



# AAE2004 Introduction to Aviation Systems

## AAE

# Design of Path Planning Algorithm for Aircraft Operation

## First Week

---

Dr Li-Ta Hsu and Dr Kam Hung NG  
Assisted by  
Miss Hiu Yi HO (Queenie), Miss Yan Tung LEUNG (Nikki)

# Lecturer's Information

- Instructor: Dr Li-Ta HSU
- Office: QR828
- Phone: 3400-8061
- Email: lt.hsu@polyu.edu.hk
- Office Hour: by appointment
- Expertise: GPS navigation, Autonomous driving, Pedestrian localization using Smartphone, Sensor Integration

# Li-Ta HSU

1985.08 – Born in a fish farmer family in Tainan, Taiwan

2003.06 – Graduated from Kang Ming Senior High School, Taiwan

2007.06 – Bachelor of NCKU Department of Aeronautics and  
Astronautics (DAA), Taiwan

2010.09 – Ph.D. Candidate of NCKU DAA, Taiwan

2012.02 – Visiting Researcher  
in University College London, UK

2012.06 – Part-time Consultant for Spirent, UK

2013.07 – Visiting Researcher  
in Tokyo Marine University, Japan

2013.12 – Ph.D. of NCKU DAA, Taiwan

2014.04 – Postdoctoral Researcher in the  
University of Tokyo , Japan

2017.05 – Assistant Professor  
in AAE of PolyU, Hong Kong

2021.07 – Associate Professor  
in AAE of PolyU, Hong Kong



# Ground Rules

## For students

- Try to speak as much English as possible.
- Participate the class activates assigned.

## For teaching staffs

- Reply your email with 3 working day.
- Open to any question regards to the subject

## For us!

- Keep an open mind—enter the classroom dialogue with the expectation of learning something new. Look forward to learning about—and being challenged by—ideas, questions, and points of view that are different than your own.
- Arrive on time to the class and finish the class on time

