41

Comparative Analysis of Different Python Editors

Sanika Kendhe

M.S.C(CS) student, MIT WPU University,

kendhe9@gmail.com

Abhishek Nishad

M.S.C(CS) student, MIT WPU University,

abhisheknishad167@gmail.com

Diksha Labhade

M.S.C(CS) student, MIT WPU University,

dikshalabhade2000@gmail.com

Vikas Magar

Assistant Professor at Department of Computer Science and Applications, Dr. Vishwanath Karad MIT World Peace University,

vikas.magar@mitwpu.edu.in

Abstract

This research paper presents a comparative analysis of different popular Python editors: Spyder, VSCode, Atom, PyCharm, Sublime Text3, IDLE and Jupyter Notebook. The analysis focuses on different criteria: size, platform support and languages to be developed in. The paper provides an in-depth valuation of each editor's strengths and weaknesses in each of

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 562

these groupings, providing insights for programmers looking to choose the best Python editor for their needs. Overall, the research finds that each editor has unique advantages, depending on the user's requirements and programming style. The abstract summarizes the paper's main findings, contributing to the broader conversation around Python development tools.

Keywords- Atom, Comparative analysis, Data analysis, Debugging tools, Jupyter Notebook, Pycharm, Spyder, Sublime Text, VSCode, IDLE.

I. INTRODUCTION

Python has become one of the most challenging programming languages in recent years, especially in the areas of data management and analytics, machine learning, and web development. As the Python environment has grown, so too has the number of tools available to help programmers write, test, and debug their code. Among these tools, Python editors have emerged as essential components of the development process, providing programmers with a range of features and functionalities to enhance their efficiency and streamline their workflow. There are many Python editors available, each with its own strengths and weaknesses. This research paper focuses on popular Python editors: Spyder, VSCode, and Jupyter Notebook, Sublime Text, Pycharm, Atom etc. These editors were chosen for their popularity, flexibility, and unique features, making them representative of the broader Python development tool landscape.

Fig 1. A shows the different python editors which are in demand.

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 563

II. WHY PYTHON EDITORS ARE IMPORTANT

Python editors are important because they offer a user-friendly interface and a range of features that facilitate writing, editing, and debugging Python code. Here are some reasons why Python editors are important:

1. Syntax Highlighting:

   Python editors provide syntax highlighting, which helps to highlight different parts of the code based on their functions. This makes it easier to read and understand the code.

2. Code Completion:

   Python editors offer code completion, which suggests possible completions for code as you type. This can save time and reduce errors when writing code.

3. Debugging:

   Python editors provide debugging tools for identifying and correcting errors in code. Debugging tools enable developers to browse the code, set breakpoints, and examine variables, which can be very helpful when debugging complex programs.

4. Version Control:

   Many Python publishers offer integration with version control systems such as Git, which facilitates code change management and collaboration with other developers.

5. Productivity:

   Python editors provide a range of features that can help to increase productivity, such as templates, snippets, and macros.

6. Customization:

   Python editors offer a high level of customization, allowing developers to customize the editor to their specific needs and preferences.

Overall, Python editors are important because they provide developers with the tools and features, they need to write, edit, and debug Python code more efficiently and effectively.

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 564

III.VARIOUS PYTHON EDITORS

2.1 VS Code:

Visual Studio Code (VS Code) is an open-source publisher developed by Microsoft. It is designed to be highly customizable and handles a wide range of programming languages and file types. VS Code offers a ton of features that make it popular among developers, including built-in debugging, Git integration, and a powerful extension system.

VS Code is based on Electron, a framework that aids the creation of desktop applications using web development technologies like HTML, CSS, and JavaScript. This makes VScode reliable across all platforms.

One of the main characteristics of VS Code is its broad support for extensions. Thousands of extensions are available on the Visual Studio Marketplace, which can add additional features, integrate with other tools and services. It also includes an on-board terminal that allows developers to execute commands and scripts directly from the editor.

Other notable features of VS Code include a built-in task runner, support for code snippets and IntelliSense, and a robust settings system that allows for customization of many aspects of the editor's behavior.

