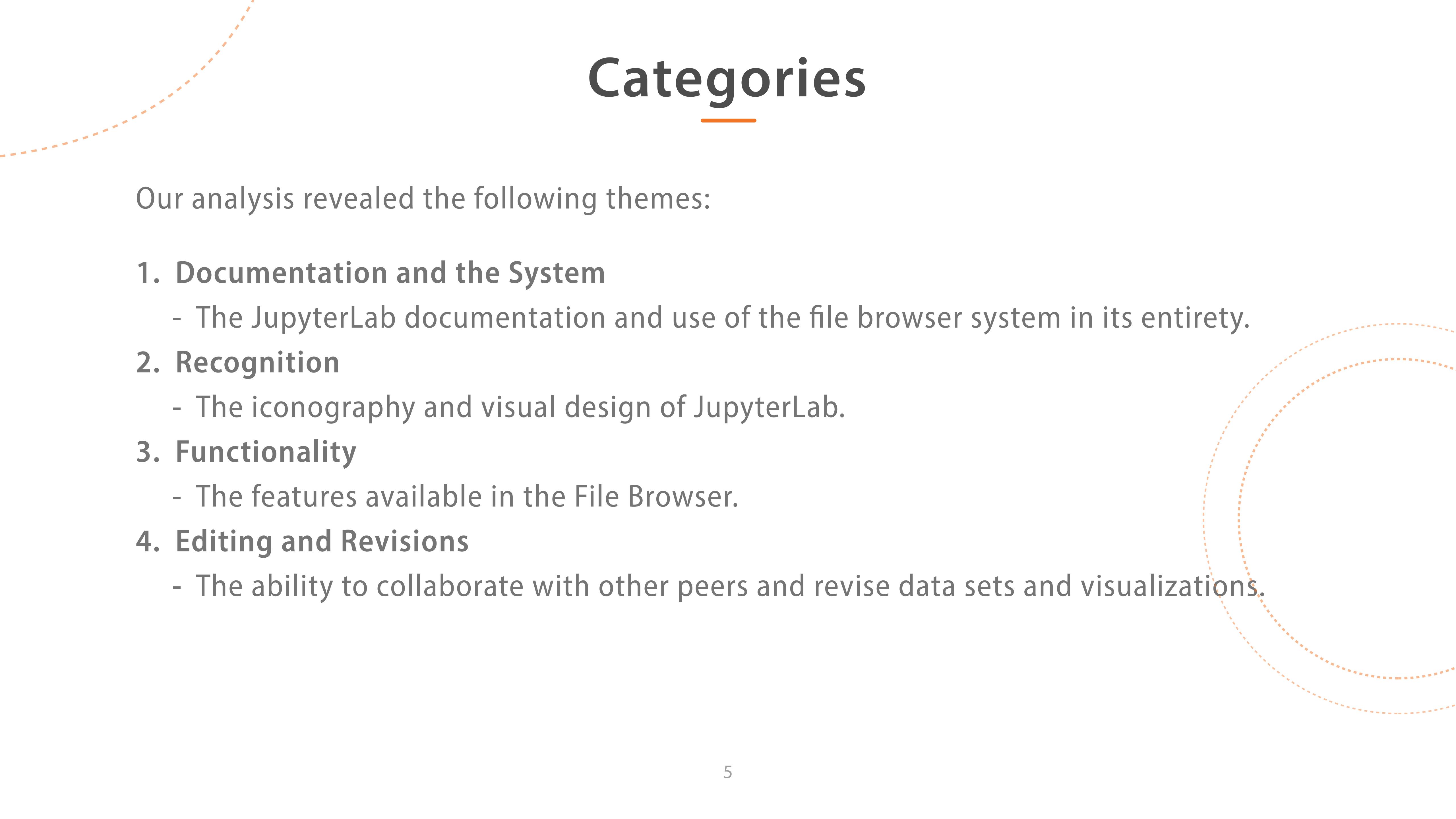
Our team used Jakob Nielsen's 10 Heuristics for User Interface Design to evaluate JupyterLab's "File Browser". Nielsen's heuristics are well-established general principles for interaction design and provide an excellent baseline for detecting usability issues.

## Ranking Definitions

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High, Medium, Low

# Categories



Our analysis revealed the following themes:

## 1. Documentation and the System

- The JupyterLab documentation and use of the file browser system in its entirety.

## 2. Recognition

- The iconography and visual design of JupyterLab.

## 3. Functionality

- The features available in the File Browser.

## 4. Editing and Revisions

- The ability to collaborate with other peers and revise data sets and visualizations.

# Documentation and the System

---



# Onboarding and installation instructions are inconsistent and unclear

## Heuristics violated:

- 4 Consistency & Standards
- 10 Help & Documentation

## Recommendations:

Provide more robust help guide or onboarding wizard

Severity Rating: High



File Browser contains all the files saved in the directory you have started the JupyterLab app from.

File Tree extension requires prior technical experience for setup.

No readily-available help documentation for JupyterLab

The screenshot shows the JupyterLab documentation website with the following navigation bar:

- Quickstart
- Architecture
- Narratives and Use Cases
- IPython
- Using Jupyter** (highlighted)
- Community
- Contributors
- Reference

The main content area is divided into several sections:

- JupyterLab**:
  - jupyter-js-notebook
  - jupyter-js-phosphide
  - jupyter-js-plugins
  - jupyter-js-services
  - jupyter-js-ui
  - jupyter-js-utils
- Architecture**:
  - jupyter\_client
  - jupyter\_core
- Using Jupyter**:
  - jupyter\_sphinx\_theme
  - kernel\_gateway
  - nbviewer
  - tmpnb
  - traitlets

On the right side, there is a sidebar with links to other documentation categories:

- Jupyter User Interfaces
- JupyterHub
- Education
- Notebook Conversion and Formatting
- Kernels
- IPython
- Deployment
- JupyterLab
- Architecture** (highlighted)

# Unclear what the difference is between "File Browser" and a "File Tree"

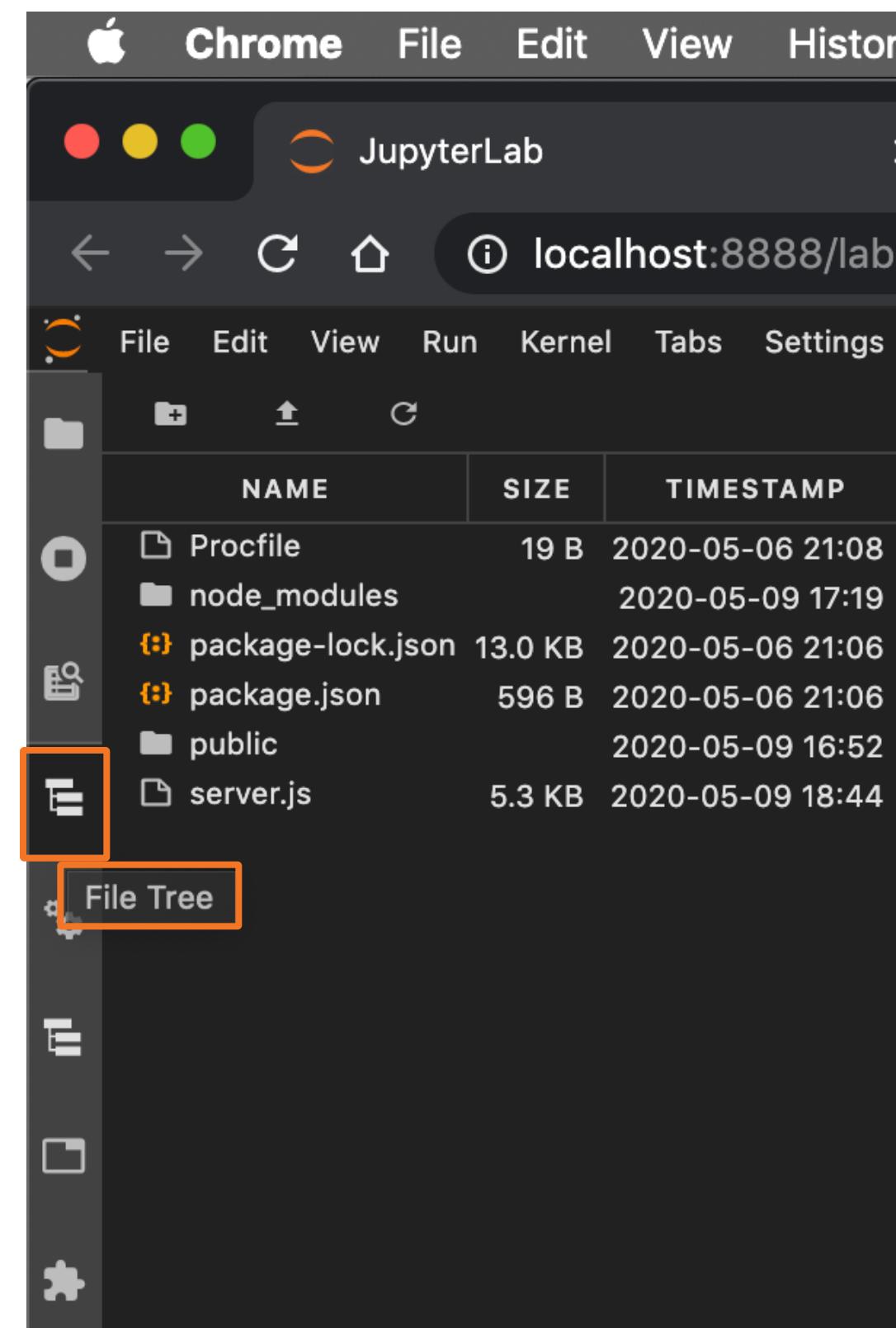
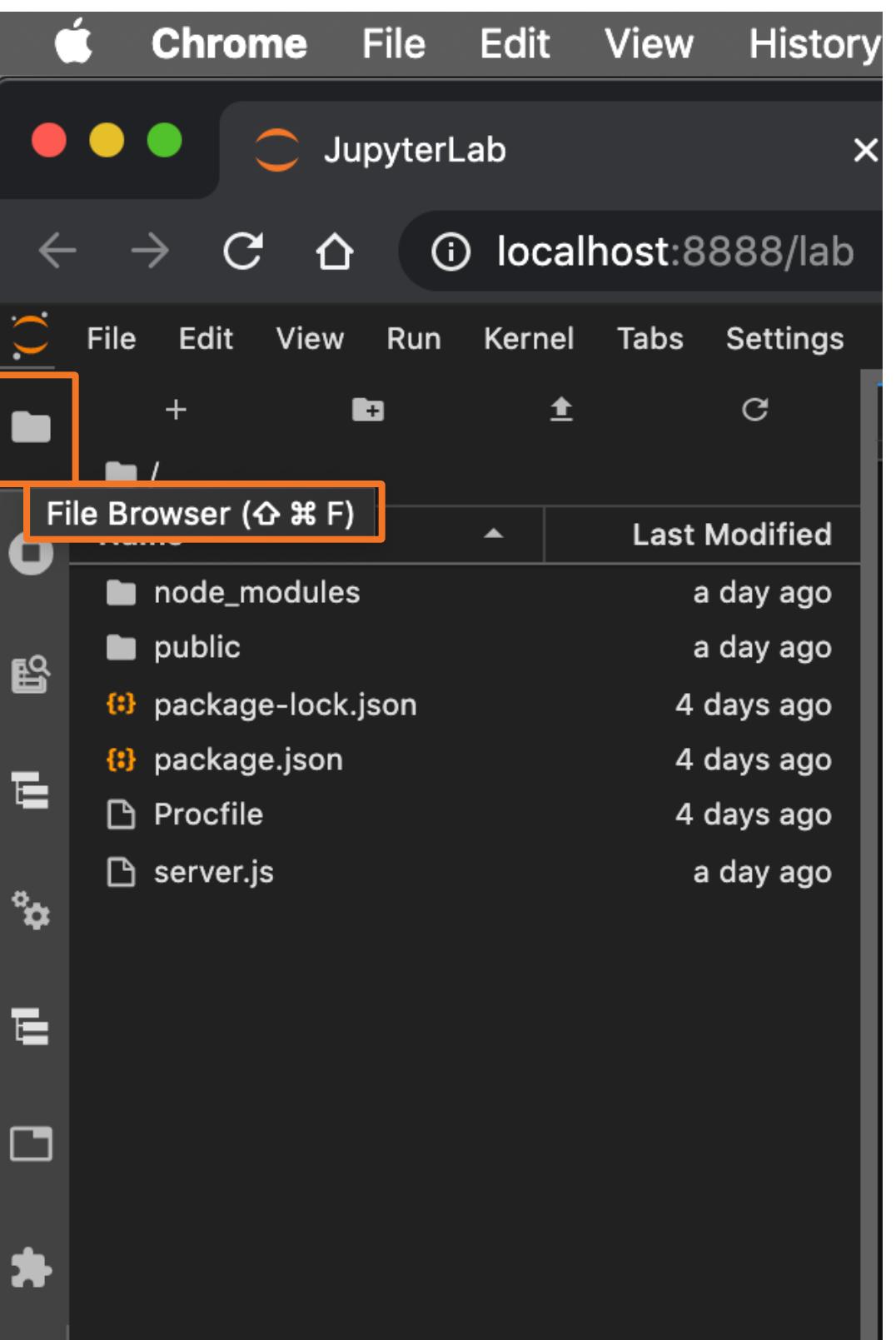
## Heuristics violated:

- 4 Consistency & Standards
- 10 Help & Documentation

## Recommendations:

Define the conceptual difference, if there is one, or merge the two

## Severity Rating: Low



# Ambiguous “Contextual Help” feature

## Heuristics violated:

10 Help & Documentation

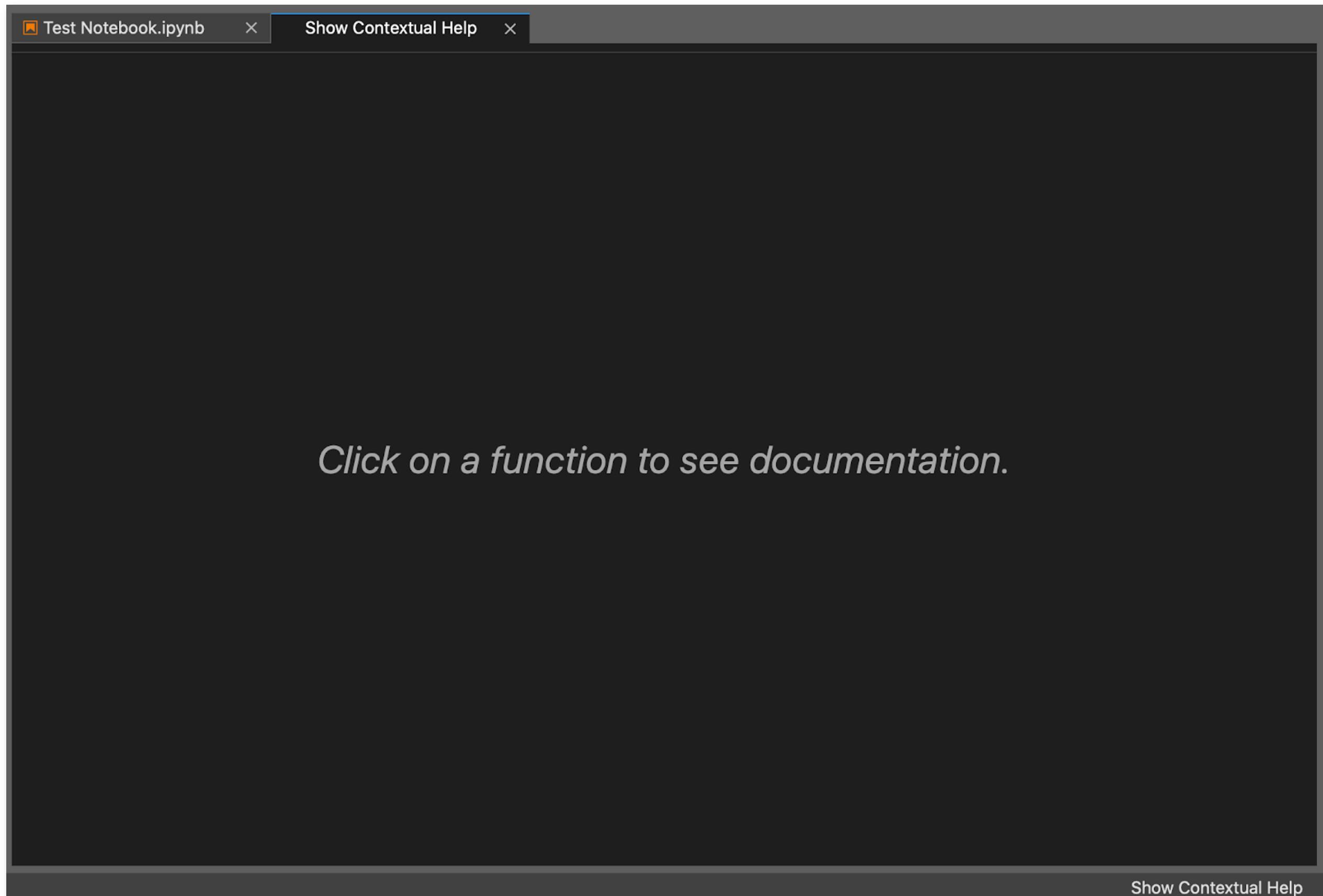
## Recommendations:

Rename to ‘Language Documentation’

## Severity Rating: Low



Feature name and placement implies that ‘contextual help’ is available for all aspects of the system, but the feature is limited to providing language documentation.