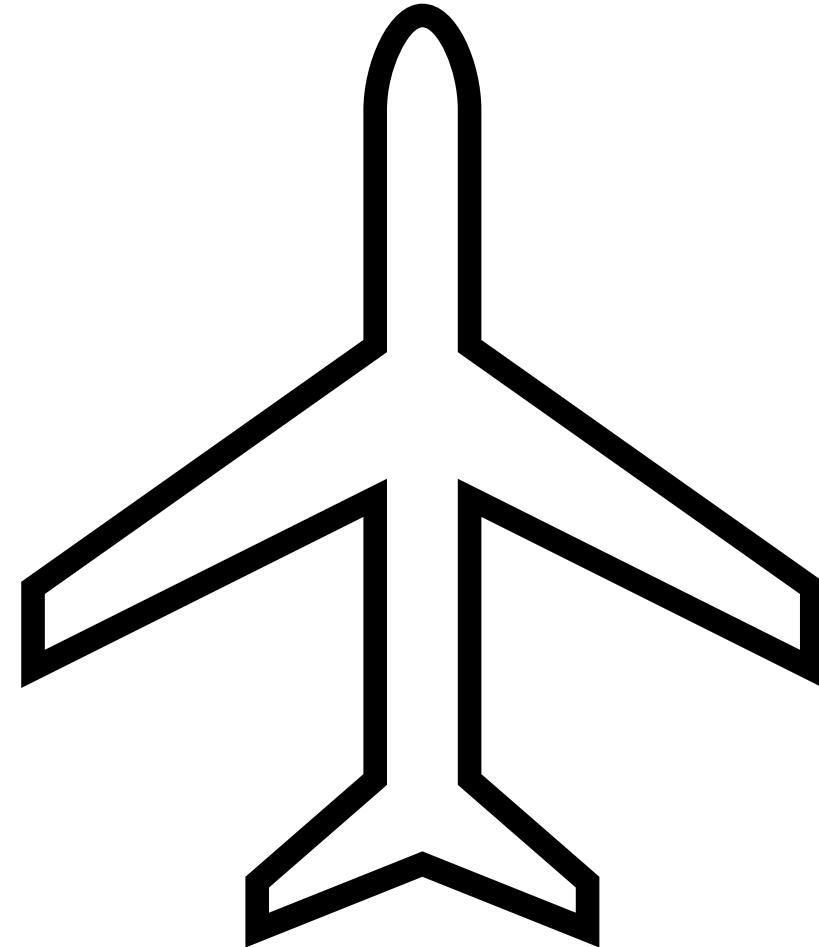
# Necessary Information

- Course Repository link: [https://github.com/IPNL-POLYU/PolyU AAE2004 Github Project](https://github.com/IPNL-POLYU/PolyU_AAE2004_Github_Project)
- TA Information & Contact:
  - Group 1-5: Queenie Ho ([hiu-yi.ho@connect.polyu.hk](mailto:hiu-yi.ho@connect.polyu.hk))
  - Group 6-10: Nikkie Leung ([yan-tung.leung@connect.polyu.hk](mailto:yan-tung.leung@connect.polyu.hk))

# Week 1 Content

---

1. Introduction to Path Planning
2. Introduction to GitHub  
(Background)
3. Introduction to GitHub Operations
4. Software Installation and setup  
Guide

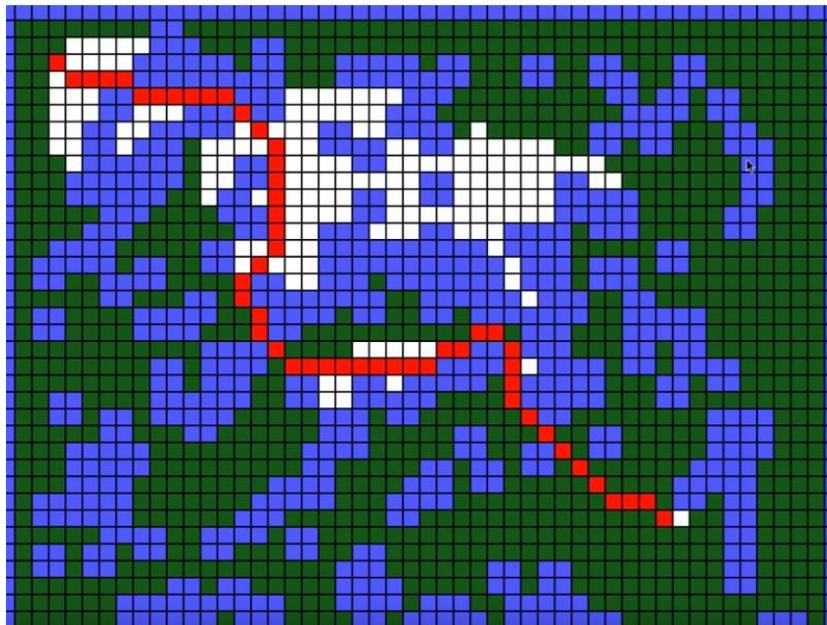


# Introduction to Path Planning

---

# What is Path Planning?

- **Path planning** (also known as the **navigation problem**) is computational problem to find a sequence of valid configurations that moves the object from the source to destination. The term is used in **aviation, robotics and computer games**.

