



STACUP-2023



Hands-On
Session-1

Python Based Statistics and its Application in Astrophysics & Cosmology

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Dept of Physics and Astrophysics,
University of Delhi, Delhi-110007

Date: October 16 2023

Structure

```
graph TD; Structure[Structure] --> Python[Python]; Structure --> Statistics[Statistics]; Structure --> Cosmology[Cosmology];
```

Python

Statistics

Cosmology

Python:

- Introduction
- Installations
- Comments Variable
- Vectors, Matrices and Multidimensional Arrays
- Conditional Statements, Loops
- Functions
- Plotting and Visualizations
- Integrations

Statistics:

Statistics:

- Random Numbers Generators
- Distributions
- Parametric Regression Analysis
- Maximizing Likelihood
- Bayesian Statistics
- Markov Chain Monte Carlo [MCMC]
- MCMC Samplers

Cosmology: Observational Datasets

Cosmology: Observational Datasets

- Cosmic Chronometers- $H(z)$: **Standard Clocks**
- SNe Ia-Luminosity Distance: **Standard Candles**

Part-I

Python

Introduction:

Python

High-level, interpreted, interactive, and object-oriented programming language.

Features:

- Open Source
- Accessible
- Versatile
- Powerful

Introduction:

Python

High-level, interpreted, interactive, and object-oriented programming language.

Features:

- Open Source
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- Versatile
- Powerful
- Free 🕶️

Installation:

Python

Installation:

Python

Source: I

Installation:

Python

Source: | Python Software Foundation:

Installation:

Python

Source: | Python Software Foundation:

Go to: <https://www.python.org/>



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```
# Python 3: Simple arithmetic
>>> 1 / 2
0.5
>>> 2 ** 3
8
>>> 17 / 3 # classic division returns a float
5.666666666666667
>>> 17 // 3 # floor division
5
```

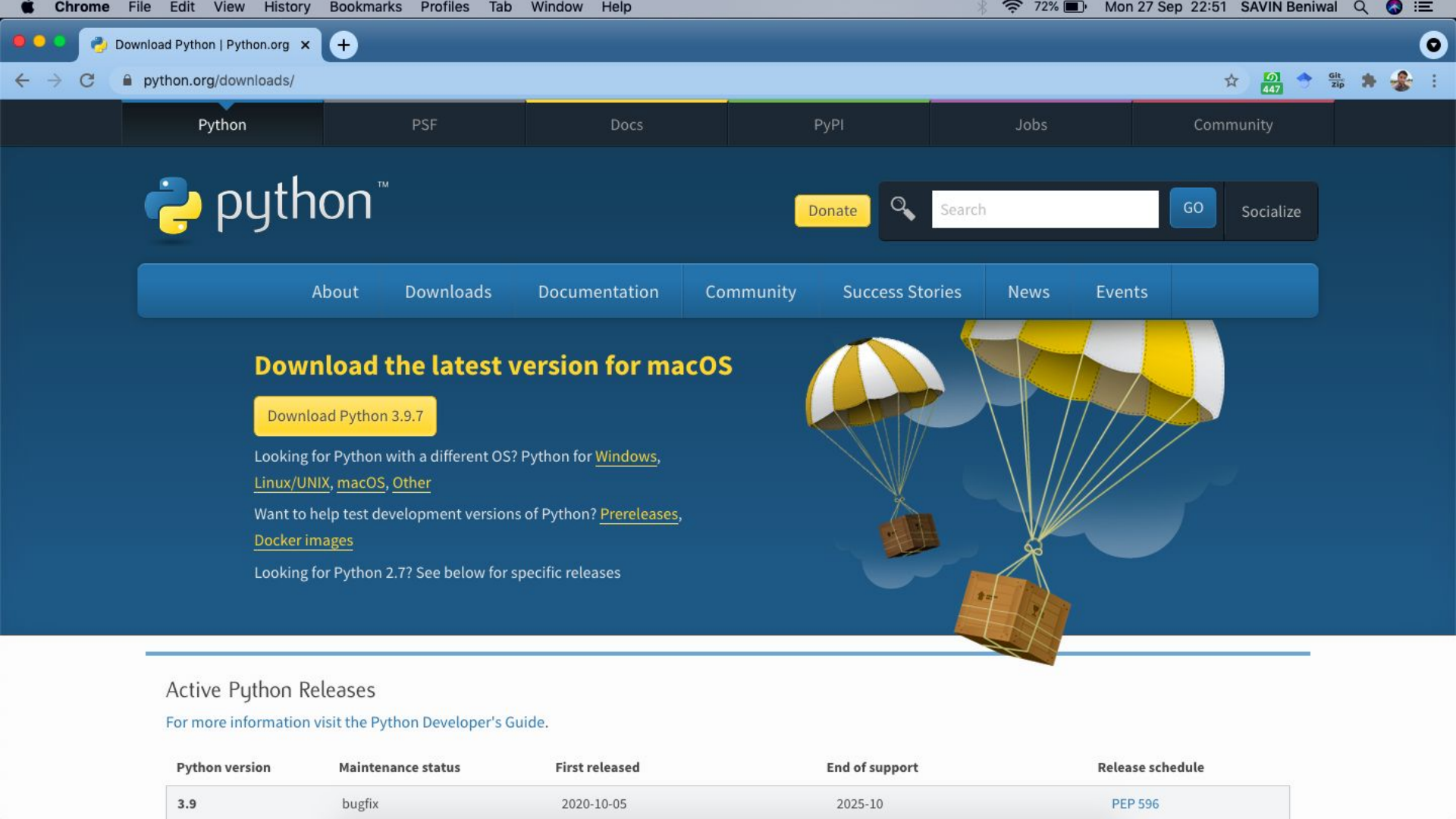


Intuitive Interpretation

Calculations are simple with Python, and expression syntax is straightforward: the operators `+`, `-`, `*` and `/` work as expected; parentheses `()` can be used for grouping. [More about simple math functions in Python 3.](#)

1 2 3 4 5

Python is a programming language that lets you work quickly and integrate systems more effectively. [>>> Learn More](#)



Download the latest version for macOS

Download Python 3.9.7

Looking for Python with a different OS? Python for [Windows](#),

[Linux/UNIX](#), [macOS](#), [Other](#)

Want to help test development versions of Python? [Prereleases](#),

[Docker images](#)

Looking for Python 2.7? See below for specific releases

Active Python Releases

For more information visit the [Python Developer's Guide](#).

Python version	Maintenance status	First released	End of support	Release schedule
3.9	bugfix	2020-10-05	2025-10	PEP 596

Installation:

Python

Source: II

Installation:

Python

Source: II Anaconda

Installation:

Python

Source: II Anaconda: Go to-<https://www.anaconda.com/>

Data science technology for a better world.

A movement that brings together millions of data science practitioners,
data-driven enterprises, and the open source community.

Get Started



Anaconda Installers

Windows

Python 3.8

64-Bit Graphical Installer (477 MB)

32-Bit Graphical Installer (409 MB)

MacOS

Python 3.8

64-Bit Graphical Installer (440 MB)

64-Bit Command Line Installer (433 MB)