Overall, Visual Studio Code is a customizable code editing tool that is suitable for a wide range of programming tasks. Its extensive support for extensions, powerful debugging tools, and multi-platform compatibility make them a popular choice among developers.

2.2 Spyder:

Spyder is an open-source Integrated Development Environment (IDE) specially designed for scientific computing and data analysis in Python. It is built on top of the Qt toolkit and offers a variety of features and tools that are tailored to the needs of scientific programmers and researchers.

One of the significant features of Spyder is its powerful code editor, which provides advanced code analysis and debugging tools, including variable exploration and real-time code analysis. Spyder also includes a built-in console that supports multiple IPython kernels, allowing for execution of code.

In addition, Spyder also provides a range of tools for scientific computation and data analytics, with support for NumPy and SciPy libraries, as well. Spyder also includes a profiler for analyzing the performance of Python code.

Overall, Spyder is a powerful and flexible IDE that is well-suited to the needs of scientific programmers and data scientists working with Python. Its range of advanced code analysis and debugging tools, as well as its support for scientific computing libraries and visualization tools, make it a popular choice for researchers and developers in this field.

2.3 Jupyter notebook:

Jupyter Notebook, formerly known as IPython Notebook is an internet-based interactive computing environment that lets you create and share documents containing live code, visualizations, and explanations. It supports multiple programming languages, including Python, and offers a flexible and powerful platform for data analysis, machine learning and scientific computing.

Jupyter Notebook's key features include its ability to combine code and documentation in a single document, which makes it easy to share and reproduce data analysis workflows. Its support for a variety of programming languages and frameworks, as well as its extensive library of extensions and plugins, make it a versatile and customizable platform for scientific computing.

2.4 Pycharm

PyCharm is an effective IDE for Python programming. It is developed by JetBrains, a company that specializes in creation of tools for developers. PyCharm offers a wide range of functionality and tools that can help you develop Python applications more effectively.

PyCharm also bids several web development tools, including support for popular web frames like Django and Flask. It also includes a built-in web server that can be used for testing web applications locally.

Along with its Python development features, PyCharm also supports other programming languages such as JavaScript, HTML, CSS and SQL. It a useful tool for full-stack development.

2.5 Atom

Atom is an open-source application developed by GitHub. It is designed to be highly customizable and modular with a variety of features and tools available. Atom is built on the Electron framework, which allows the development of desktop applications using web technologies such as HTML, CSS, and JavaScript.

Atom offers a wide range of features, including a customizable user interface, built-in package manager, and powerful search and replace tools. It also includes support for multiple panes and tabs, allowing users to work with multiple files and projects simultaneously.

Atom also offers a range of tools for code editing and debugging, including syntax highlighting, autocompletion, and a built-in debugger. It also includes support for Git and other version control systems, allowing developers to manage their code repositories directly from within the editor.

Overall, Atom is a flexible and customizable code editor that is well-suited to the needs of developers working on a wide range of projects. Its modular design, support for plugins and add-ons, and powerful search and replace tool make it a popular choice among developers looking for a versatile and customizable code editor.

2.6. Sublime Text

Developers frequently utilise the well-liked multiplatform text editor Sublime Text 3 for coding and programming jobs. It is known for its speed, flexibility, and broad spectrum of features, which can help developers work more efficiently.

One of the main features of Sublime Text 3 is its user interface, which is designed to be minimalistic and distraction-free. This can help developers focus on their code and avoid unnecessary clutter. Sublime Text 3 also has several customization options, such as customizable keyboard shortcuts and support for third-party plugins and packages.

Another useful feature of Sublime Text 3 is its multiple selection capability, which allows users to edit multiple lines of code at once. It also has a in-built command palette that provides quick access to frequently used commands and functions.

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 567

2.7. IDLE (Integrated Development and Learning Environment)

An Integrated Development Environment (IDE) for Python coding is referred to as IDLE (Integrated Development and Learning Environment). It is included with most Python installations, making it a popular choice for beginners and those who are just getting started with Python.