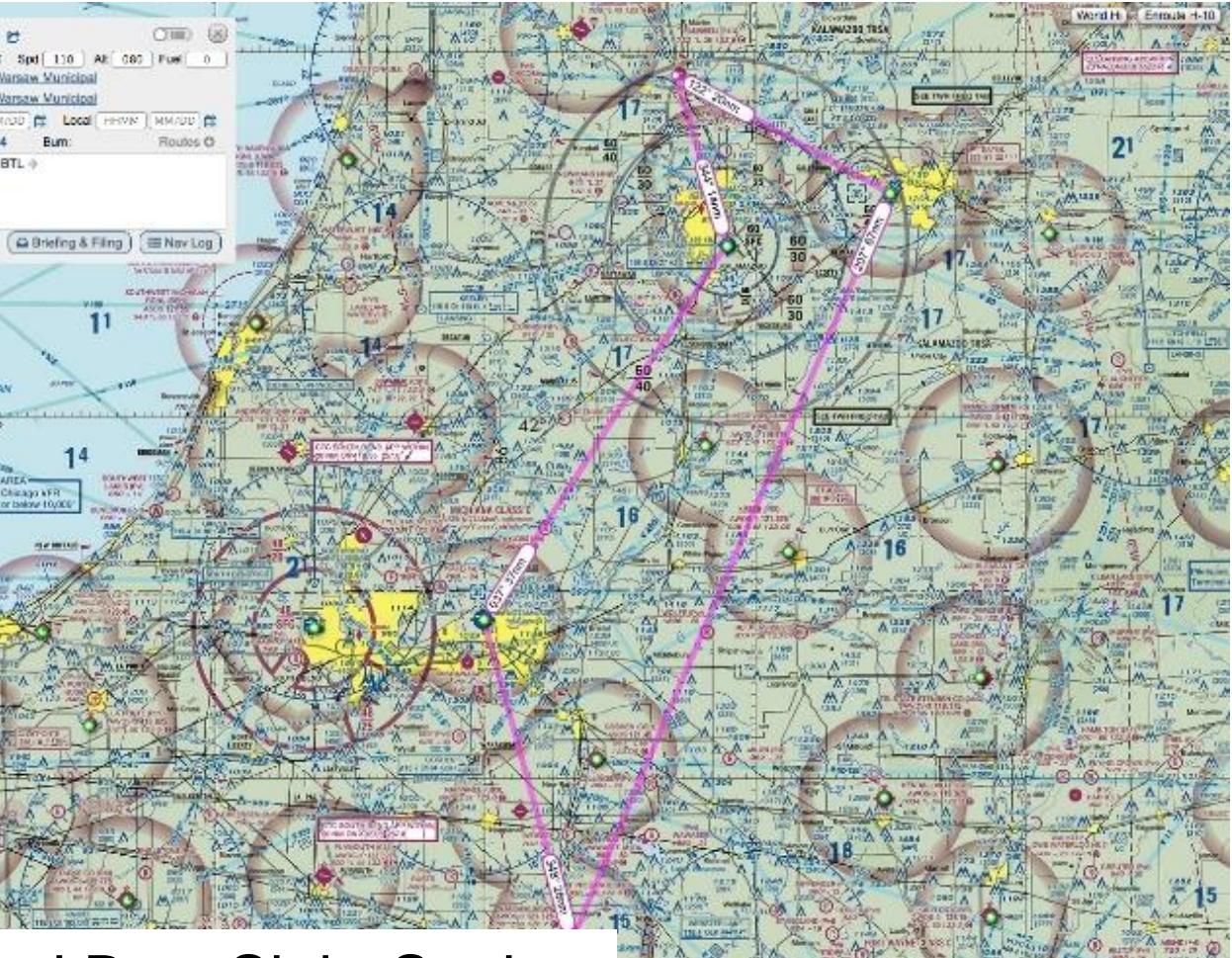
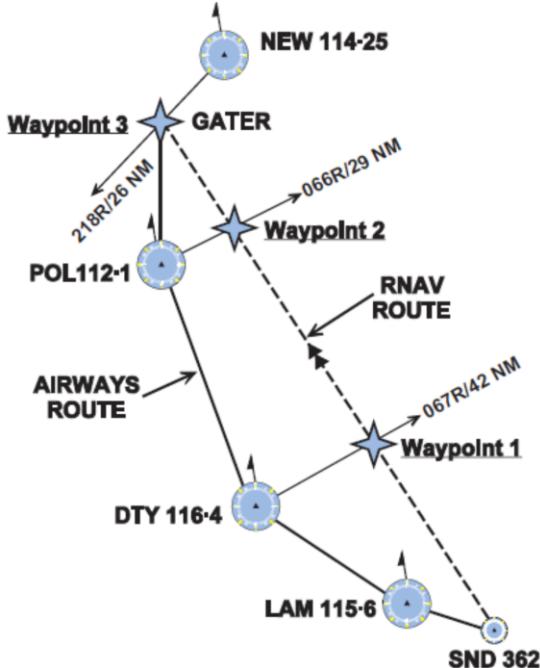


