Python Apps on Visual Studio Code

Develop apps and utilize the true potential of Visual Studio Code

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Dedicated to

My beloved wife:

Rupali

&

My son ***Ojass***

About the Author

Swapnil Saurav is a highly accomplished and versatile professional with over 20 years of experience in various industries, including CPG and Retail. Passionate about understanding customer challenges and driving business growth in competitive markets. Skilled in process consulting, market analysis, sales and marketing support, product development, customer service, and project management. Known for being a perceptive troubleshooter with a unique ability to solve large-scale problems using data analytics skills. Career progression includes roles in product development, value delivery in sales cycle, and IT operations. Strong educational background includes an MBA from S. P. Jain Institute of Management & Research and a Master of Science in Software Systems from BITS, Pilani.

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Preface

Welcome to the world of **Python Apps on Visual Studio Code**! In this book, we aim to provide you with a comprehensive guide on building Python applications using the Visual Studio Code editor. Python has gained immense popularity in recent years due to its simplicity, versatility, and an ever-growing community of developers. As a result, there has been a surge in demand for tools and editors that cater specifically to Python development.

Visual Studio Code, commonly known as VS Code, has emerged as one of the most preferred code editors for Python developers. Its lightweight nature, extensive customization options, and powerful features make it an ideal choice for anyone looking to write Python applications. Whether you are a beginner or an experienced Python developer, this book presents a step-by-step approach to using Visual Studio Code for Python development. We will cover essential concepts, techniques, and best practices that will empower you to build robust Python applications efficiently.

In this book, readers take their basic programming skills to more productive and delivering outstanding results and fully functioning applications using a rich tool, VS Code. This book helps lazy programmers skip the long learning hours and start being efficient and effective as a smart python developer.

In this book, the author covers practical teaching, how to use Python in developing desktop GUI applications, websites and web applications. You will explore VS Code and its capabilities. You will also get to know all the popular and high performing extensions available in VS Code. Furthermore, you will learn to work around various python high-performing libraries such as Flask, NumPy, Pandas, and others. You will come across how to code data structures and implement algorithms, how to configure web servers, how to add authentication to apps and various tools to improve the capabilities of your python apps.

Throughout this book, we have strived to provide practical examples, code snippets, and tips to help you grasp the concepts and apply them to your own projects. We believe that by the end of this book, you will not only have a solid understanding of Python development on Visual Studio Code but also be equipped with the necessary skills to build sophisticated Python applications.

We hope you find this book to be a valuable resource in your quest to become a proficient Python developer.

Happy coding!

Chapter 1: Introduction to VS Code - This chapter covers the basics of using Visual Studio Code, a popular and versatile code editor. Its features and functionalities, such as creating and managing projects, writing code, debugging, and integrating with other tools and extensions are covered. We also learn various tips and tricks to enhance productivity and efficiency while using Visual Studio Code for coding and development tasks.

Chapter 2: Setting up the Environment - covers the nuts and bolts of the VS Code environment and builds the first Python program. This chapter covers the installation of Python and VS Code, setting up the Python environment using Python extension, installing default extensions along with it, and learning about editing settings.

Chapter 3: Top Extensions in VS Code for Python - This chapter covers the top 10 popular extensions used by developers across the world and the powerful features of these extensions. Also, you will learn how to configure these Python extensions and the Python-specific settings, which can be edited in VS Code. This chapter also covers the installation of packages in Python. Python, and focuses focuses on how to create functions, modules, and packages for application development.

Chapter 4: Developing Visualizing Python App in VS Code - In this chapter, we will cover the Python concepts such as Numpy, Scipy, Pandas, and Matplotlib and work on data analysis. This chapter also introduces basic statistical concepts and focuses on how to plot using Matplotlib. The chapter then explains the practice of data analytics by analyzing sample datasets. This chapter also provides clear explanations and examples to help the reader understand these concepts and apply them in practice. Towards the end of the chapter, the authors guide the reader on how to use GitHub with VS Code.

Chapter 5: Developing Desktop Application using Database - In this chapter, the author discusses how Python applications can be used to create and manage databases for various purposes. Python's comprehensive object-oriented library and its ability to interface with popular database systems make it an ideal choice for the rapid development of database applications. This chapter emphasizes the importance of learning to use Python for database applications, an efficient tool for data analysis and processing. In the last part of the chapter, the author covers debugging in VS Code. Debugging helps identify potential performance issues and allows for code optimization.

Chapter 6: Advanced Algorithm Design - This chapter focusses on learning and using different algorithms. The following algorithms are covered in this chapter: Divide and conquer, Backtracking Binary tree, Heaps, Hash table, and Graph algorithm. This chapter discusses the concept of Big O notation, which is a way of measuring the complexity of an algorithm.

