

Python for Modeling, Machine Learning & Design

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Purpose of Lecture

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- A guide and a description of the software suite for this course. You will learn where they are located and the different ways to get your copy and install on your system.
- The minimum hardware requirements to install the software.
- Integration and preparation for the lectures. Things to do before and after each lecture.

Fusion 360

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- This is the design environment we will use for the course. This course is not primarily to teach you Fusion 360. You may take another course for that purpose.
- We shall know and apply enough Fusion 360 to learn to use its API to create graphical objects and learn Python in the process.
- If you already know Fusion 360, you are at an advantage. If not, it is an exciting opportunity to learn as we move along.

System requirements for Autodesk Fusion 360	
Operating System	Apple® macOS™ Catalina 10.15; Mojave v10.14; High Sierra v10.13 (learn more about Apple Security Updates)* Microsoft® Windows® 8.1 (64 bit) (until January 2023)** Microsoft Windows Windows 10 (64-bit) Semi-Annual Release Channel
CPU Type	64-bit processor (32-bit and ARM not supported), 4 cores, 1.7 GHz Intel Core i3, AMD Ryzen 3 or greater
Memory	4 GB of RAM (integrated graphics recommend 6 GB or more)
Graphics Card	Supported for DirectX 11 or greater Dedicated GPU with 1 GB or more of VRAM Integrated graphics with 6 GB or more of RAM
Disk Space	3 GB of storage
Display Resolution	1366 x 768 (1920 x 1080 or greater at 100% scale strongly recommended)
Pointing Device	HID-compliant mouse or trackpad, optional Wacom® tablet and 3Dconnexion SpaceMouse® support
Internet	2.5 Mbps or faster download; 500 Kbps or faster upload

System Requirements

- Of the three software systems, Fusion 360 has the highest system specs. Any computer that can run Fusion 360 will be good enough for the others
- The previous page contains the specs that your computer needs to meet in order to work with the software for this course

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- Python is perhaps the most popular beginner's language in the market today. It combines the best practices in Object-Oriented Programming in a rich function-driven environment. The results are as follows:
 - You can create simple scripts and applications without needing to get too deeply into the Object Model.
 - The Object model is there all along and you can create advanced applications that are fully Object-Oriented.
 - It has a huge array of libraries for most Scientific, Graphical and Artificial Intelligence applications.
- If you do these things outside of Python, you are probably working harder than you need to!

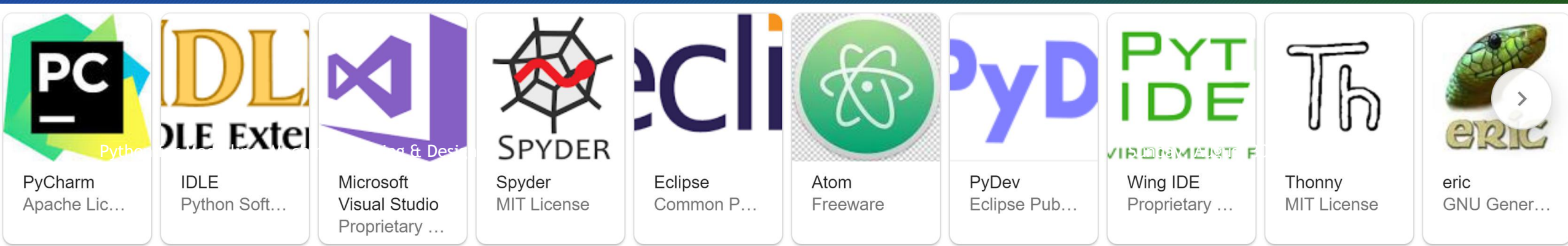
Minimum Hardware & Data Requirements

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- To properly follow the course and to install the three software: Python, Fusion 360 and Visual Studio Code, the following specs are recommended:
 1. 64-bit System
 2. Windows 10 or Linux or Apple Mac
 3. A good data service for downloading and Zoom lectures.

Visual Studio Code

- There are many ways to interact with the Python language.
 - The Command-Line, REPL or IDLE is often used in introductory courses.
 - The Integrated Development Environments, IDEs. The figure below is certainly not exhaustive. Many provide excellent fully integrated development systems to write, debug and run your code. We will focus on only one.
- The Visual Studio Code is the choice for this course
 - it is only here that you can integrate not only the coding, debugging and execution of your code, but the Fusion 360 API environment as well.