**How to go from A to B considering factors!**



# How is Path Planning important to Aviation Engineering?

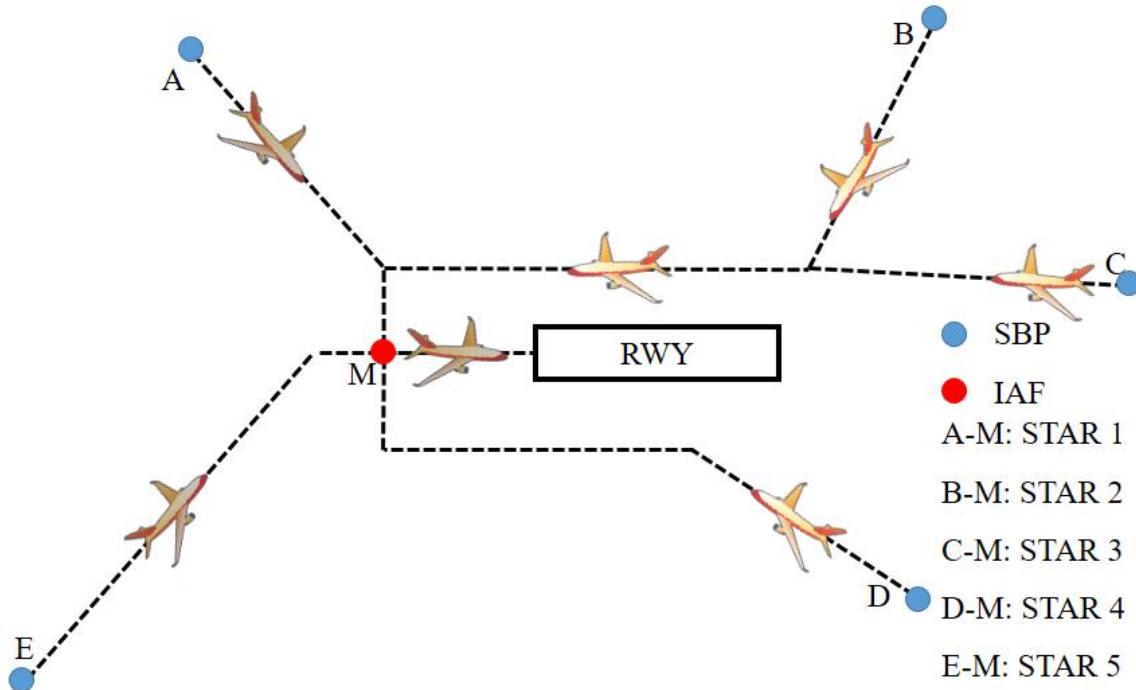
- Private pilots do the path plan before the flight to make sure the navigation aid is available