Linux

Python 3.8

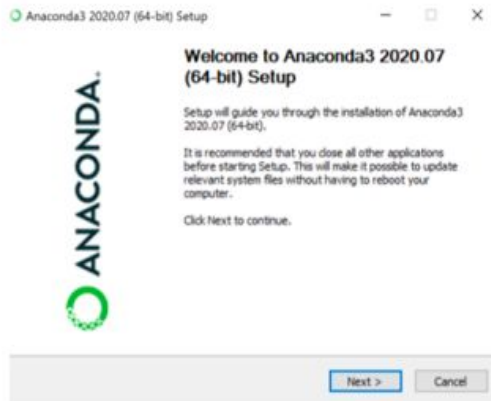
64-Bit (x86) Installer (544 MB)

64-Bit (Power8 and Power9) Installer (285 MB)

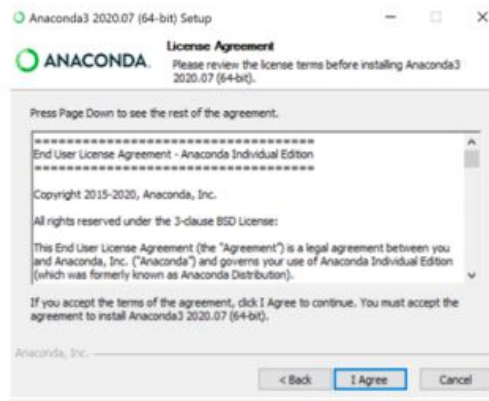
64-Bit (AWS Graviton2 / ARM64) Installer (413 M)

64-bit (Linux on IBM Z & LinuxONE) Installer (292 M)

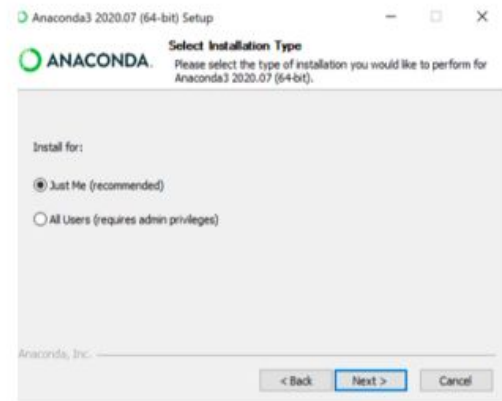
(a) Welcome Screen



(b) Read/accept license agreement

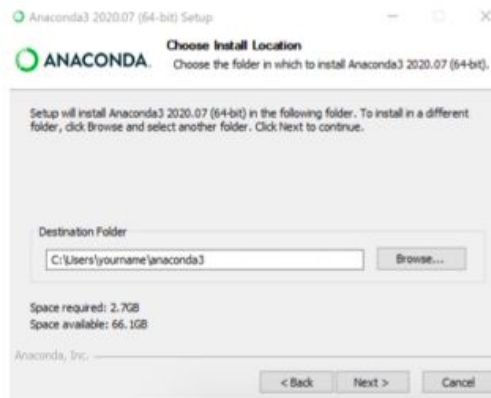


(c) Installation type

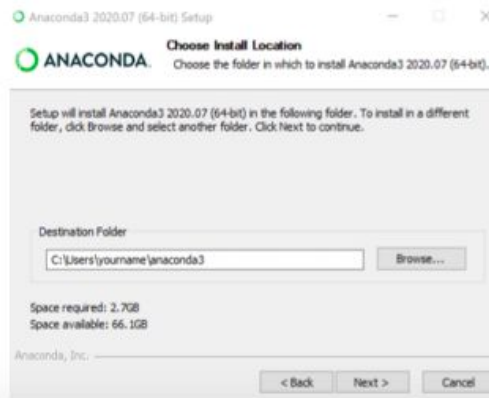


Installation in Windows:

(d) Choosing location for installation



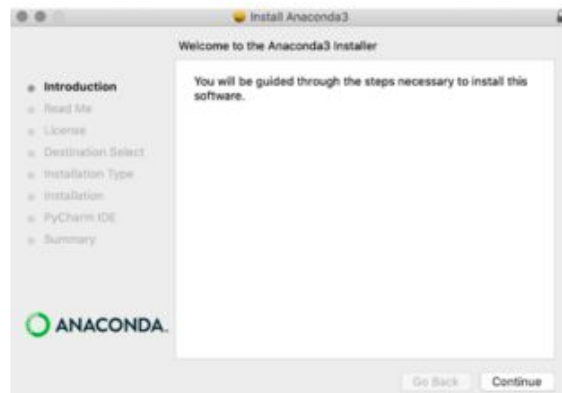
(e) Advanced installation options



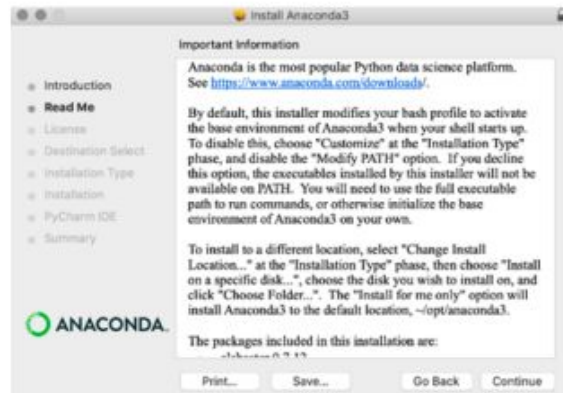
(f) Finish installation and close wizard



(a) Welcome Screen



(b) Read/accept license agreement



(c) Installation type



(d) Choosing location for installation

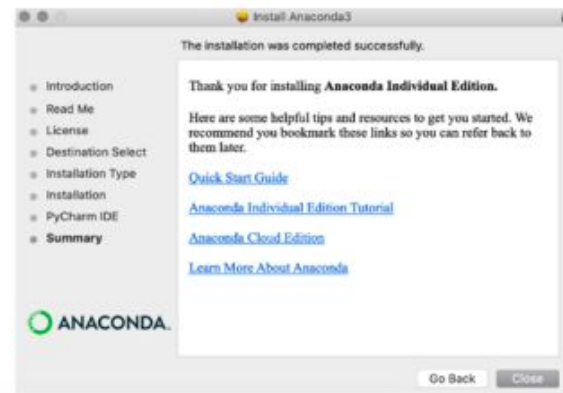


Installation in MacOS:

(e) Advanced installation options



(f) Finish installation and close wizard




[Home](#)

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Applications on

base (root)

Channels



JupyterLab

1.2.6

An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.

Launch



Notebook

6.0.3

Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.

Launch



Qt Console

4.7.3

PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.

Launch



Spyder

4.1.3

Scientific PYTHON Development Environment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features

Launch

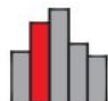


VS Code

1.45.0

Streamlined code editor with support for development operations like debugging, task running and version control.

Launch



Glueviz

0.15.2

Multidimensional data visualization across files. Explore relationships within and among related datasets.