Fusion 360 Acquisition/Installation

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- The three software suites we use for this course can be acquired online. Fusion 360 retails for US\$495.00 per year. As a student, you can get a free copy that comes with credits for using their cloud facilities.
- Visit their [Educational Page](#) and follow the instructions that apply to you. There are several interesting software you are presented with. The one for this course is Fusion 360.

Install Python

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- We describe here the simplest way to go about things here. There are other methods, but time does not permit exhaustive treatment.
 1. Install Python by visiting python.org look for Downloads there and find version 3.7.6 It is not the most recent version, but it is the one tested to work with the other software we will integrate with it.
 2. You may also install the latest if you want as the Visual studio Code IDE allows you to specify the version of Python you want to run a project on. It is therefore possible to have several versions at the same time.

Install Visual Studio Code

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- Get the Visual Studio Code installed from the organization that produces it: <https://code.visualstudio.com/download>.
- It is easy and quick to complete the installation. The [download link](#) is shown above.
- We have tested all these on the 64-bit Windows 10 machine. Please select these options and make sure that you have a system that can handle it.

Install Python and Visual Studio Code, Cont'd

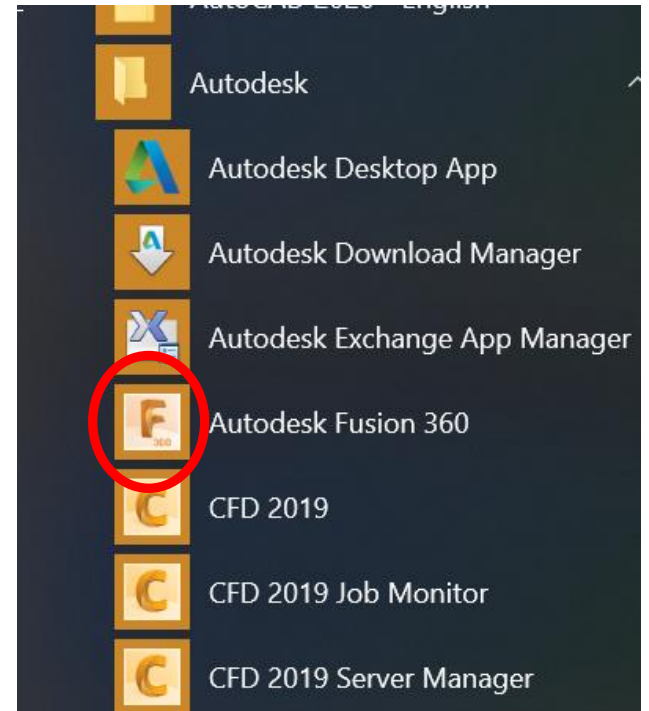
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- Do this installation by yourself.
 - There are people making YouTube videos for these. Use them if you care to.
 - Took only like 10 minutes for both installed and they are simple to follow.
- Make sure you read the instructions
 - Accept that either code places itself on the search path of your computer logic. After installation, restart your computer to activate the “Path”. This way, they will be able to find each other. Fusion 360 will find VSC on its own
 - Fusion 360 automatically defaults to using visual studio code. More fanciful environments such as PyCharm, Anaconda Studios can be used for this. But, if you want the easy way to do things, Use Visual studio code.

- Fusion 360 is a general-purpose design tool that can be specialized to most graphical creation needs.
- Our purpose here is to use its geometric capabilities to give visual and concrete demonstrations of many of the programming abstractions in Python. You will become familiar with the graphical tools and can use its GUI directly in due course.
- We will also use the Applications Programming Interface to create graphics using Python. The two methods will show us the practical aspects of our coding in concrete ways.

Launch Fusion 360

- You can launch Fusion 360 from your windows menu list or from the task bar, depending on the way you are setup.
- You can also launch from your start-up menu if you created an icon for it in that.
- In whatever way you choose, the first thing to do is to look for the Fusion 360 icon (circled in red), select by clicking on it.