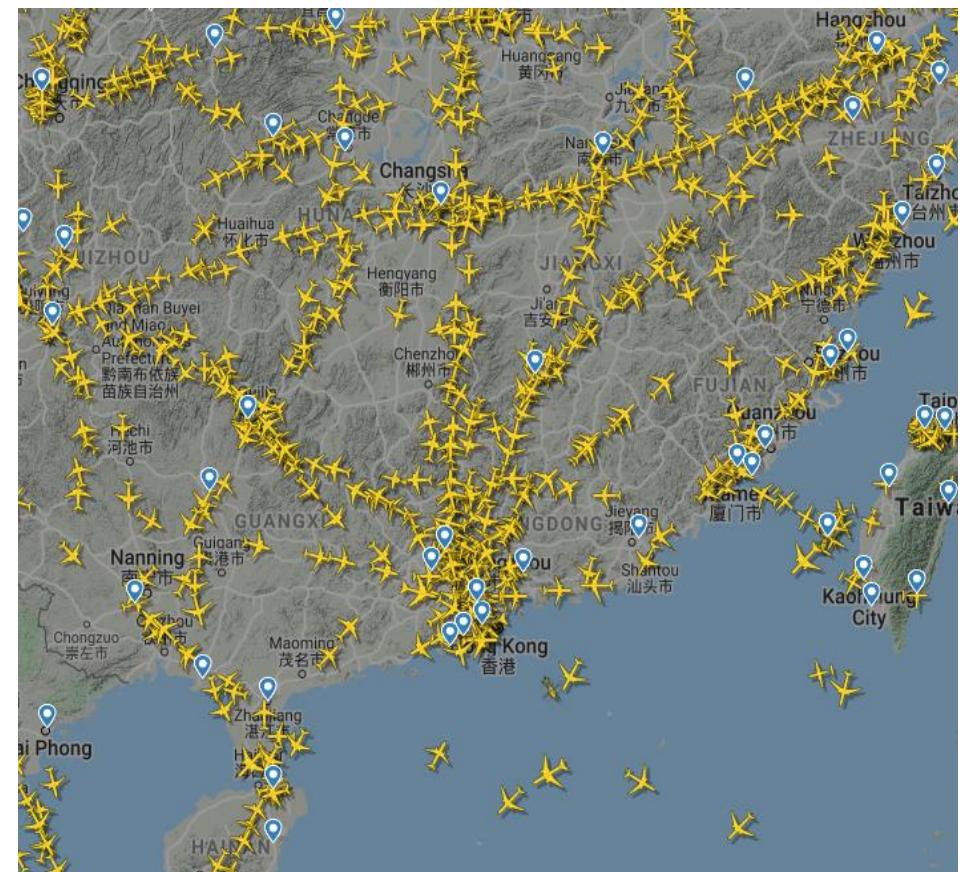
# Objective: Safe and Best Sight Seeing

# How is Path Planning important to Aviation Engineering?

- For ATC near airports, collaborative path planning is required to make the best use of the crowded airspace