One of the main features of IDLE is its interactive shell, which allows users to enter Python commands and checks the results in real time. This can be a useful tool for testing and experimenting with code.
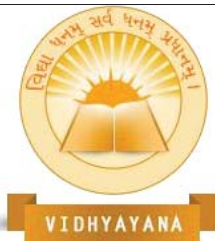
IDLE also has a code editor that provides basic syntax highlighting and indentation. It also includes a debugger that can help users identify and correct errors in their code.

Another useful feature of IDLE is its support for multiple windows. Users can open multiple code files and shell windows at the same time, which can help streamline the development process.

IV. RELATED RESEARCH WORK

Some related work that has been done on the comparison of Spyder, VSCode, and Jupyter Notebook includes:

1. Spyder vs PyCharm vs Jupyter Notebook: A Comparative Analysis" by Suraj Sharma, which compares Spyder, PyCharm, and Jupyter Notebook for scientific computing and data analysis. The author evaluates each editor's features, ease of use, and performance, and provides recommendations for different use cases.

2. "VSCode vs Spyder: A Head-to-Head Comparison for Data Science" by Rebecca Vickery, which compares VS Code and Spyder for data science tasks. The author evaluates each editor's features, debugging tools, and support for different data science libraries, and provides recommendations based on their strengths and weaknesses.

3. "Comparing the Top Python IDEs and Code Editors" by Mark Brown, which provides a comprehensive comparison of 10 Python IDEs and code editors, including Spyder, VS Code, and Jupyter Notebook.

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 568

These connected papers offer insightful analyses of each editor's advantages and disadvantages as well as suggestions for various usage scenarios.

V. PROS AND CONS OF EACH PYTHON EDITOR

Table 1, Pros and Cons of different python editors

Sr. No.	Python Editors	Pros	Cons
1.	IDLE	Comes pre-installed with Python, simple and easy-to-use interface, interactive shell for testing code, basic code editor, supports multiple windows	Limited features, lacks advanced tools and plugins.
2.	Atom	Highly customizable, supports a wide range of programming languages, built-in package manager, Git integration, multiple cursors, split panes	Can be slower and more resource-intensive than some other editors, may require more setup and configuration.
3.	Sublime Text	Fast and lightweight, customizable keyboard shortcuts, multiple selection capability, built-in command palette, advanced search and replace capabilities	Not free (although a trial version is available), lacks some advanced features found in other editors.
4.	PyCharm	Advanced code analysis and debugging tools, intelligent code completion, integrated development environment for web development with Django	Can be resource-intensive, not as customizable as some other editors.