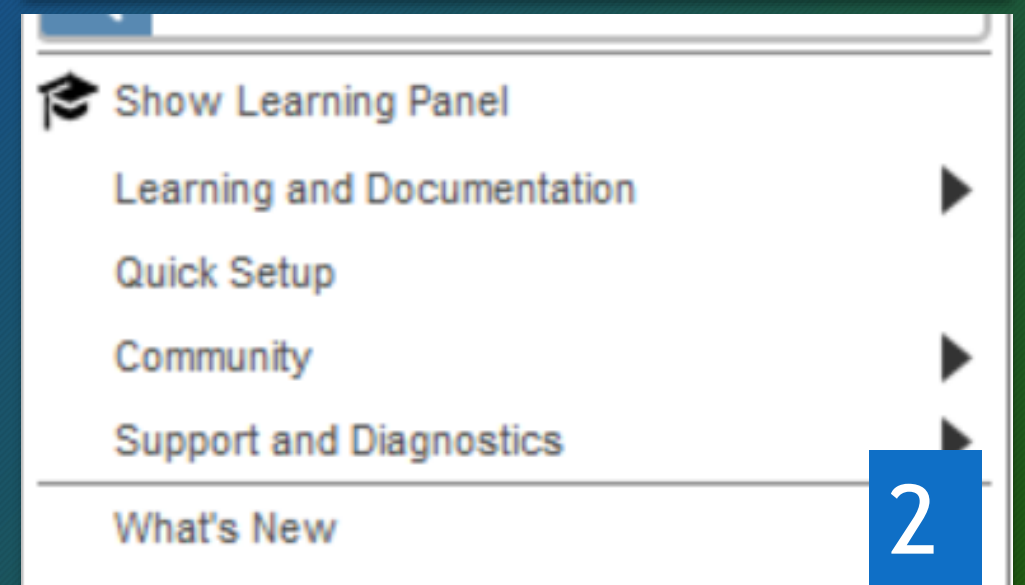
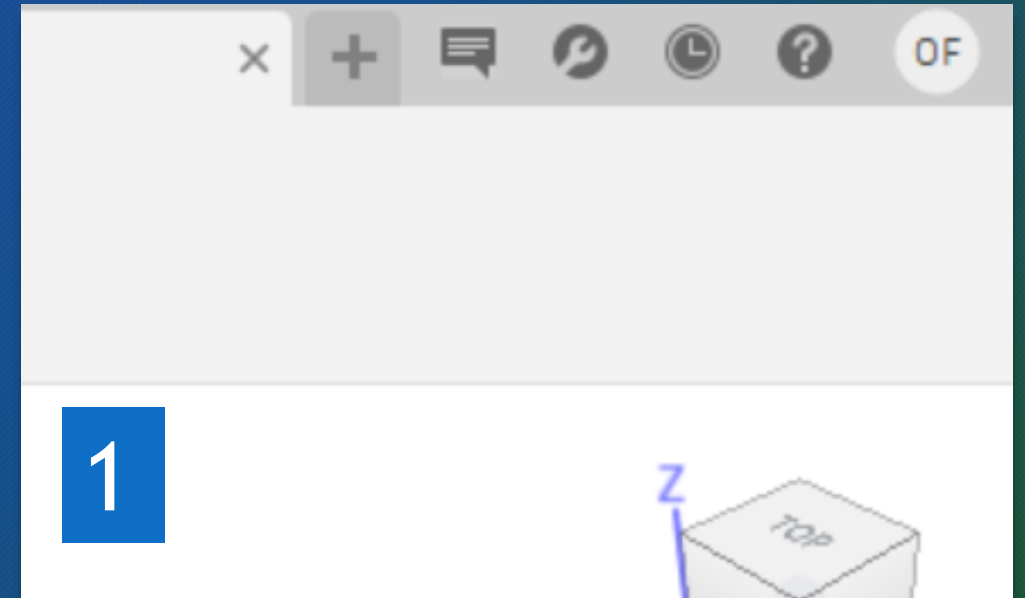
Fusion 360 Learning Resources

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- For those that have no background in Fusion 360, the best preparation for the first Python lecture is to become familiar with the graphical environment of Fusion 360.
- Two of the many ways to get to the learning resources are
 1. Navigate to Learning resources from within Fusion 360, immediately after launching the software as shown in previous slides, and
 2. Moving to the learning resources directly from your web browser.