Install



Orange 3

3.23.1

Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.

Install



RStudio

1.1.456

A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks.

Install

[Documentation](#)

[Developer Blog](#)

Installation:

Python

Source: II Anaconda

- Spyder

Installation:

Python

Source: II Anaconda

- Spyder
- Jupyter Notebook

Installation:

Python

Source: II Anaconda

- Spyder
- Jupyter Notebook
- JupyterLab

Installation:

Python

Source: III

Installation:

Python

Source: II Google Colab

Hands-on Sessions will be performed on Google Colab!

Installation:

Python

Source: II Google Colab

- First create a Google account.

Installation:

Python

Source: II Google Colab

- First create a Google account.
- Login into Google account.

Installation:

Python

Source: II Google Colab

- First create a Google account.
- Login into Google account.
- Type Colab in Google Search bar

colab - Google Search

google.com/search?q=colab&sca_esv=573626709&sxsrf=AM9HkKnMOnl8TVDr33Qcm5pecSMGG5uuXw%3A1697390322022&source...

Google

colab

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About 13,00,00,000 results (0.23 seconds)

Google Research

https://research.google.com › collaboratory

Welcome To Colaboratory

With Colab you can harness the full power of popular Python libraries to analyze and visualize data. The code cell below uses numpy to generate some random data ...

Google Colab Notebook · Colab Pro · Cancel your subscription · Local runtimes

colab.google

https://colab.google

Google Colab

Colab is a hosted Jupyter Notebook service that requires no setup to use and provides free access to computing resources, including GPUs and TPUs.

Google Colab notebooks