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 569

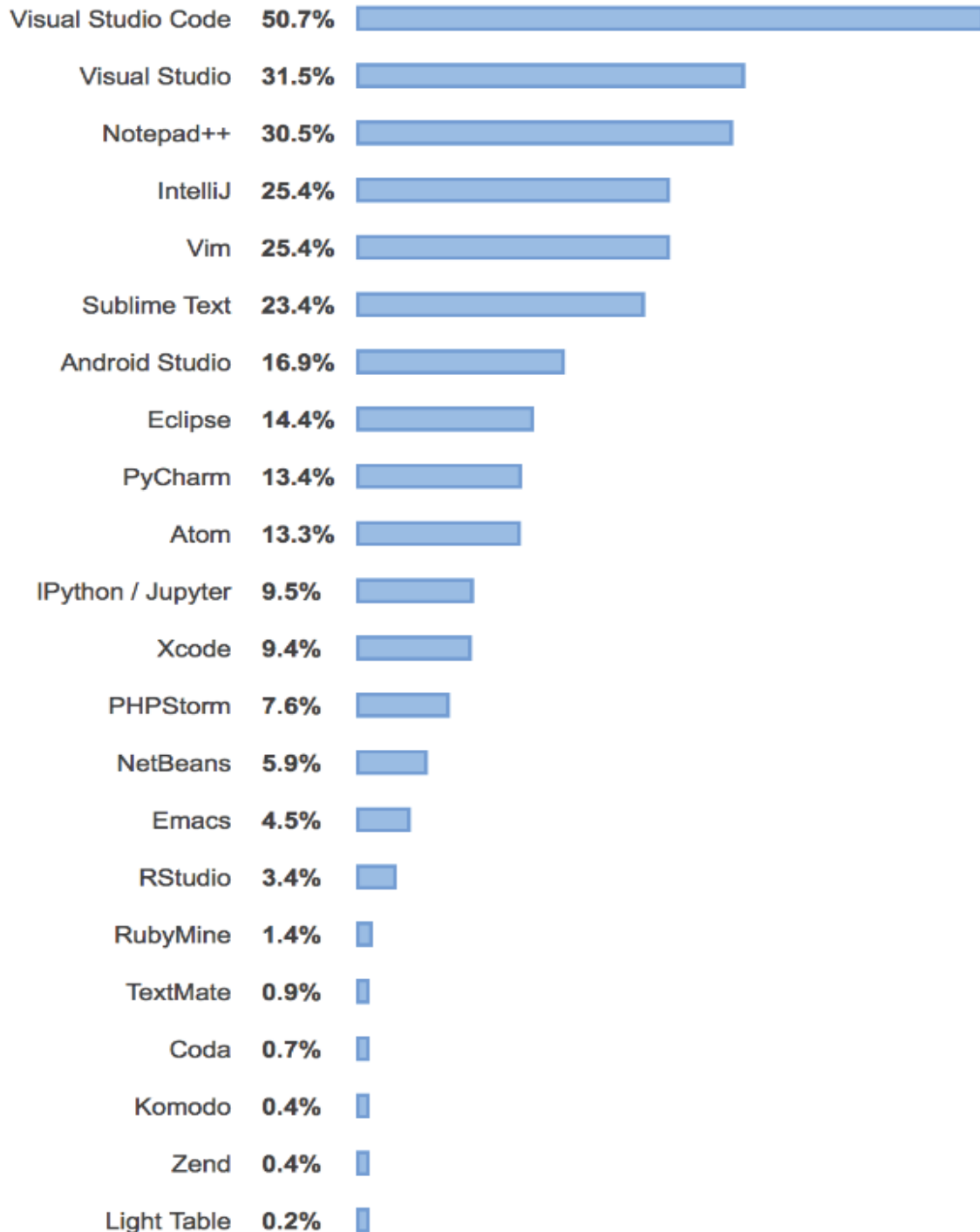|		and Flask frameworks, support for multiple languages, built-in Git integration	
5.	Jupyter	Multiple programming languages are supported by an interactive notebook interface that enables users to blend text, code, and visualisations in a single document. It also has built-in functionality for data analysis and visualisation.	Not designed for general-purpose text editing, can be less convenient for some programming tasks.
6.	Spyder	Designed specifically for scientific computing and data analysis, includes tools for debugging, profiling, and testing code, supports multiple languages and libraries.	Lacks some advanced features found in other editors, may not be as useful for non-scientific programming tasks.
7.	VSCode	Highly customizable, supports a wide range of programming languages, built-in debugger, Git integration, extension marketplace, IntelliSense for intelligent code completion, built-in terminal.	Can be slower and more resource-intensive than some other editors, may require more setup and configuration.

Editor	Percentage
Visual Studio Code	50.7%
Visual Studio	31.5%
Notepad++	30.5%
IntelliJ	25.4%
Vim	25.4%
Sublime Text	23.4%
Android Studio	16.9%
Eclipse	14.4%
PyCharm	13.4%
Atom	13.3%
IPython / Jupyter	9.5%
Xcode	9.4%
PHPStorm	7.6%
NetBeans	5.9%
Emacs	4.5%
RStudio	3.4%
RubyMine	1.4%
TextMate	0.9%
Coda	0.7%
Komodo	0.4%
Zend	0.4%
Light Table	0.2%