# Top-level directory is not visible

## Heuristics violated:

- 1 Visibility of System Status
- 6 Recognition over Recall

## Recommendations:

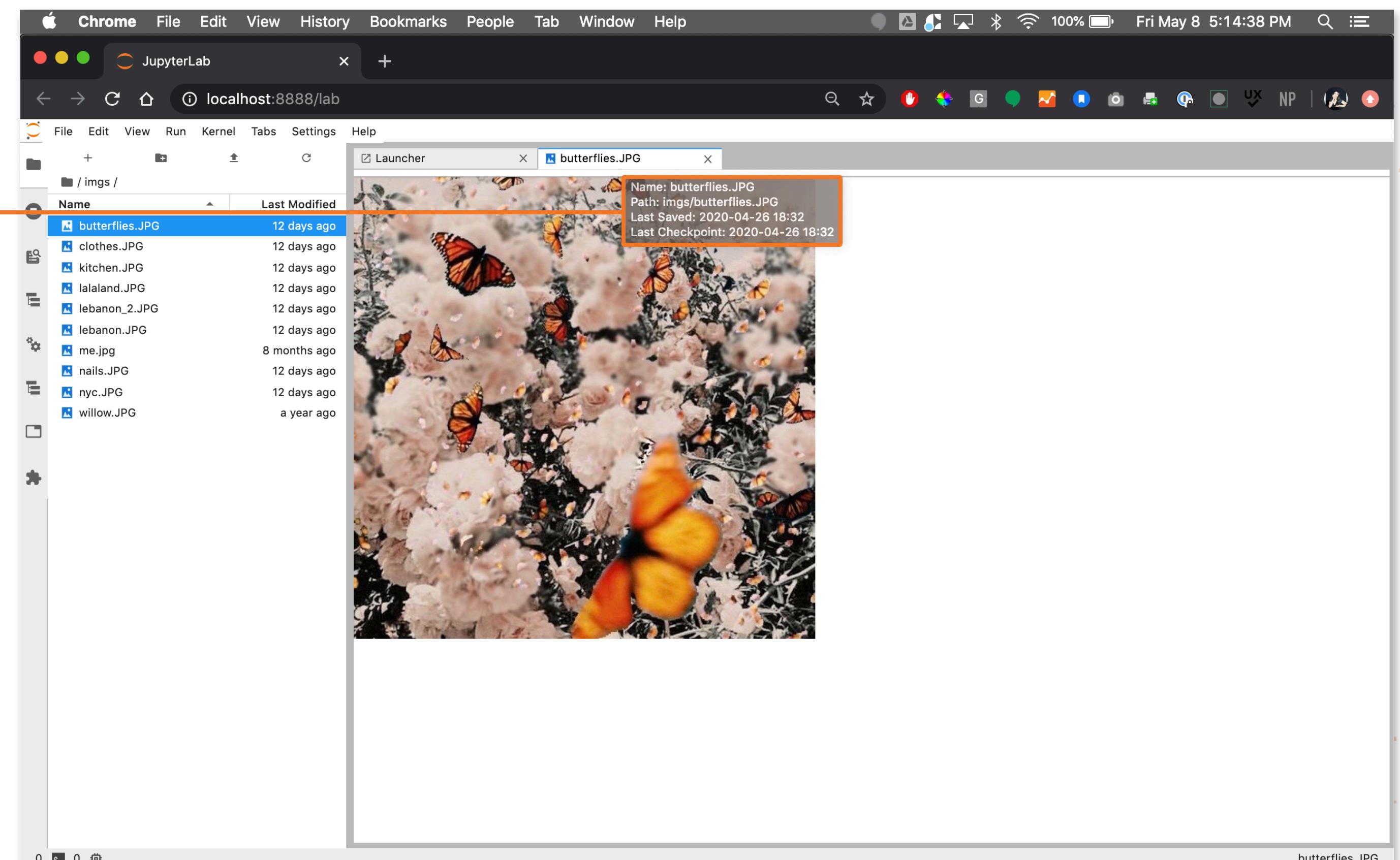
Provide some indicator as to where the user is in the file directory.

Either forbid more than one file tree icon, or perhaps color code them, or add numbers.

Severity Rating: High



To see the full path, you must hover over the file tab. But again, no clear indicator that it is from the File Browser or a File Tree the user has configured or what the exact root directory is.



# "Show Active Files" functionality is inconsistent

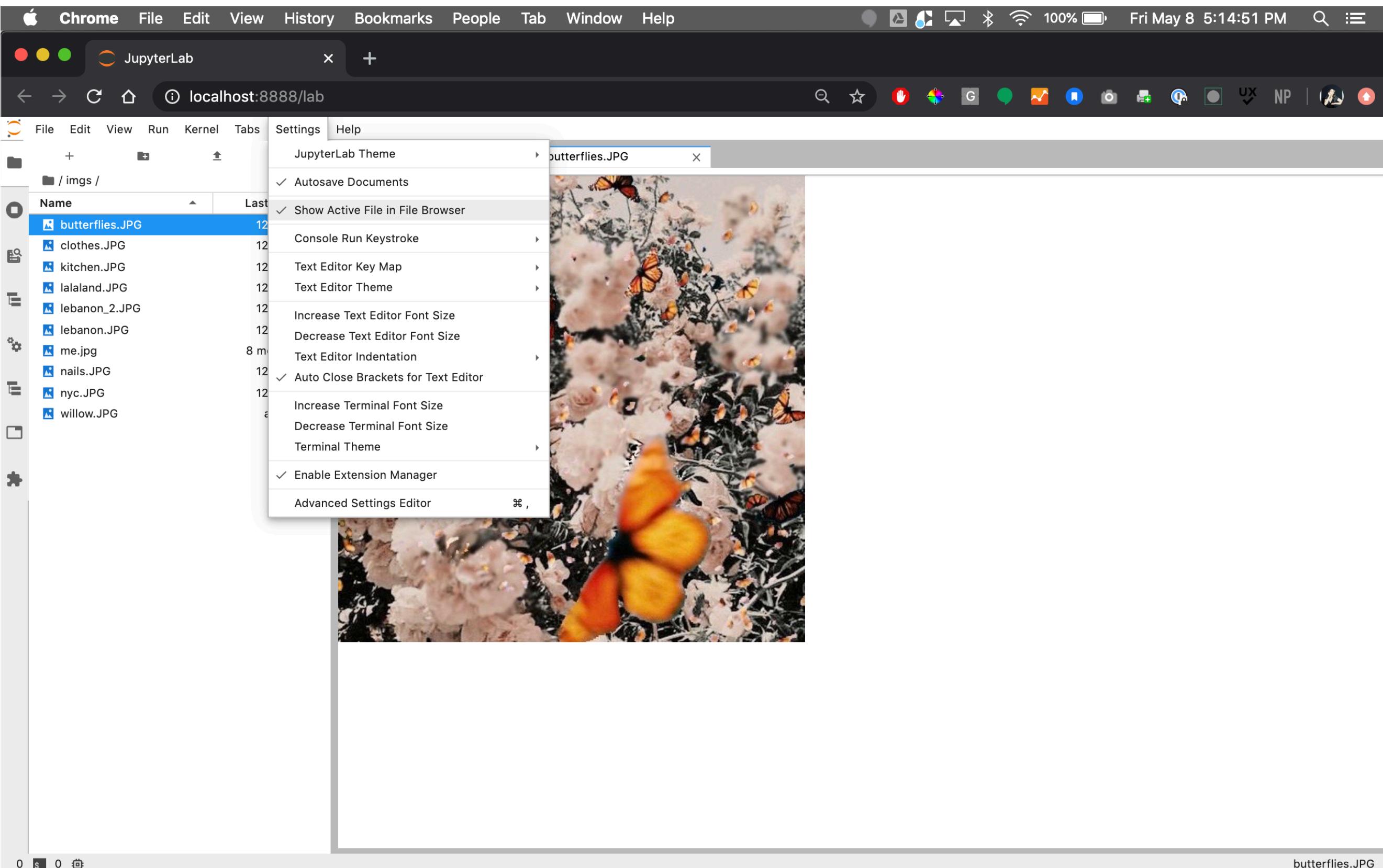
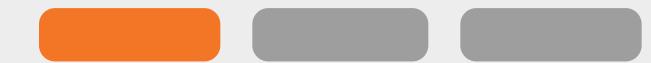
## Heuristics violated:

- 1 Flexibility and Efficiency of Use
- 6 Consistency and Standards

## Recommendations:

Resolve inconsistencies in functionality; enable 'Show Active Files' by default

## Severity Rating: Low



# Same folder icons serve different functions

## Heuristics violated:

- 4 Consistency and Standards

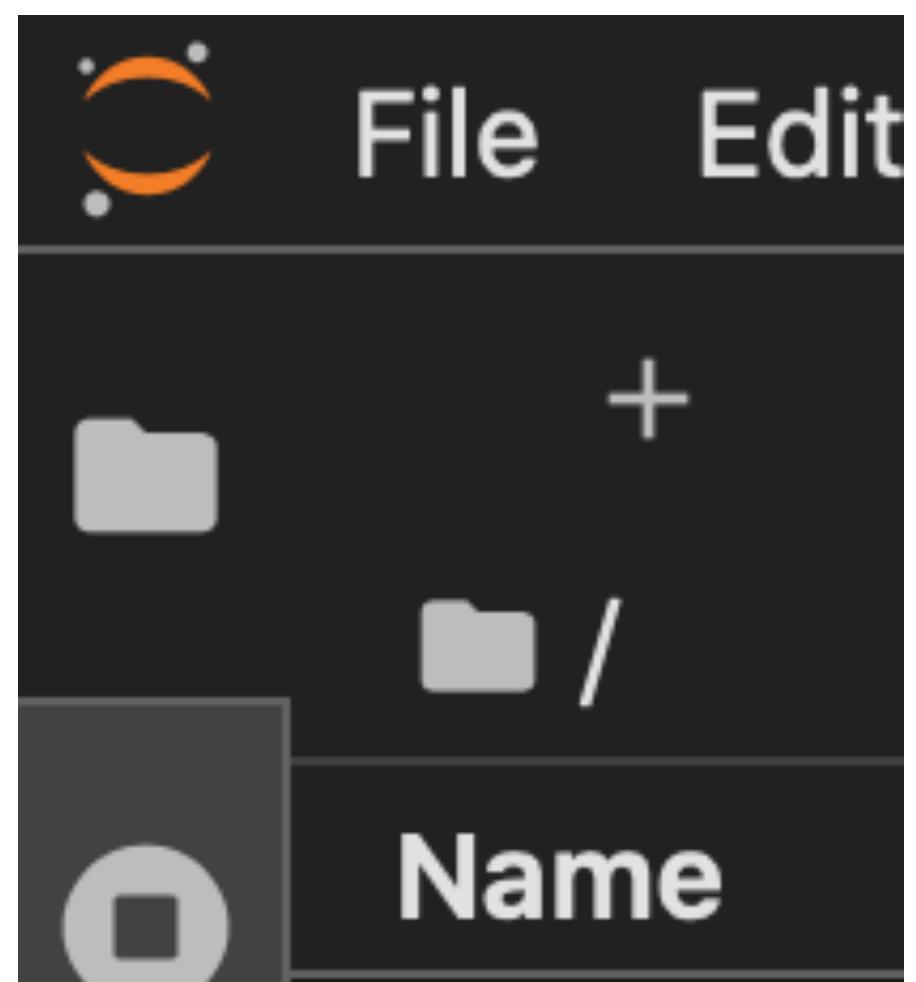
## Recommendations:

Replace with relevant icons.