https://colab.research.google.com › notebook


Google Colab

Sign in.

Videos

Google Colab Tutorial for Beginners | What Is Google Colab ...


Colab




Colab is the commonly used abbreviation of the New York City artists' group Collaborative Projects, which was formed after a series of open meetings between artists of various disciplines. Wikipedia

Founded: 1978


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The Times Square Show



ABC No Rio



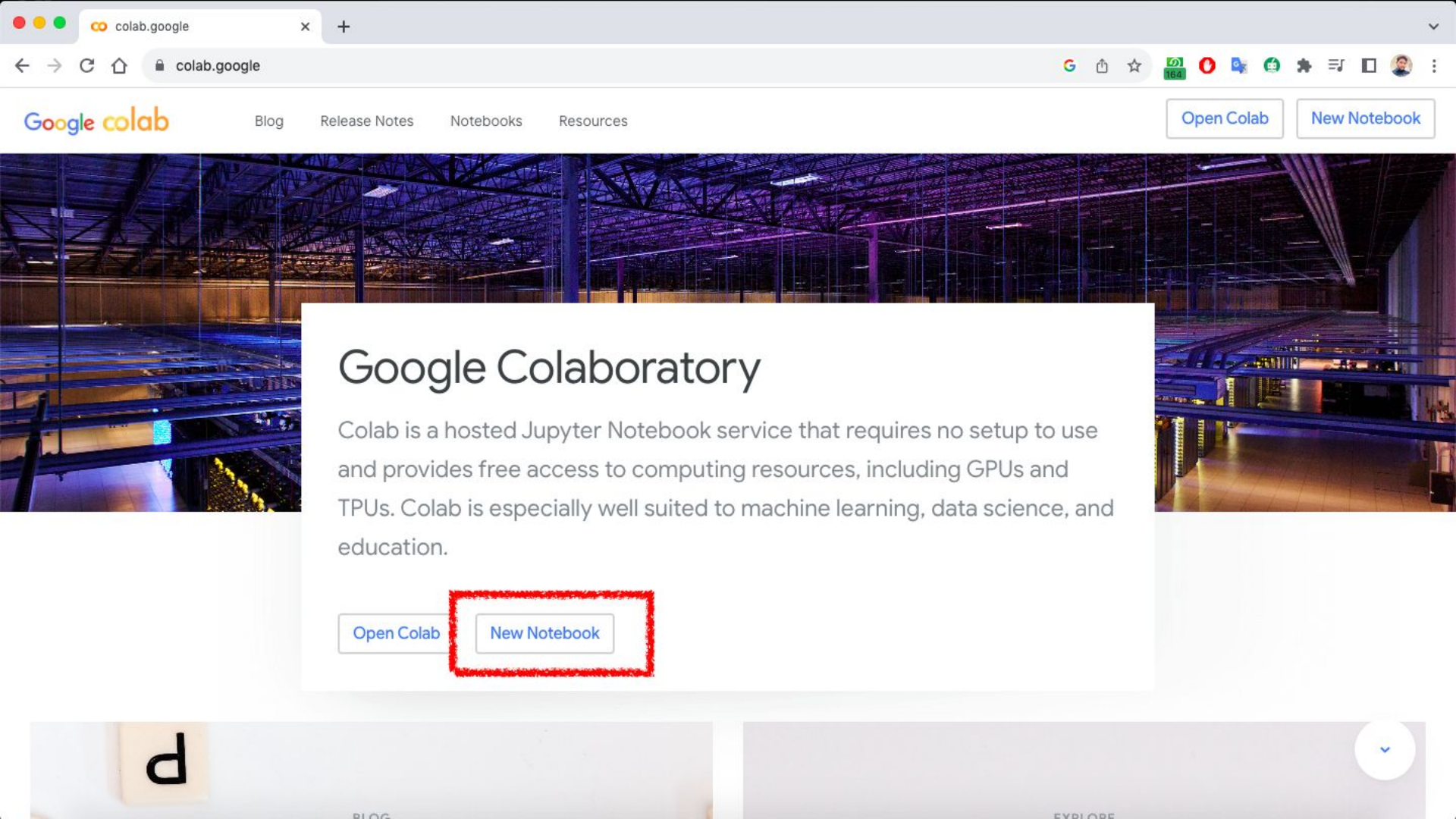
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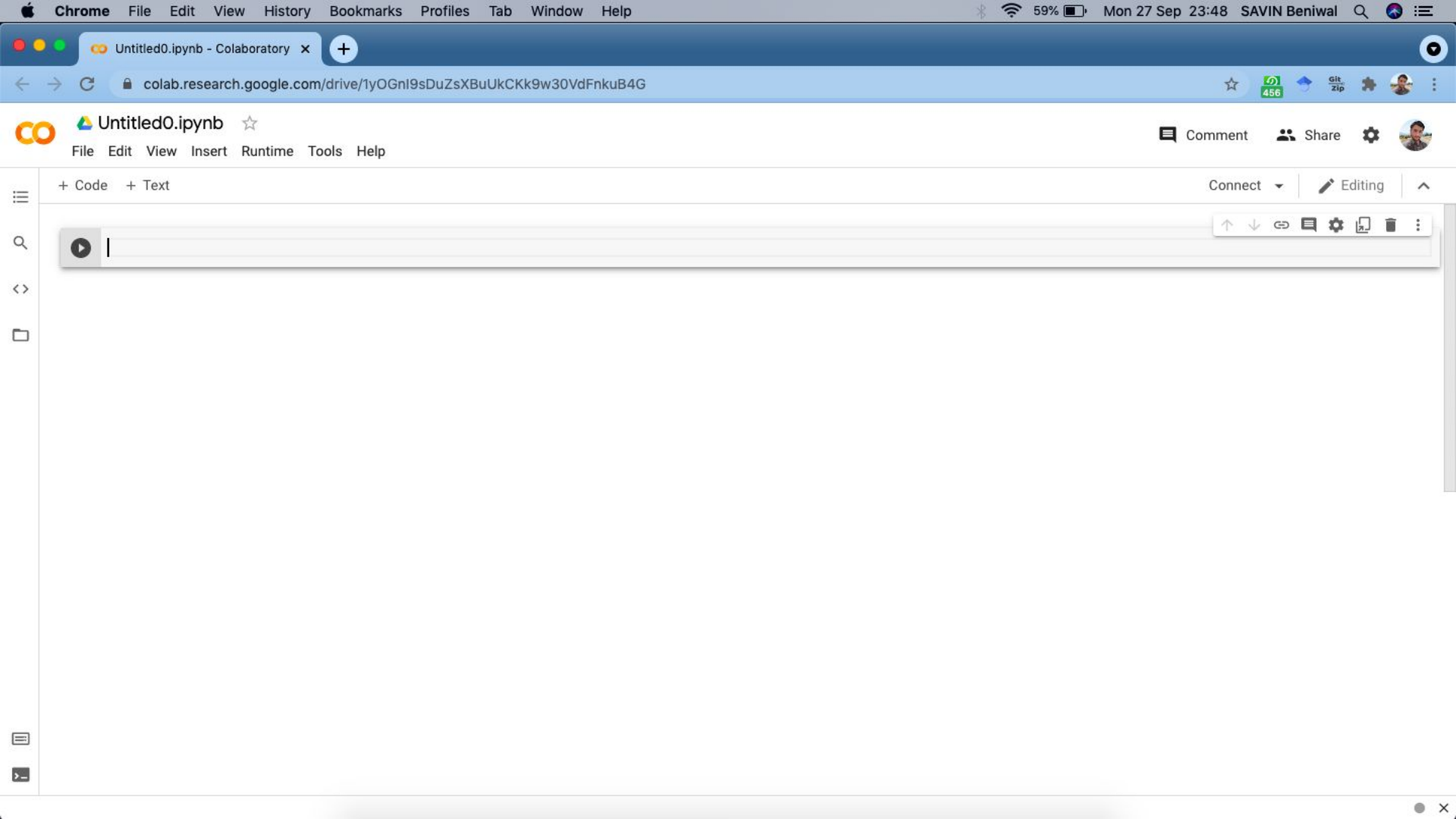


Google Colaboratory

Colab is a hosted Jupyter Notebook service that requires no setup to use and provides free access to computing resources, including GPUs and TPUs. Colab is especially well suited to machine learning, data science, and education.

Open Colab

New Notebook



co

Untitled0.ipynb

☆

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1

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3

4

sample_data

Run Cell

Cell

RAM & Disk Space

Disk Space

1

2

3

4

Table of Contents

Code Snippets

Files

Mount Google Drive

Disk 64.19 GB available

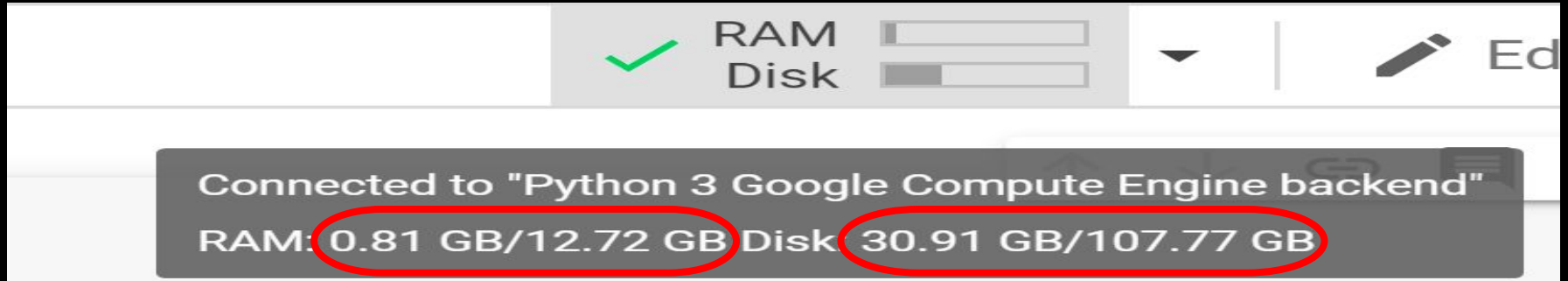
RAM Disk

Editing

Platform-I: Google Colab

Python

RAM Space

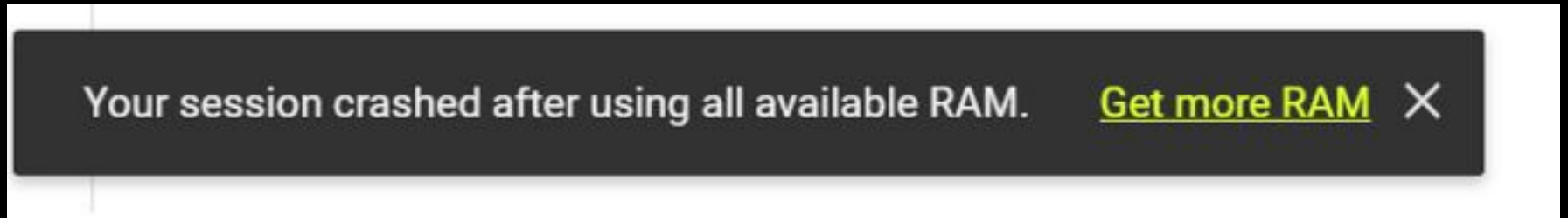


The image shows a snippet of the Google Colab interface. At the top, there is a status bar with a green checkmark, the text 'RAM Disk', and two progress bars. Below this, a dark grey notification box contains the text 'Connected to "Python 3 Google Compute Engine backend"'. Below the notification box, the RAM and Disk usage is displayed as 'RAM: 0.81 GB/12.72 GB Disk 30.91 GB/107.77 GB'. The values '0.81 GB/12.72 GB' and '30.91 GB/107.77 GB' are circled in red.