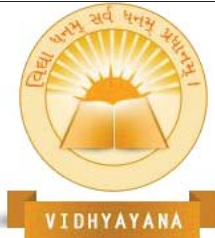**Fig 2, Most popular python editor**

VI. COMPARATIVE ANALYSIS BASED ON COMMON FACTORS

Table 2 Comparative Analysis on common factors

IDE	Type	Space required	Open source	Developed on	Cross platform
IDLE	IDE	361-427MB	Yes	Python	Yes
Atom	Text Editor	87-180MB	Yes	Electron, CoffeeScript, JavaScript	Yes
Sublime Text	Text editor	15.7MB	No	C++, Python	Yes
PyCharm	IDE	174-270MB	No	Java, Python	Yes
Jupyter	IDE	100-150MB	Yes	Python	Yes
Spyder	IDE	361-427MB	Yes	Python	Yes
VSCode	IDE	60 MB	Yes	TypeScript, JavaScript, CSS	Yes

VI. RESULT AND CONCLUSION

a. For those looking for a flexible and extendable editor, Atom is an excellent option because it is extremely customisable and supports a broad variety of programming languages. However, it can be slower and more resource-intensive than some other editors.

b. Sublime Text is fast and lightweight, with advanced search and replace capabilities, making it a good choice for those who need a powerful text editor. However, it lacks

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 572

some advanced features found in other editors and is not free.

c. PyCharm is a powerful IDE with advanced code analytics and debugging tools, making it a great choice for web development and more complex projects. However, it can be resource-intensive and may not be as customizable as some other editors.

d. VS Code is highly scalable and supports a wide range of programming languages, with built-in debugging and Git integration, making it a popular language. However, it can be slower and more resource-intensive than some other editors.

e. IDLE is a simple and user-friendly editor that is pre-installed with Python, making it a good choice for beginners or those who want a basic edition. However, it lacks advanced features and plugins.

f. Jupyter is an interactive portable interface that allows users to combine code, text and views into one document, making it a good choice for data analysis and visualization. However, it is not designed for general-purpose text editing.

g. Spyder is designed specifically for scientific computing and data analysis, with advanced tools for debugging, profiling, and testing code. However, it may not be as useful for non-scientific programming tasks and lacks some advanced features found in other editors.

h. To conclude, the choice of editor or IDE is dependent on the needs and preferences of the user. For general-purpose programming, Atom, Sublime Text, PyCharm, and VS Code are good choices, while IDLE and Jupyter are more suitable for beginners or those with specific needs. Spyder is a specialized editor designed for scientific computing and data analysis. Ultimately, the best editor is the one that meets the user's specific requirements and fits their workflow.

i. Beginners or those who are just starting to learn may find IDLE or Jupyter to be the easiest to use, while those who need advanced features and tools for web development or scientific computing may prefer PyCharm or Spyder. VScode, Atom, and Sublime Text are good choices for those who want a highly customizable and extensible editor with a wide range of features.

Volume 8, Special Issue 7, May 2023
4th National Student Research Conference on
"Innovative Ideas and Invention in Computer Science & IT with its Sustainability"

Page No. 573

REFERENCES

[1] Atom: A Hackable Text Editor for the 21st Century." Atom.io, 2021, atom.io.

[2] "IDLE - Python's Integrated Development and Learning Environment." Python Software Foundation, 2021, python.org.

[3] "Jupyter Notebook." Project Jupyter, 2021, jupyter.org.

[4] "PyCharm - The Python IDE for Professional Developers." JetBrains, 2021, jetbrains.com/pycharm.

[5] "Spyder - The Scientific Python Development Environment." Spyder IDE, 2021, spyder-ide.org.

[6] "Sublime Text - A sophisticated text editor for code, markup and prose." Sublime Text, 2021, sublimetext.com.

[7] "Visual Studio Code - Code Editing. Redefined." Microsoft, 2021, code.visualstudio.com.

[8] "The Best Python IDEs and Code Editors for 2021." Real Python, 2021, realpython.com.

[9] "10 Best Python IDEs and Code Editors." Towards Data Science, 2021, towardsdatascience.com.

[10] "A Review of 5 Popular Text Editors for Python Programming." DataCamp, 2021, datacamp.com.

[11] "Atom vs. Sublime Text: Which Editor Is Right for You?" SitePoint, 2021, sitepoint.com.

[12] "PyCharm vs. Spyder: What are the Differences?" Data Science Society, 2021, datasciencesociety.net.