## Severity Rating: Low



The two folder icons in the top-left serve different functions. The top left-most icon is the folders in the file system directory in which JupyterLab is running. The one to the lower-right of that is the path of the currently-chosen folder or file.



# Need for a file path to open files

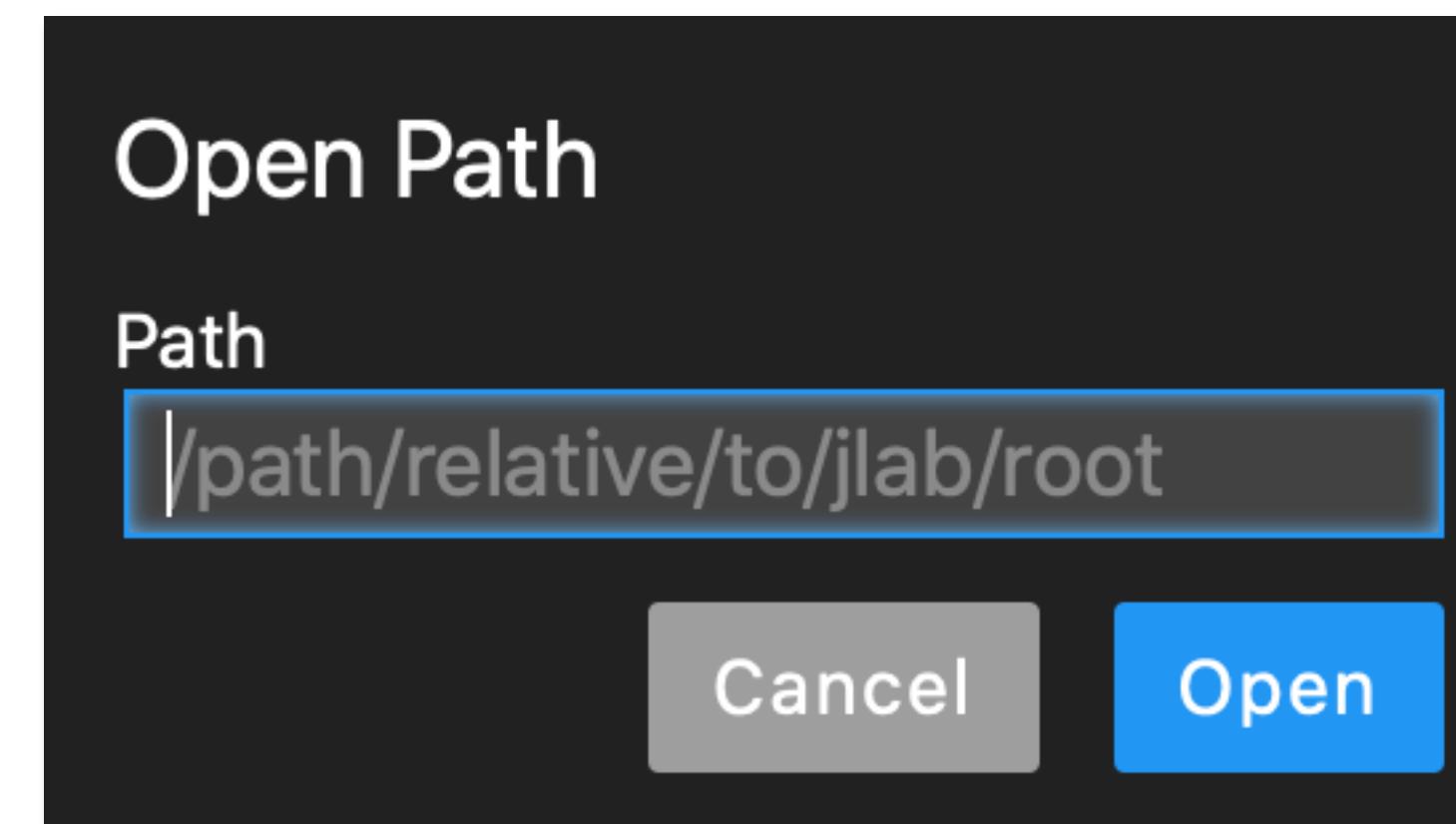
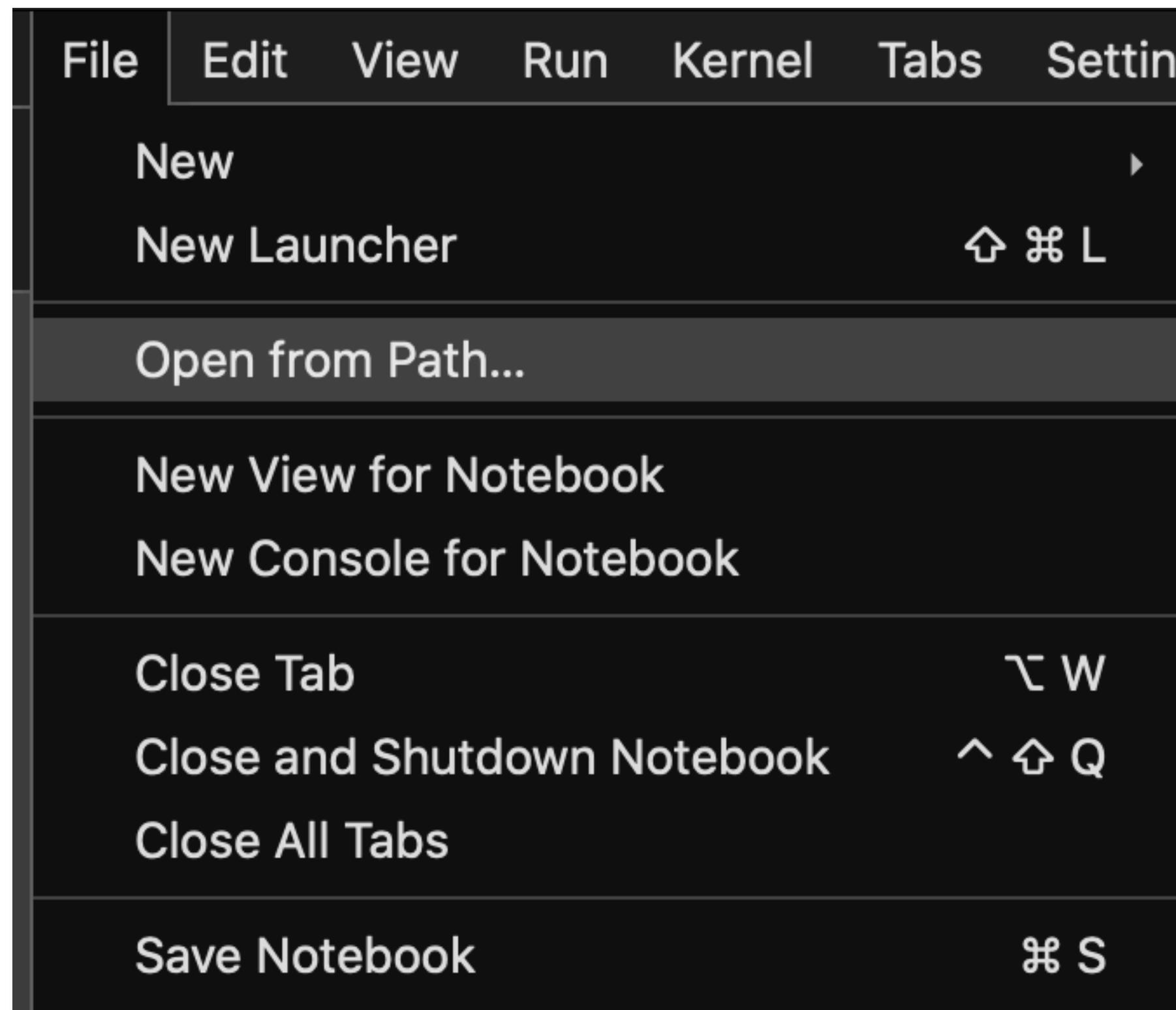
## Heuristics violated:

- 4 Consistency and Standards
- 5 Error Prevention
- 6 Recognition over Recall

## Recommendations:

Provide an experience that allows users to open files without a file path relative to working directory.

## Severity Rating: Medium



Why no apparent ability to open a file from a GUI? Appears I must have a file path.