✓ RAM Disk

Connected to "Python 3 Google Compute Engine backend"

RAM: 0.81 GB/12.72 GB Disk 30.91 GB/107.77 GB



The image shows a dark grey error message box with the text 'Your session crashed after using all available RAM.' followed by a link 'Get more RAM' and a close button 'X'.

Your session crashed after using all available RAM. [Get more RAM](#) X

Installation:

Python

Locate your Colab notebook in Google-Drive

- Login into Google account.
- Type Colab in Google Search bar

google drive - Google Search

google.com/search?q=google+drive&rlz=1C5CHFA_enIN1064IN1064&oq=google+drive&aqs=chrome..69i57j35i39i650j0i433i512j69i60l...

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Videos

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Books

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SafeSearch

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Google

https://drive.google.com > drive > my-drive

Google Drive: Sign-in

Access **Google Drive** with a Google account (for personal use) or Google Workspace account (for business use).

Drive settings · Email or phone · Shared Drives · Computers

Google

https://www.google.com > intl > en_in > drive

Personal Cloud Storage & File Sharing Platform

Learn about **Google Drive**'s file sharing platform that provides a personal, secure cloud storage option to share content with other users.

Google Play

https://play.google.com > store > apps > details > id=c...

Google Drive - Apps on Google Play

Google Drive, part of Google Workspace, is a safe place to back up and access all your files from any device. Easily invite others to view, edit, ...

★★★★★ Rating: 4.4 · 9,994,124 votes · Free · Android · Business/Productivity

Google Play