Inside Fusion 360

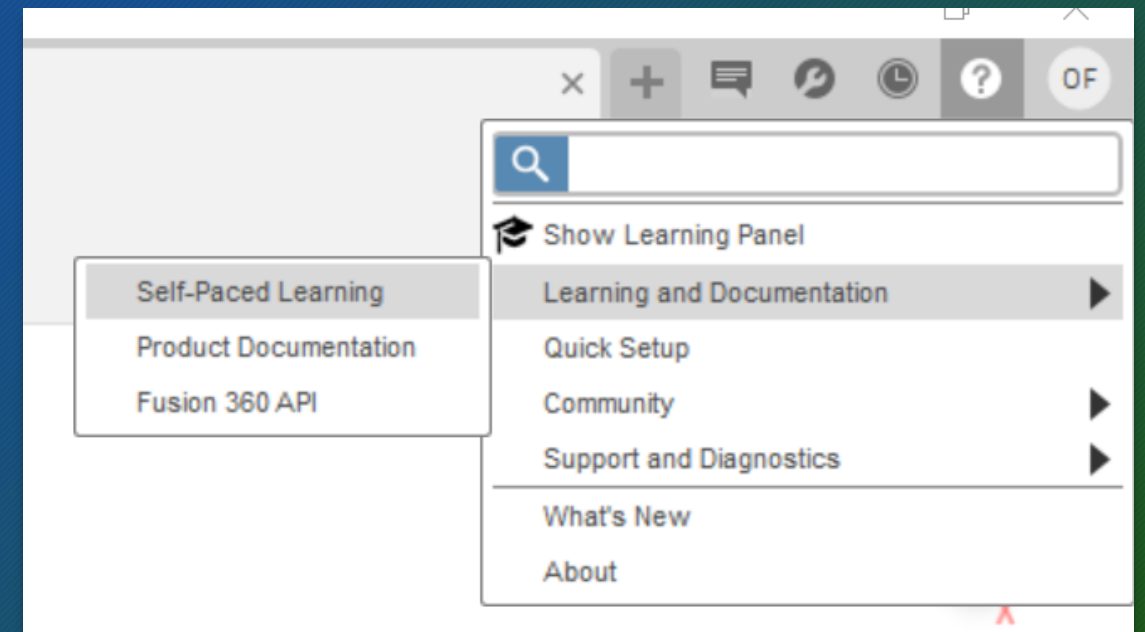
- After launching Fusion 360, on the top right corner of your screen, observe the following:
 1. The viewcube that allows you to look at your model in different views and directions Screen #1.
 2. Five or more icons above the cube itself. The rightmost of these icons has either your initials or your picture and the penultimate has a **question mark, ?**
 3. Clicking on this **?** takes you to the drop down in #2



Learning & Documentation

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- Select the drop down called **Learning and Documentation** and you should see this list of three options the first of which is **Self-Paced Learning** as shown on your right here.
- When you choose it, you will be taken out of Fusion 360 back into your web browser and the learning videos will be available to you.

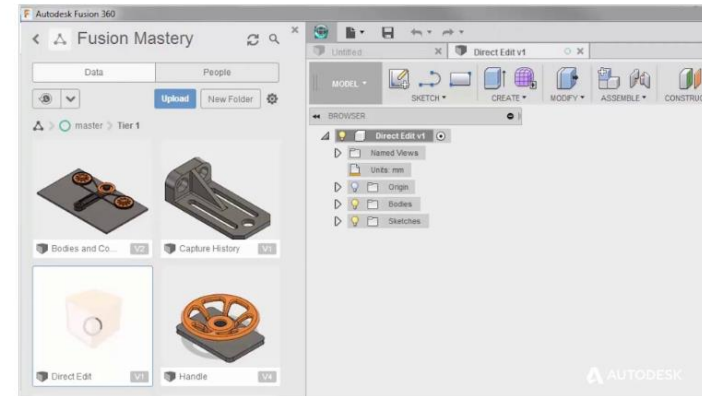


Getting Started for Absolute Beginners

- The first item on your landing with your browser is titled Getting Started for Absolute Beginners.
- There are 16 video lessons. If you can invest 20 minutes of your time before starting lectures on Wednesday, you could go through the **first three** of these videos.
- Click **Start Learning** as circled in red
- You will be happy you did because the product creators are giving you the definitive introduction to the environment. Please try to do this. If you have specific questions, we shall attend to them on our website.