Chapter 7: Building Multithreading Application - This chapter provides an overview of the concept of threads and how they can be utilized to optimize the execution of multiple tasks simultaneously. This chapter discusses the threading module in Python

and its various components, such as threads, locks, and semaphores. It explains how to create and manage threads, as well as how to implement synchronization mechanisms to prevent data corruption and race conditions. The chapter also explores different threading techniques, including thread pooling and communication between threads.

Chapter 8: Building an Interactive Dashboard using Jupyter Notebook - This chapter introduces the process of developing a dashboard using Jupyter Notebooks on Visual Studio Code. This chapter explains how to set up the necessary environment and dependencies, including installing the Jupyter extension. The chapter also provides step-by-step instructions on creating a new Jupyter Notebook file within VS Code and importing libraries such as Pandas and Matplotlib for data manipulation and visualization. This chapter concludes with an example of creating a simple dashboard by analyzing and displaying data from a CSV file.

Chapter 9: Editing and Debugging Jupyter Notebook - This chapter provides a comprehensive guide for effectively editing and debugging Jupyter Notebooks using VS Code. By reading this chapter, you will understand various features and functionalities that VS Code offers for editing Jupyter Notebooks, such as cell manipulation, code execution, and markdown formatting. This chapter also covers debugging techniques, including setting breakpoints, inspecting variables, and using the built-in debugger in VS Code.

Chapter 10: Mastering Tkinter GUI Capabilities using VS Code - This chapter provides a comprehensive overview of Tkinter's GUI capabilities and demonstrates how to utilize them effectively using Visual Studio Code. The chapter begins with an introduction to the Tkinter library and its features and then dives into the process of building a graphical user interface using Tkinter in Visual Studio Code. The topics covered includes creating windows and frames, adding buttons and labels, using various widgets and layout managers, and handling events.

Chapter 11: Developing Flask-based Web Applications - In this chapter, we learned how to build web applications using the Flask framework provided by Python. The chapter covers a wide range of topics, from setting up a development environment and creating a basic Flask application to implementing authentication and authorization, handling forms, and database interactions. This chapter also provides clear explanations, step-by-step instructions, and practical examples, making it an invaluable resource for both beginner and experienced developers looking to build their own Flask-based web applications.

Chapter 12: Working with Containers in Azure - This chapter details the necessary steps for working with containers in Azure from Visual Studio Code using Python. By using the right tools and a bit of knowledge, developers can easily containerize their code in Azure. This chapter also covers deploying the Flask App developed in *Chapter 11* on Azure.

Code Bundle and Coloured Images

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Code Bundle and the ***Coloured Images*** of the book:

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Chapter 1
Introduction to VS Code

People don't buy what you do, they buy why you do it.
— Simon Sinek

Introduction

Welcome to the first chapter of this book, *Python Apps on Visual Studio Code*. You would have guessed correctly by now that we will build lots of Python applications in this book. But why Visual Studio Code or VS Code? The first step to learning any programming language is to pick a code editor and learn the tips and tricks to get the most out of your code editor. You will come across many code editors to program in Python from, but the most popular, and my favourite, is VS Code. Do not confuse VS Code with Visual Studio. VS Code is a free, open-source platform, and you will learn more about this editor in this chapter.

Over a decade ago, *Simon Sinek* in his TedTalk, had said, *People don't buy what you do, they buy why you do it*. It is stuck in my mind till today. So, the first thing we will talk about is why we should use VS Code for Python. Next, we will discuss what VS Code is and how to use it.

Visual Studio Code is an open-source code editor that is free to use and fully supports development in Python programming language. It has useful features, such as real-time collaboration with other programmers around the world. This chapter is meant to introduce VS Code to help you understand its development process and its different components.

This chapter is for readers who have not yet heard about VS Code and wonder why they should even consider it for their development work. This chapter will provide information about VS Code; we will discuss why it is probably the most popular code editor, look at its features, and discuss the different components of VS Code. We will look at the architecture of VS Code to understand why it is a perfect tool for software development needs and how a developer can quickly perform a code-build-debug cycle and leave more complex workflows to fuller featured IDEs, such as Pycharm or Visual Studio IDE.

Structure

We will be looking at the following topics in this chapter:

- Why use VS Code?
- What is VS Code?
  - VS Code: Context View
  - VS Code: Development View
  - VS Code: Functional View
  - Performance and Scalability
- VS Code vs Visual Studio

Now, let us dive deep into each of these topics.

Why use VS Code?