https://play.google.com > store > apps > details > id=c...

Google Drive

Web site

Google Drive is a file storage and synchronization service developed by Google. Launched on April 24, 2012, Google Drive allows users to store files in the cloud, synchronize files across devices, and share files. [Wikipedia](#)

Date launched: 24 April 2012

Created by: [Google](#)

Developer: [Google](#)

Programming languages: [Python](#), [Objective-C](#)

URL: [drive.google.com](#)

Users: 1 billion (July 2018)

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Storage

23.57 GB of 100 GB used

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My Drive

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	me	10:51PM	—
	me	Aug 24, 2022	—
	me	Jul 31, 2021	—
	me	Aug 26, 2021	—
	me	Feb 8, 2022	—
	me	Jul 31, 2021	—
	me	Sep 25, 2023	12.5 MB
	me	Sep 28, 2023	289 KB
	me	Sep 8, 2023	1 KB

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File upload

Folder upload

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Colab_Notebooks

Machine_Learning_Python_ICARD

week_1_Introduction

	Owner	Last modified	File size
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Google Colaboratory

Google Data Studio

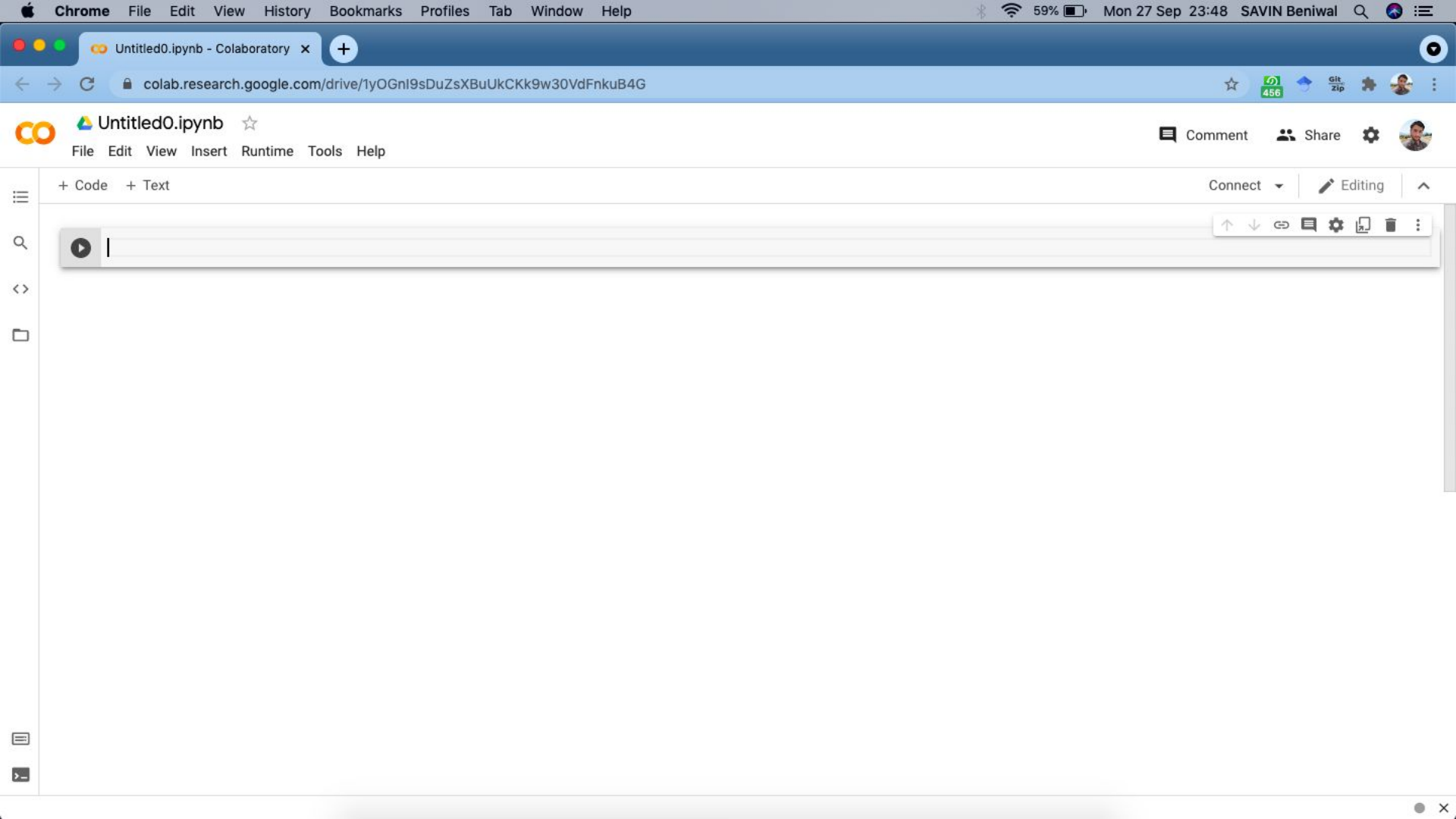
Google Jamboard

Hidden Folder for Drive, Cloud USB

ONLYOFFICE Personal

PDF Tables Extractor

Pixlr Express



Platform-II: Google Colab

Python

Google Colaboratory: All Set

Let's work in Colab Notebook!

Hands-On Session:

Python

Hands-On Session:

Python

- You've already opened Colab Notebook in your browser.

Hands-On Session:

Python

- You've already opened Colab Notebook in your browser.
- Now, search Github in Google Search bar



github



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<https://github.com>