# Cool low-fi “hacker” look

## Heuristics supported:

- 8 Aesthetic and Minimalist Design

## Comments:

The low-fi “hacker” design is aesthetically pleasing. Mimics the command line and terminal view that technically-proficient users will understand.

```
[1]: What does this do?  
Object `do` not found.  
  
[2]: Print "run something"  
  
      File "<ipython-input-2-86430f0c3951>", line 1  
          Print "run something"  
                         ^  
SyntaxError: invalid syntax
```

# Recognition

---

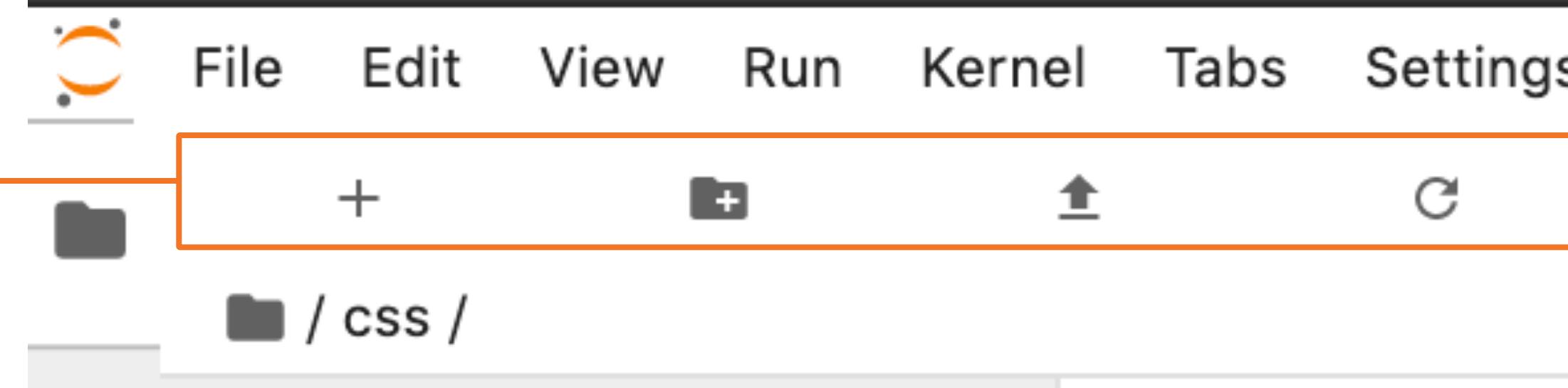


# Majority of icons are recognizable and accurately indicate their functionality

Heuristics supported:

- 2 Match between System & World

Functions at the top of the file menu sidebar make sense, e.g. plus icon in folder for new file, arrow pointing up for upload, and cycle button for refresh  
  
(See page 19; could differentiate between the plus icon for a new launcher and the plus icon for a new folder)



# "Commands" icon is unclear

## Heuristics violated:

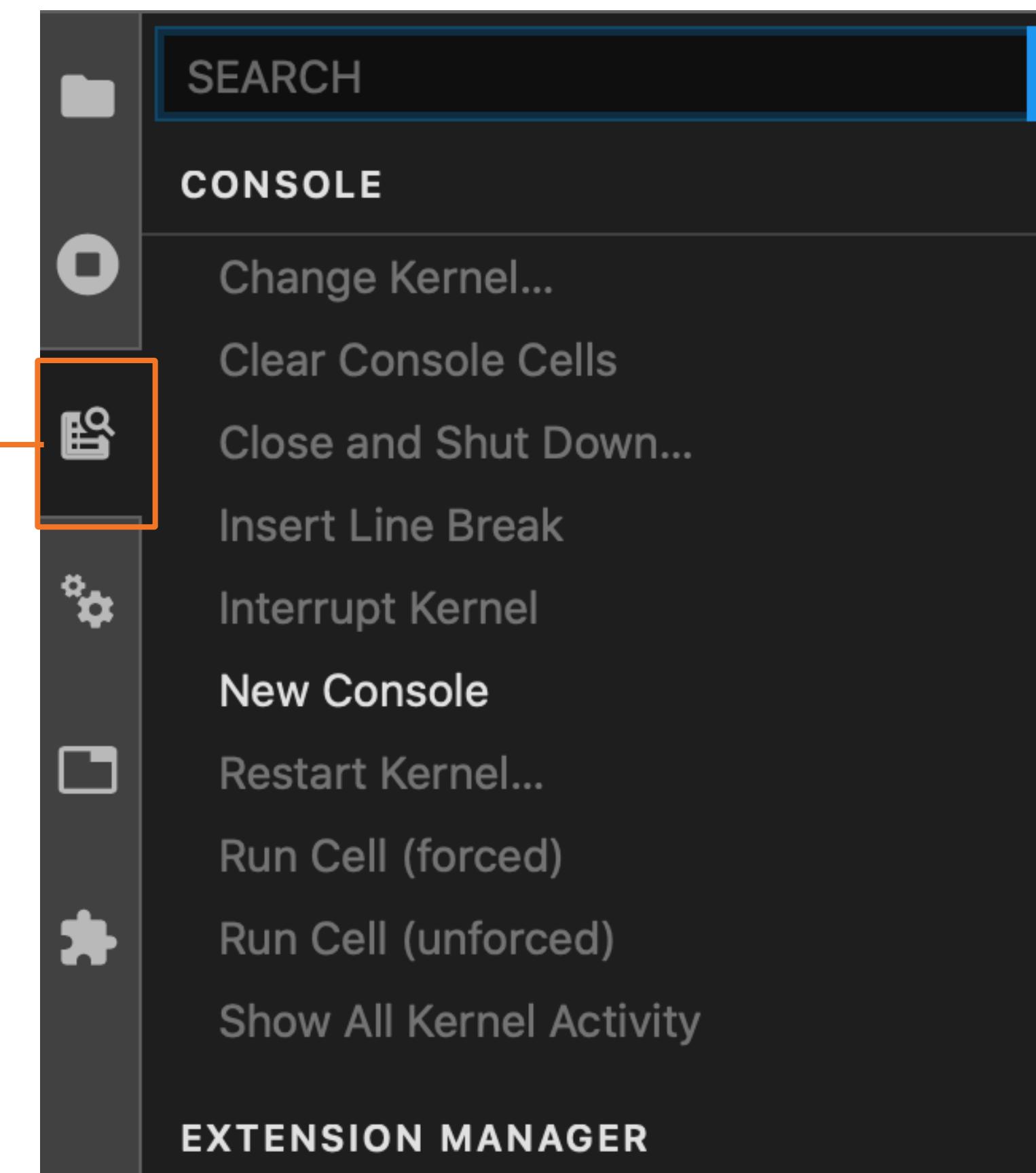
- 2 Match between System & World

## Recommendations:

Needs a more descriptive icon. Recommend a terminal icon, or perhaps a military-themed icon.

Severity Rating: Medium

Current "magnifying glass over piece of paper" does not suggest "Commands," but rather suggests "inspect" or "examine."



# "Property Inspector" icon mental model mismatch

## Heuristics violated:

- 2 Match between System & World

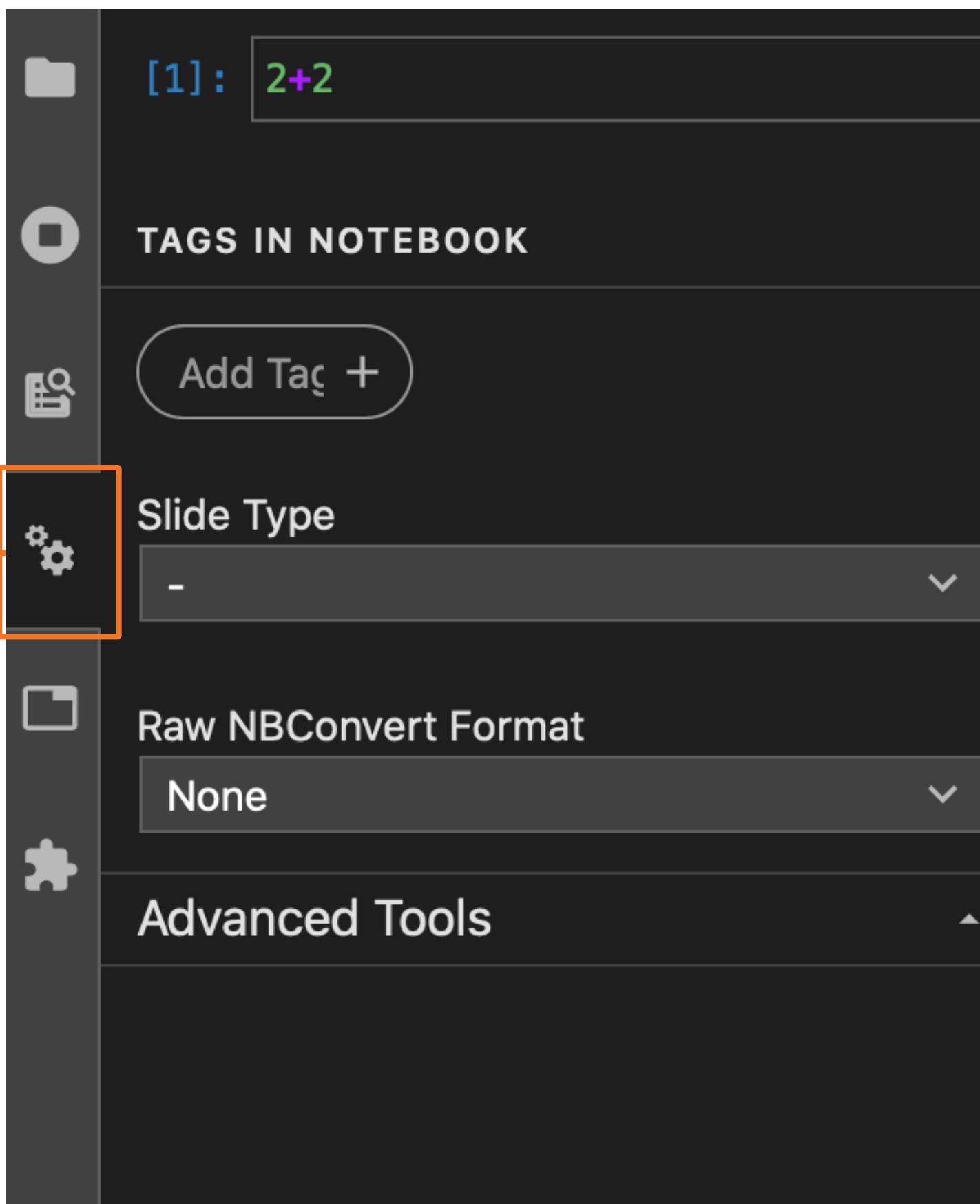
## Recommendations:

Needs a more descriptive icon. This could be a better place to use the “magnifying glass over piece of paper” icon.

Severity Rating: Medium



Gear icon tends to suggest settings, not "Property Inspector."