Getting started for absolute beginners

To better align the Fusion 360 learning experience, we've moved the **Fusion 360 for Designers** and **Fusion 360 for Absolute Beginners** to the Design Academy.

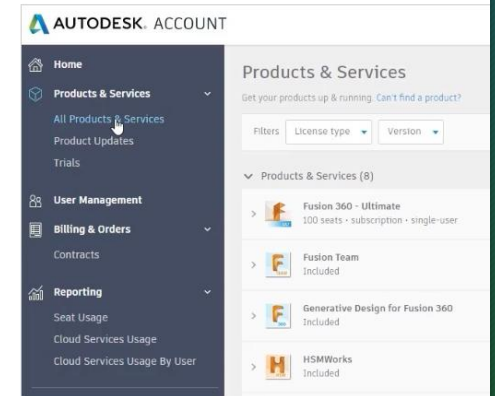


Getting started in Fusion 360

- 16 lessons
- Beginner
- Course

It's important to have a good understanding of 3D modeling as you make your first design. This two hour course explores the core concepts of Fusion 360 with a series of lectures and tutorials.

[→ Start learning](#)



Administration and Fusion Team

- 5 lessons
- Beginner
- Course

This course covers what you need to know about your subscriptions and manage a Fusion Team.

[→ Start learning](#)

Directly from your Browser

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- You can reach these lessons without first invoking Fusion 360. Get there [directly by clicking on this link](#)
- Please press the Ctrl key while clicking on the link. You are, once again, right at the videos introducing Fusion 360 to absolute beginners.
- Most of the issues that confuse new users are thoroughly dealt with in these videos. We save a lot of time and get much more done when learners are already familiar with these things.

Current Version of Python

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- Sometimes, Fusion 360 does not work well with the very latest release of the Python Interpreter. You may need to install an older version.
- Navigating in your browser to www.python.org takes you to a page like we show here. You can see that the latest version is 3.8.5.
- If you click the big yellow download button, you will get the latest. Not a bad idea.



The screenshot shows the Python.org website. At the top left is the Python logo and the word "python" with a trademark symbol. To the right is a yellow "Donate" button and a search icon. Below the logo is a navigation bar with four buttons: "About", "Downloads", "Documentation", and "Community". The "Downloads" button is highlighted. Below the navigation bar is a large yellow button that says "Download Python 3.8.5". Underneath this button is the text "Looking for Python with a different OS? Python for [Windows](#), [Linux/UNIX](#), [Mac OS X](#), [Other](#)".

Older Versions of Python

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- We are sure that Python 3.7.6 will work with Fusion 360. To download this version, **do not** click the **big Yellow** button, Instead, select the link circled red in the picture
- This will give you many other versions of Python and you can download the windows version of 3.7.6 by scrolling down until you see it.