Objective: Safe and least delay

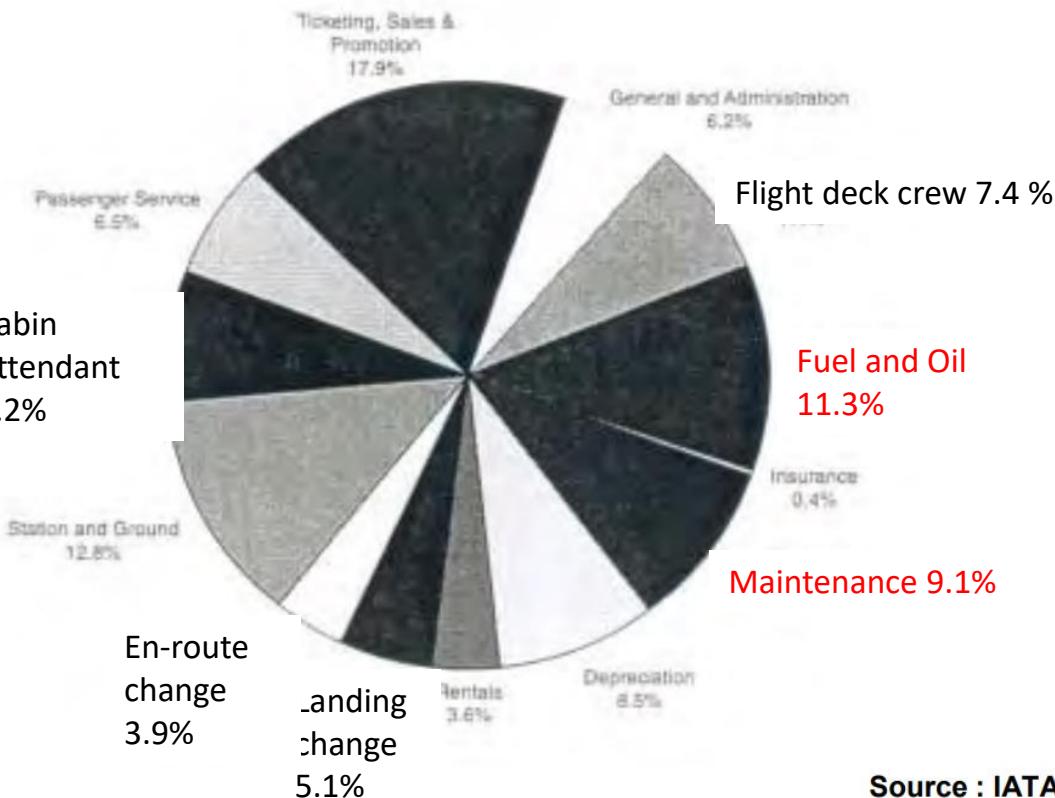


# How is Path Planning important to Aviation Engineering?

- Commercial pilot follow the path that plan based on different cost index designed by airlines.

Objective: Safe and Minimum Cost

Figure 2. Distribution of operating costs



## 2.1 Trip cost

Without having to resort to complicated mathematics we can readily appreciate that the total cost of a specific trip is the sum of fixed and variable costs :

$$C = C_F \times \Delta F + C_T \times \Delta T + C_c$$

with     $C_F$  = cost of fuel per kg  
           $C_T$  = time-related cost per minute of flight  
           $C_c$  = fixed costs independent of time  
           $\Delta F$  = trip fuel  
           $\Delta T$  = trip time

In order to minimize C or the total trip cost we therefore need to minimize the variable cost :

$$C_F \times \Delta F + C_T \times \Delta T$$

Source : IATA

<https://ansperformance.eu/library/airbus-cost-index.pdf>

# Cost-Index Published by Aircraft Manufacturer

Flight Operations Support & Line Assistance

getting to grips with the cost index

Issue II - May 1998

Customer Services

AIRBUS



## 3.1 A300/A310 Family

Considering, with good approximation, that the following range of time-related costs cover the maintenance cost difference between A300 and A310 as well as the cabin crew contingent (plus or minus two) difference, the following cost brackets result :

6 < Hourly maintenance cost < 12 (US\$/min)

+ 7 < Crew cost < 14 (US\$/min)

13 < Time-related cost < 26 (US\$/min)

NB : Crew composition = 2 cockpit crews + 8 ( $\pm 2$ ) cabin crews.

In turn, the following cost index tables reflect these cost ranges for the A300 and for the A310.