# "Launcher" icon indicates "add", not "launch"

Heuristics violated:

- 2 Match between System & World

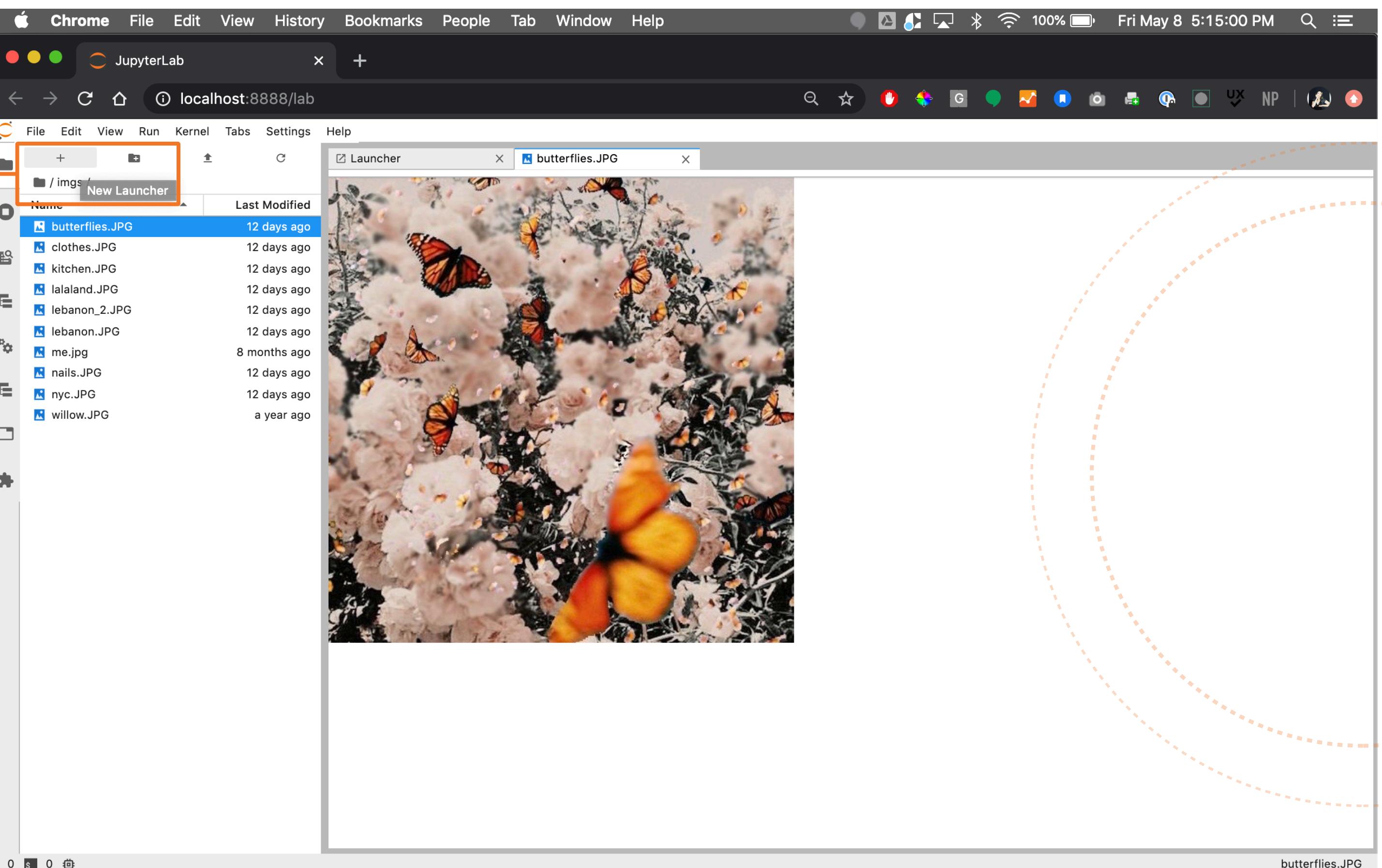
Recommendations:

Include labels with icons

Severity Rating: Medium



"+" icon is unclear as to what you're adding.  
Opens another "Launcher"



# Heavily-repeating text increases visual load

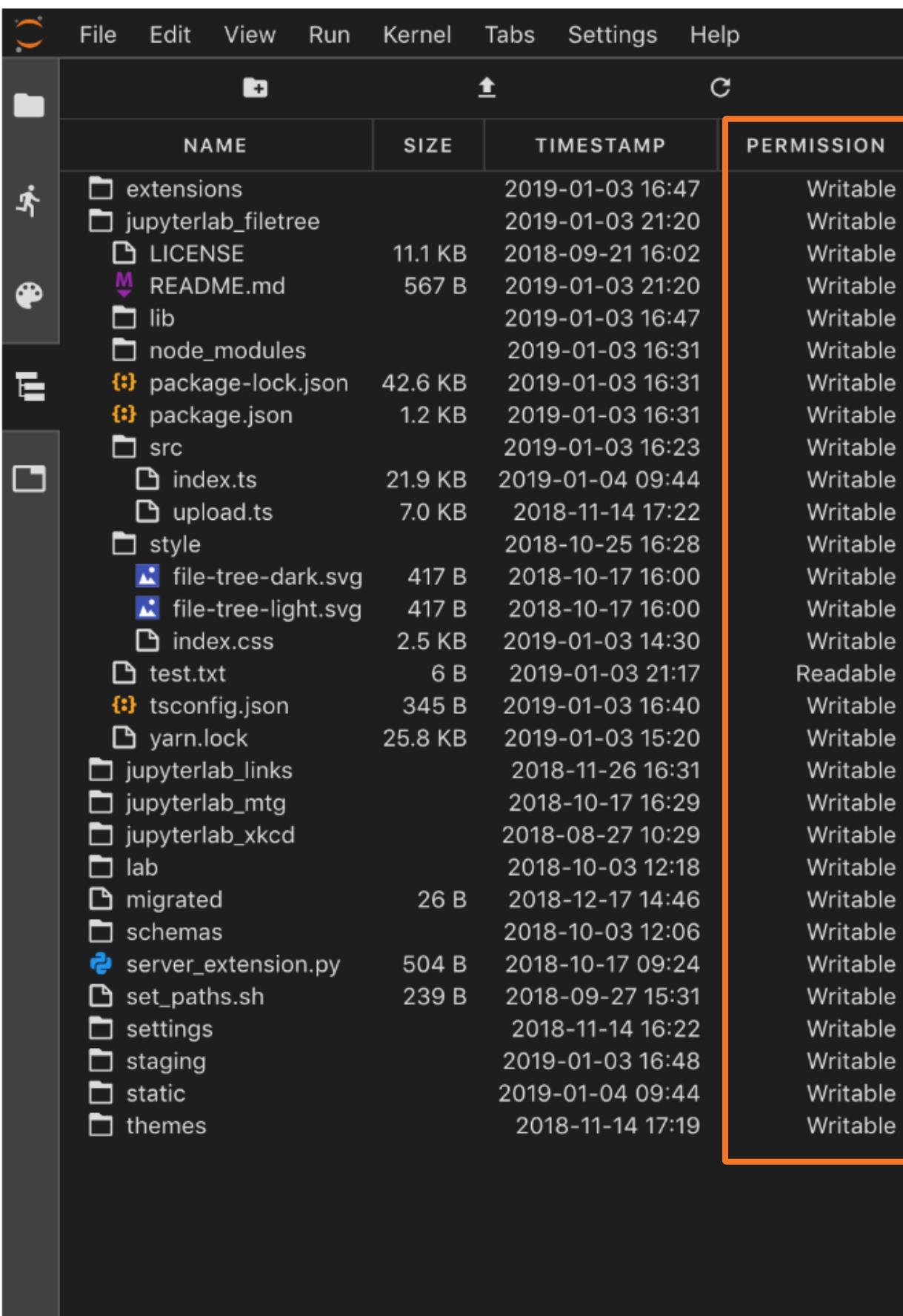
**Heuristics violated:**

- 2 Match between System & World

**Recommendations:**

Create icons for readable / writeable

**Severity Rating: Medium**



NAME	SIZE	TIMESTAMP	PERMISSION
extensions		2019-01-03 16:47	Writable
jupyterlab_filetree		2019-01-03 21:20	Writable
LICENSE	11.1 KB	2018-09-21 16:02	Writable
README.md	567 B	2019-01-03 21:20	Writable
lib		2019-01-03 16:47	Writable
node_modules		2019-01-03 16:31	Writable
package-lock.json	42.6 KB	2019-01-03 16:31	Writable
package.json	1.2 KB	2019-01-03 16:31	Writable
src		2019-01-03 16:23	Writable
index.ts	21.9 KB	2019-01-04 09:44	Writable
upload.ts	7.0 KB	2018-11-14 17:22	Writable
style		2018-10-25 16:28	Writable
file-tree-dark.svg	417 B	2018-10-17 16:00	Writable
file-tree-light.svg	417 B	2018-10-17 16:00	Writable
index.css	2.5 KB	2019-01-03 14:30	Writable
test.txt	6 B	2019-01-03 21:17	Readable
tsconfig.json	345 B	2019-01-03 16:40	Writable
yarn.lock	25.8 KB	2019-01-03 15:20	Writable
jupyterlab_links		2018-11-26 16:31	Writable
jupyterlab_mtg		2018-10-17 16:29	Writable
jupyterlab_xkcd		2018-08-27 10:29	Writable
lab		2018-10-03 12:18	Writable
migrated	26 B	2018-12-17 14:46	Writable
schemas		2018-10-03 12:06	Writable
server_extension.py	504 B	2018-10-17 09:24	Writable
set_paths.sh	239 B	2018-09-27 15:31	Writable
settings		2018-11-14 16:22	Writable
staging		2019-01-03 16:48	Writable
static		2019-01-04 09:44	Writable
themes		2018-11-14 17:19	Writable