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Focus on what matters instead of fighting with Git. Whether you're ...

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Explore GitHub

Explore is your guide to finding your next project, catching up ...

People also ask

GitHub
Software company



 github.com

GitHub, Inc. is a platform and cloud-based service for software development and version control using Git, allowing developers to store and manage their code.
[Wikipedia](#)

Parent organization: [Microsoft Corporation](#)

Founders: [Tom Preston-Werner](#), [Chris Wanstrath](#), [P. J. Hyett](#), [Scott Chacon](#)

Subsidiaries: [Good Software LLC](#), [npm, Inc.](#), [Semmler Limited](#)

CEO: [Thomas Dohmke](#) (15 Nov 2021–)

Headquarters: [San Francisco, California, United States](#)

Type STACUP 2023



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1

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Pull requests6k

Discussions147

Users0

More

Advanced

+ Owner

+ Size

+ Number of followers

+ Number of forks

+ Number of stars

+ Date created

+ Date pushed

+ Topic

+ License

+ Archived

1 result (65 ms)

Sort by: Best match ▾ Save ⋮

🌐

darshanbeniwal/Astrophysics_Stats_Py_STACUP_CUTN_IUCAA_2023

☆ 1 · Updated 3 hours ago

This repository hosts materials and code from the 'School on Statistical Techniques in Astrophysics & Cosmology Using Python (STACUP)' (O...

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Untitled.ipynb - Colaboratory x Astrophysics_Stats_Py_STACU x +

colab.research.google.com/drive/1YxdKaOh_ZLIW1ZUOfP-rgqeTd3Nx4GL?authuser=0

Untitled.ipynb ☆

File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

Connect ▾

1 !python --version

Press Shift+Enter

Staff