Visual Studio Code, or VS Code, is the best code editor by far for multiple reasons. As per the official documentation, VS Code provides *the delightfully frictionless edit-build-debug cycle means less time fiddling with your environment, and more time executing on your ideas*. In terms of the number of users, VS Code has the largest user base (December 2021, source: JetBrains/Python Software Foundation). *JetBrains,* along with Python Software Foundation, conducted a Python developer survey in which respondents were asked one question, 'What is the main editor you use for your current Python development?' More than 23,000 Python developers answered the survey. Around 35% answered VS Code, making it number one, ahead of PyCharm. One interesting finding was that the web developers preferred PyCharm and VS Code almost equally (about 39%), but data scientists preferred VS Code as their main editor. The result is represented in *Figure 1.1*:

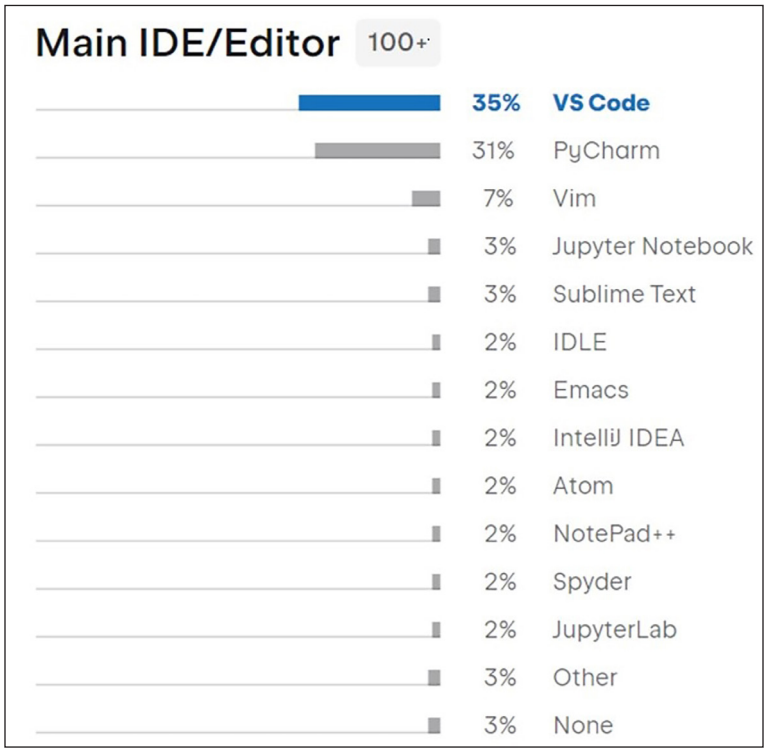

***Figure 1.1**: Main IDE/Editor (source: JetBrains/Python Software Foundation)*

According to a report published by Visual Studio Magazine (*visualstudiomagazine.com*, July 2022), the Python extension for Visual Studio Code has seen over 60 million installs, which is, by far, the highest number of installs. Jupyter has (40.8 million), Pylance (33.5 million), and Jupyter Keymap (23.4 million), with these extensions (also related to Python), taking the second, third, and fifth positions, respectively. But, this did not happen overnight. *Visual Studio Code, along with GitHub, Codespaces, and Azure Machine Learning, have been investing substantially into tools and platforms to make the lives of Python data scientists easier* (source: EuroPython show 2021). The amazing thing is that we will cover all these in the later chapters of this book, so rest assured that you will learn the best tools available today.

Let us look at some of its features and why it has become programmers' favourite code editor:

- It is a free open-source (under the MIT License) cross-platform application.
- It is easy to use.
- It is a lightweight, fast but powerful source code editor.
- It can be integrated with scripting tools and perform common tasks like developing everyday workflows.

- It comes with built-in support for tools like IntelliSense code completion, code refactoring, parameter hints, multi-cursor editing, and rich semantic code understanding, which takes programming to the next level. For example, if the user forgets to declare a certain variable before being used in the program, intelli-sense will declare that variable. A sample screenshot is shown in the *Figure 1.2*:

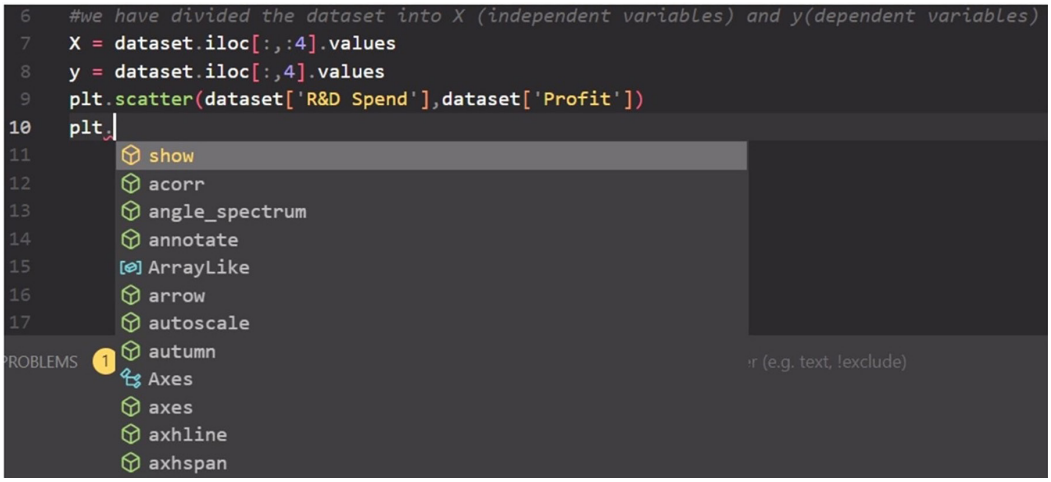

***Figure 1.2**: Auto completion in VS Code using Intelli-Sense*

- It has an integrated interactive debugger, which helps step through the code, inspect values of variables, and view call stacks. It can also execute commands in the console. *Figure 1.3* shows the various options of integrated interactive debugger marked on the image:

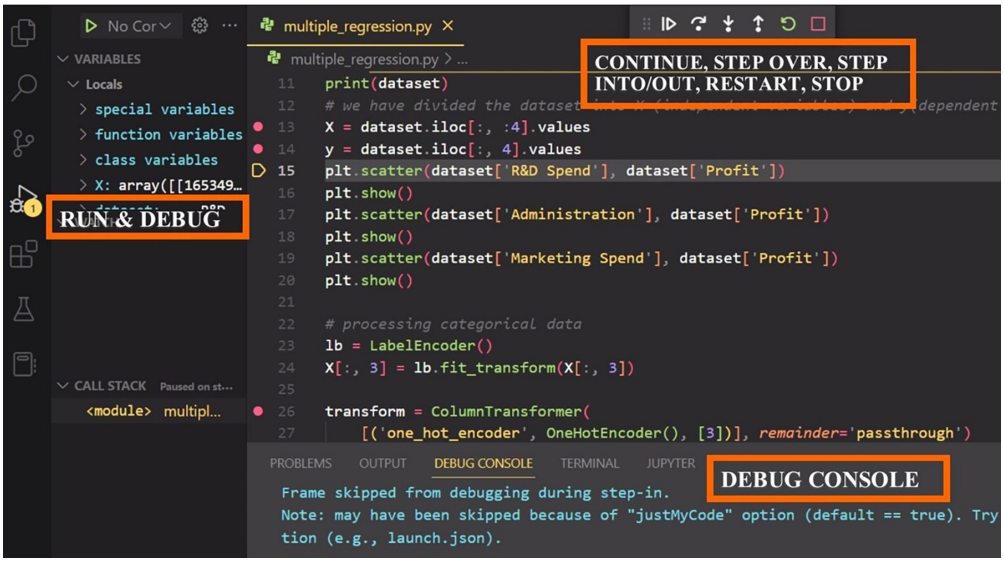

***Figure 1.3**: Debugging in VS Code*

- It runs on a desktop and is available for Windows, macOS, and Linux. Earlier, editors used to support one of the operating systems, Windows, Linux, or Mac. But VS Code is cross-platform, so it can easily work on all three platforms.
- It is fully customizable to fit any developer's preferences and project requirements.
- It has great support from the community and tons of extensions. So, if a programmer cannot find support for a given programming language, they can easily download the extension and continue working.
- It has built-in support for web programming languages like JavaScript, TypeScript, and Node.js. It also has an ecosystem of extensions for multiple other languages and runtimes, such as C++, C#, Java, Python, PHP, Go, and .NET. These are just a few of more than 30 languages that are supported. This has another advantage here; VS Code can easily detect if there is any fault in the cross-language reference.
- It can be configured to anybody's liking through its various settings: language, user, and workspace. Several scopes for settings are provided by VS Code, which enables us to modify almost every part of Code's editor, user interface, and functional behavior.
- It provides comprehensive facilities to computer programmers to be instantly productive with features like syntax highlighting, bracket-matching, auto-indentation, box-selection, snippets, and many more.
- It has support for Git, which means the programmers can work with source control without leaving the editor, even for viewing pending changes differences.
- It supports multiple projects. It is possible to work with projects containing multiple files/folders that can be opened simultaneously. These projects or folders can even be unrelated to each other.
- It provides an ides inbuilt terminal/console, so the user need not switch between VS Code and command prompt or terminal.
- It is liked by front-end and back-end developers because of the multiple language support. Along with this, common zoom-in, zoom-out, brightness, and theme selection features are also available.
- It is updated monthly with new features and bug fixes.

What is VS Code?

Now, let us understand why VS Code is probably a better choice among all the code editors available right now. First, it is free to use and has very useful features that fully featured IDEs generally have. It enables a programmer to write code, debug, and autocomplete or correct the code. It is difficult for a code editor to have such features, but since VS Code has Intelli-sense integrated with itself, it makes this possible. In this section, we will learn