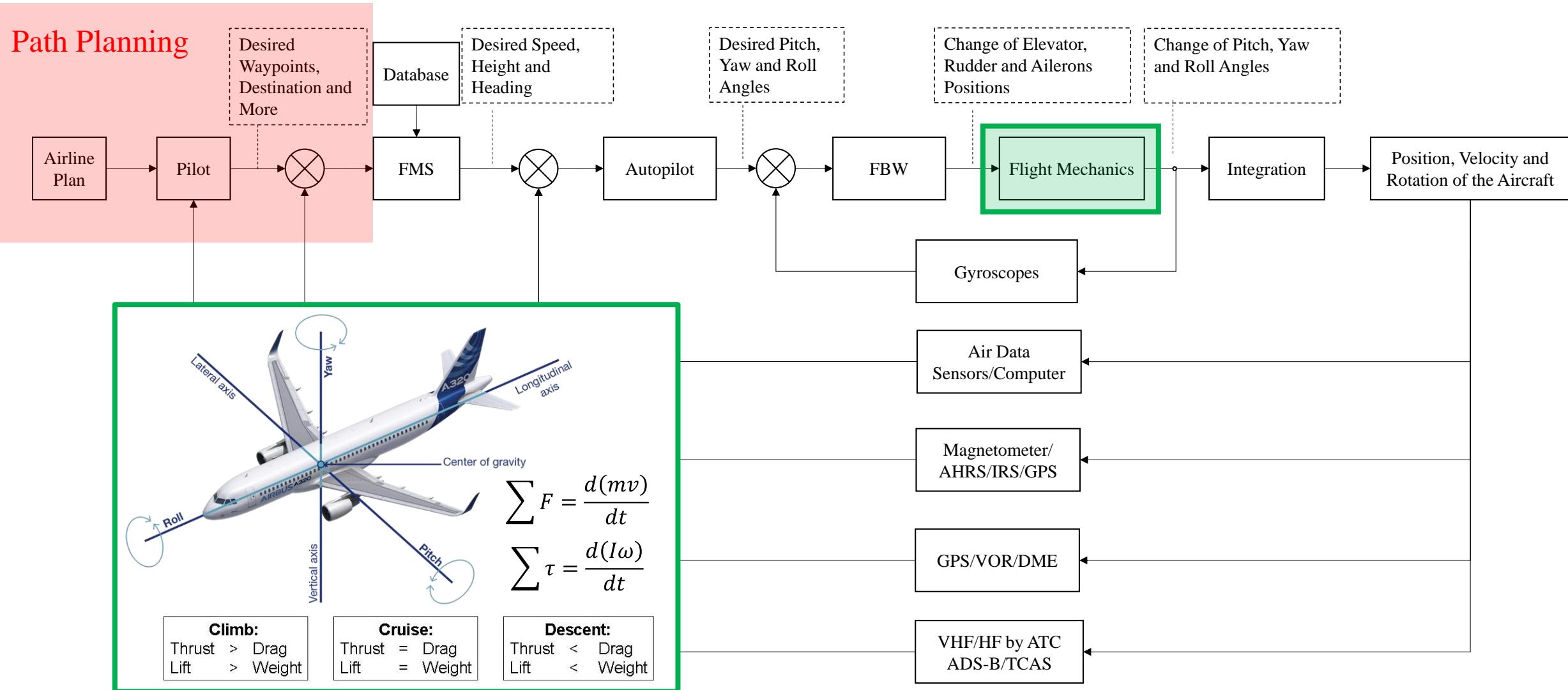
Table 1. A300/A310 cost index

(kg/min)  
(Honeywell FMS)

TIME COST (US\$/min)\ FUEL COST (US\$/USG)	LOW	MEDIUM	HIGH
LOW < 0.7	65	85	100
MEDIUM 0.7 < < 0.9	50	65	80
HIGH > 0.9	40	55	65