# Functionality

---



# "Copy file path" does not spawn absolute path to file

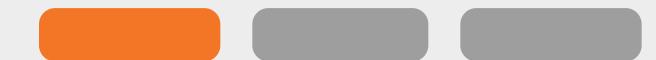
## Heuristics violated:

- 6 Recognition over Recall
- 7 Flexibility and Efficiency of Use

## Recommendations:

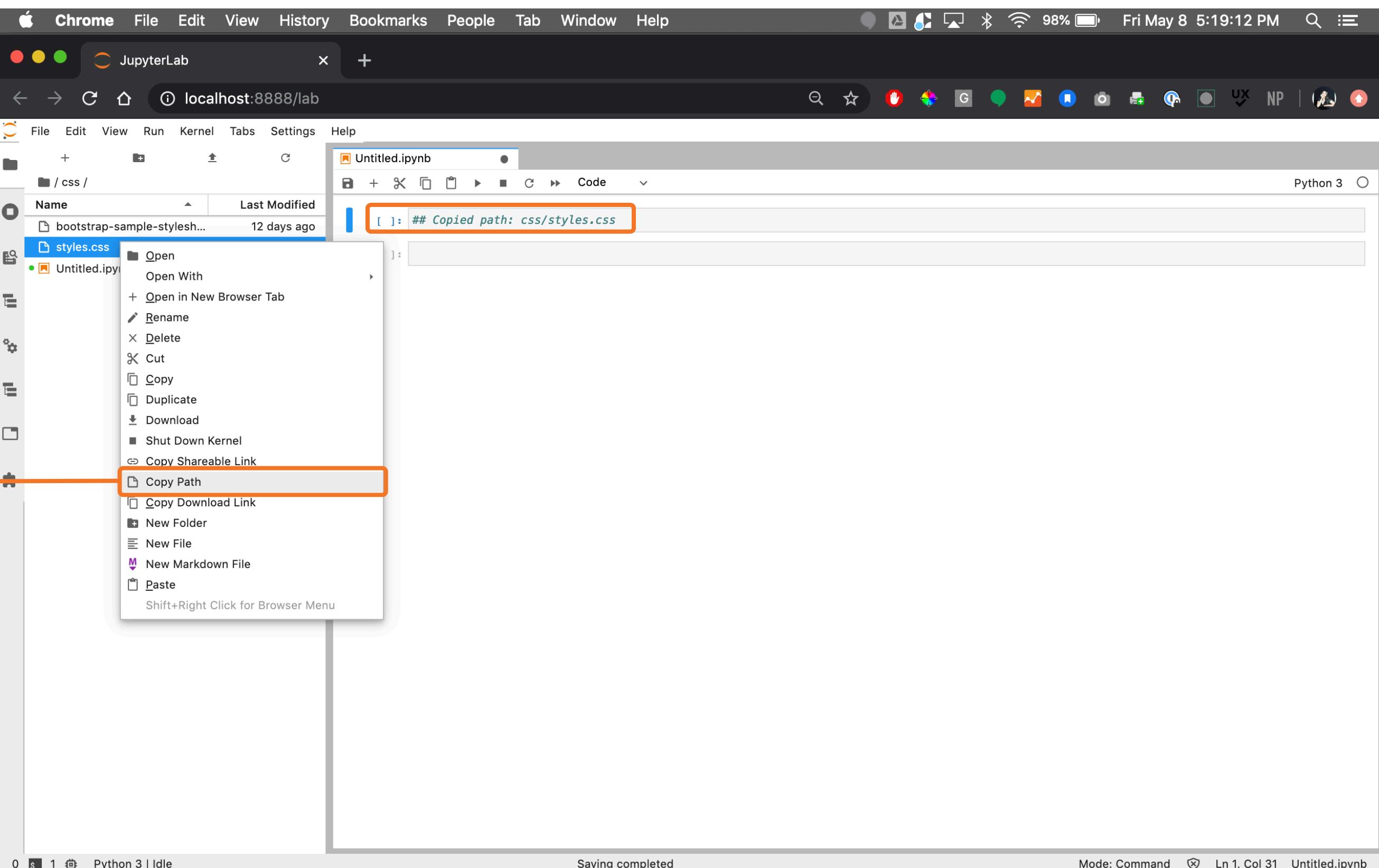
Include root directory in the path.

Severity Rating: Low



Copying path creates a misleading user experience because the copied path ends at the location where JupyterLab is running – which may not be the entire path to the file in the underlying system.

While ability to copy file paths is important and very useful, the root directory should be included in the path.



# Cannot search within File Browser

## Heuristics violated:

- 2 Match between System & World
- 7 Flexibility and Efficiency of Use

## Recommendations:

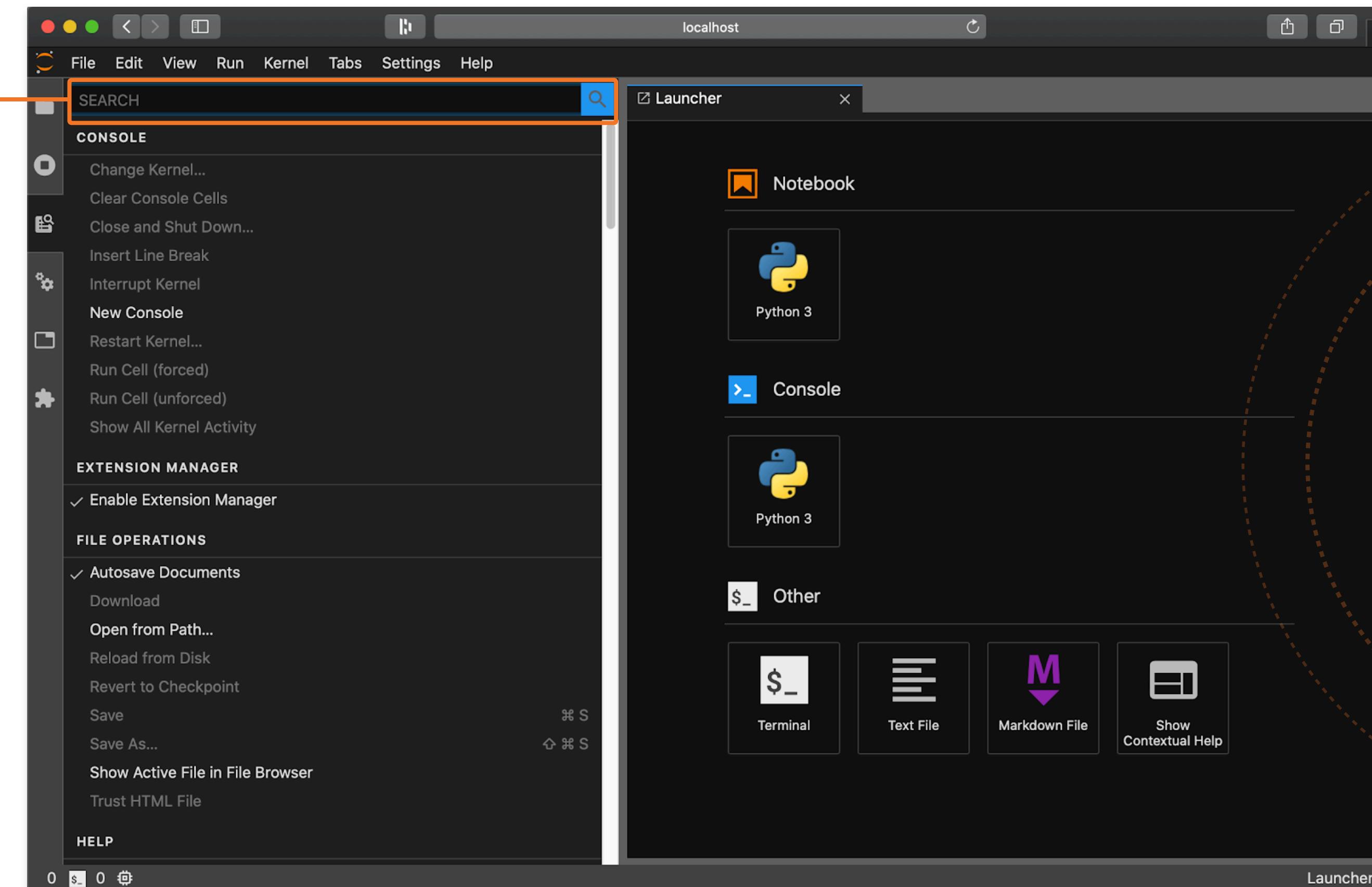
Provide search functionality within the File Browser and determine a way to differentiate between the File Browser Search and the Command Search (see the “Recognition” section).

Severity Rating: High



A search function does exist, but is irrelevant to the File Browser. The search menu is a long wall of text with several options that make the user scroll through categories to find their item, which is difficult for new users who may not know the correct search term.

Adjusting will help cater better to mid-level users.