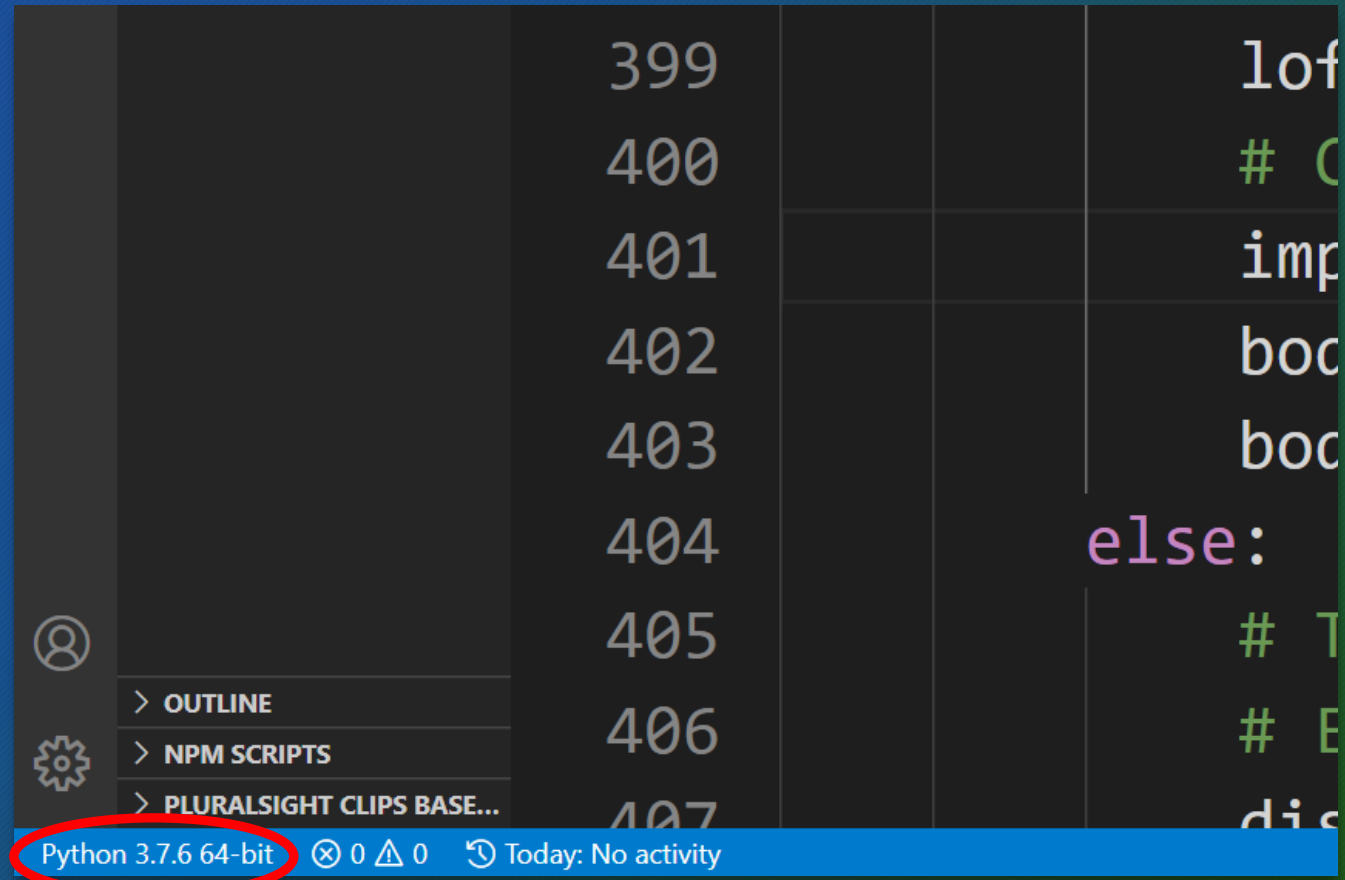
Setting Versions in Visual Studio Code

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- The **Visual Studio Code** Integrated Development Environment, IDE is capable of hosting multiple programming languages as well as different versions of the same language. Python is not an exception.
- Let us assume that you have more than one version of Python, there are several ways to make a particular version current.
- We present one easy way to do this for our purpose.

Setting Python to Version 3.7.6

- Your Visual Studio Code Screen has a blue bar at the lower end. The left side of this bar may look like what we have here.
- You can see that my Python version is set to 3.7.6 64 bit. But I have other versions on my computer.
- How do I change this setting and point to a different version?
- The thing to do is to simply use your mouse button to click on the Python version on this bar and you will see ...




```
current: C:/Users/oafak/AppData/Local/Autodesk/webdeploy/production/b5edf6a9efeacc46b6646b3!
```

```
Python 3.7.6 64-bit ('base': conda)
```

```
D:\Conda\python.exe
```

```
Python 3.7.6 64-bit
```

```
~\AppData\Local\Autodesk\webdeploy\production\b5edf6a9efeacc46b6646b394c91bddfaa2f2d05...
```

```
Python 3.7.7 64-bit
```

```
~\AppData\Local\Programs\Python\Python37\python.exe
```

```
Python 3.8.3 64-bit ('SciFic': conda)
```

```
D:\Conda\envs\SciFic\python.exe
```

Changing Python Versions

A pop-up screen will appear on your screen like the one I am showing you here:

Simply pick what you want and you are good to go!

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