# Limited file sorting and filtering capabilities

## Heuristics violated:

- 2 Match between System & World
- 7 Flexibility and Efficiency of Use

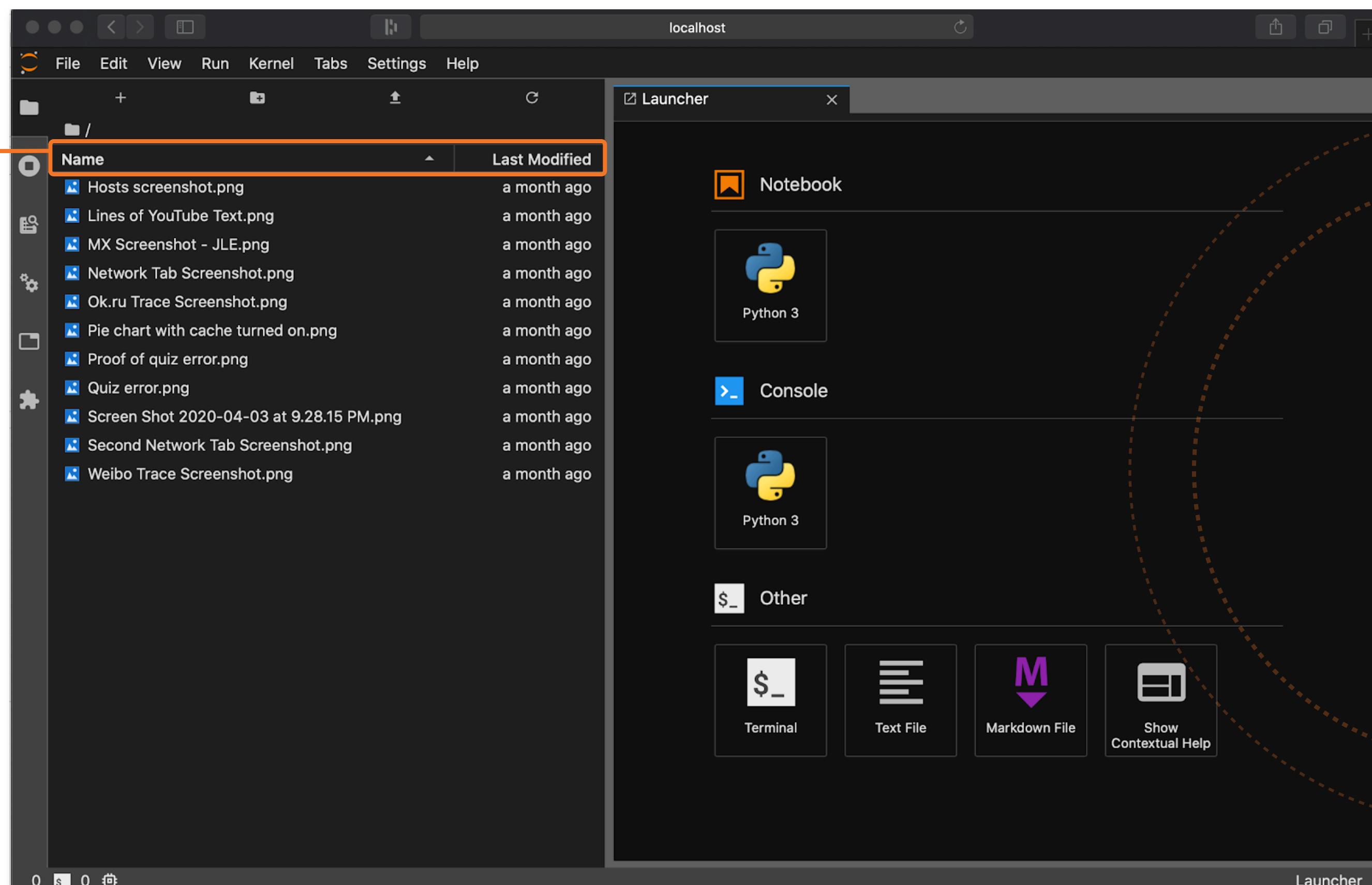
## Recommendations:

Allow for sorting and filtering

Severity Rating: Low



Can't sort files based on size, file type, or data type



# Editing and Revisions

---



## Insufficient support for collaboration

### Heuristics violated:

- 3 User Control and Freedom
- 6 Recognition Over Recall
- 7 Flexibility and Efficiency of Use

### Recommendations:

Explore building out sharing capabilities.

Severity Rating: High



No easy way as of now to share files so users can validate the work and data of other scientists.

# Minimal revision history capabilities

## Heuristics violated:

- 1 Visibility of System Status
- 3 User Control and Freedom
- 7 Flexibility and Efficiency of Use

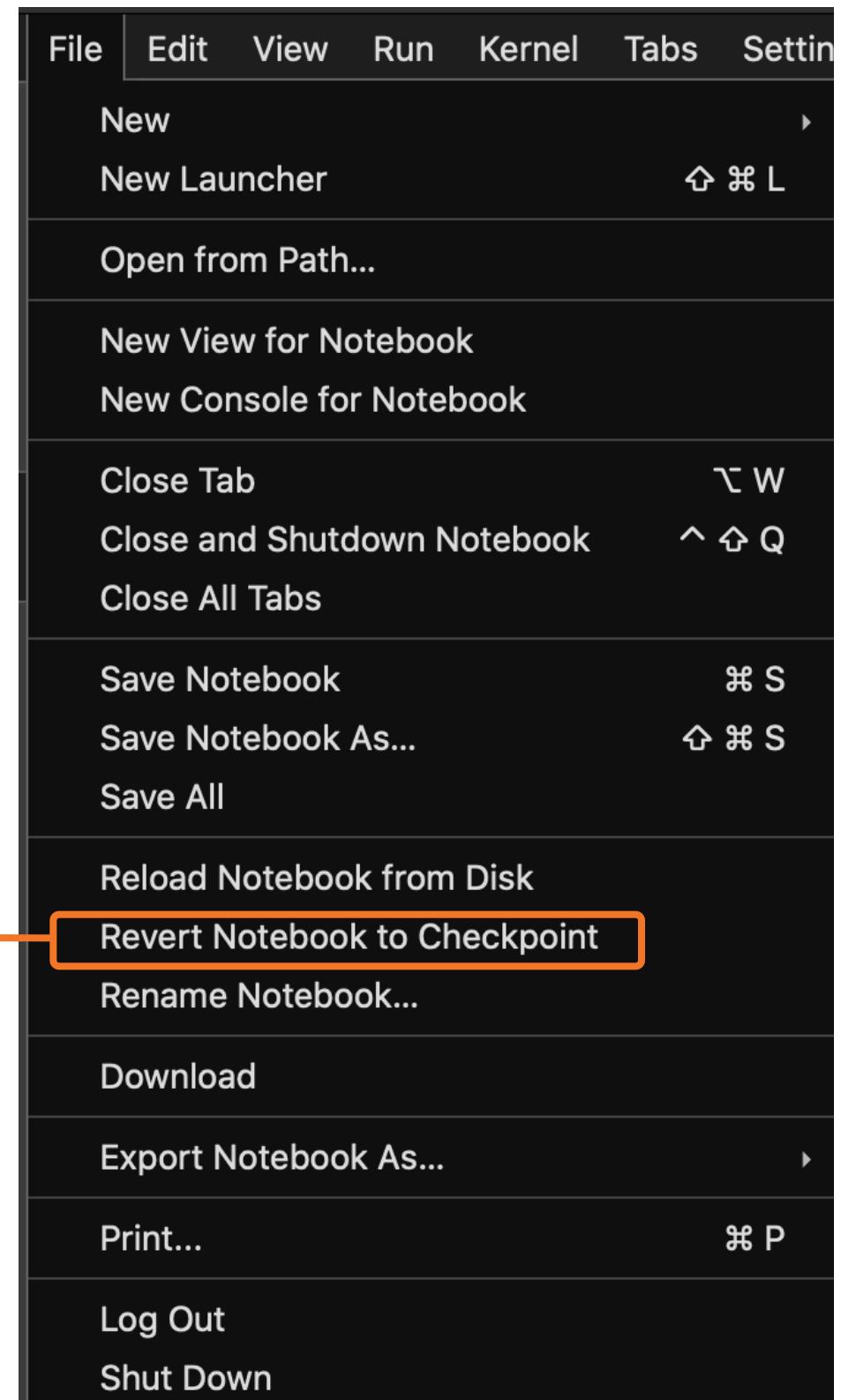
## Recommendations:

Create a visual timeline of revisions or include an additional panel or modal with list of revisions.

Severity Rating: High



"Revert to checkpoint" / "reload" are hidden in "File" menu. No indicators that file revisions are being stored somewhere



# Findings Summary

## Documentation and the System

Onboarding and installation instructions are inconsistent and unclear

Severity Rating: High

Unclear what the difference is between "File Browser" and a "File Tree"

Severity Rating: Low

Ambiguous "Contextual Help" feature

Severity Rating: Low

Top-level directory is not visible

Severity Rating: High

"Show Active Files" functionality is inconsistent

Severity Rating: Low

Same folder icons serve different functions

Severity Rating: Low

Need for a file path to open files

Severity Rating: Medium

Cool low-fi "hacker" look

Strength

## Recognition

Majority of icons are recognizable and accurately indicate their functionality

Strength

"Commands" icon is unclear

Severity Rating: Medium

"Property Inspector" icon mental model mismatch

Severity Rating: Medium

"Launcher" icon indicates "add", not "launch"

Severity Rating: Medium

Heavily-repeating text increases visual load

Severity Rating: Medium

## Functionality

"Copy file path" does not spawn absolute path to file

Severity Rating: Low

Cannot search within File Browser

Severity Rating: High

Limited file sorting and filtering capabilities

Severity Rating: Low

## Editing and Revisions

Insufficient support for collaboration

Severity Rating: High

Minimal revision history capabilities

Severity Rating: High

# Next Steps

---

We strongly advise JupyterLab to provide users a clear and consistent ability to see their location in a file system at all times. At this juncture, **users are trapped within their working directory** from which JupyterLab is running. This does not match the real world mental model of standard file systems. This could seriously hinder a user's ability to view, manage, and explore their data in JupyterLab.

Beyond that, JupyterLab should **explore collaboration features**, be this asynchronous via version control, or real-time collaboration similar to Google Drive. In addition, since the ideological foundation of JupyterLab is to share and validate data sets among the scientific community, **the ability to easily share these data sets is paramount**.

Lastly, **clarifying the inconsistencies** found throughout the File Browser will allow users to more easily work with JupyterLab.

**Thank you!**

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