<https://ansperformance.eu/library/airbus-cost-index.pdf>

# Aircraft Operation in Flight Control System



# How is the Freshman Project related to the AE programme study?

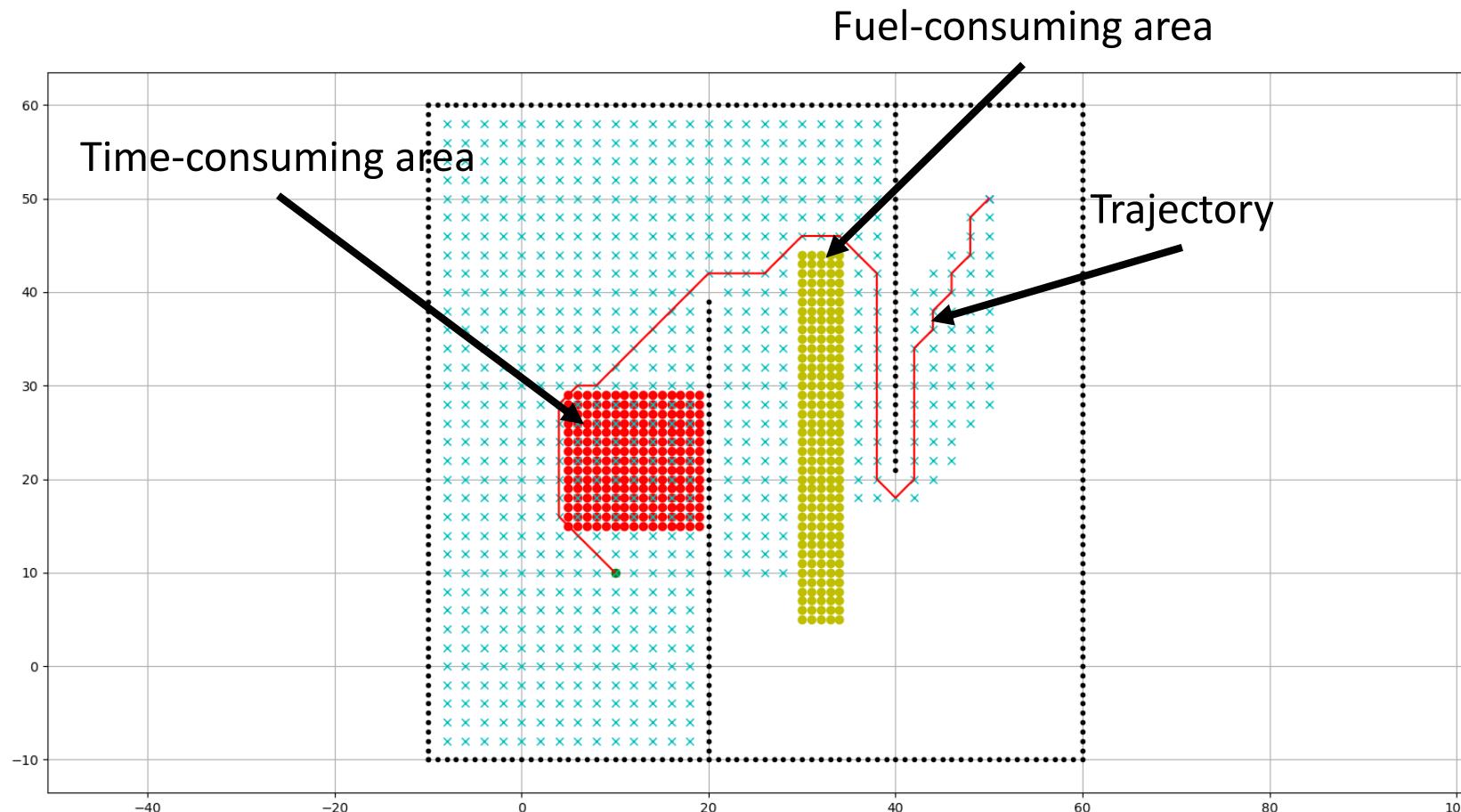
- Mathematics & Physics
- Computer Science
- Aeronautical and Aviation
- The plan should be planned considering the physical limitation (dynamics) of the aircraft

Year 1 (33 + 4 training credits)					
Semester 1 (15 + 2 training credits)		Semester 2 (18 +2 training credits)			
AAE2001	Introduction to Aircraft and Aviation Systems	AMA1120	Basic Mathematics II		
AMA1110	Basic Mathematics I	AP10006	Physics II		
AP10005	Physics I	APSS1L01	Tomorrow's Leaders		
ENG1003	Freshman Seminar for Engineering	ENG2003	Information Technology		
LCR I (English)		LCR II (English)			
		CAR I ^			
Healthy Lifestyle (non-credit bearing) ^					
IC2105    Engineering Communication and Fundamentals (4 training credits) or IC2133    Aircraft Manufacturing and Maintenance Fundamentals (4 training credits)					
Year 2 (30 + 3 training credits)					
Semester 1 (15 credits)		Semester 2 (15 + 3 training credits)			
AMA2111	Mathematics I	AMA2112	Mathematics II		
ENG2001	Fundamentals of Materials Science and Engineering / Biology / Chemistry	EE2902S	Fundamentals of Electrical and Electronic Engineering		
ENG2002	Computer Programming	ME33001	Mechanics of Materials		
ME23001	Engineering Mechanics	LCR III (Chinese)			
CAR II^		CAR III^			
IC381	Appreciation of Aircraft Manufacturing Processes (3 training credits)				
Year 3 (32 + 3 training credits)					
Semester 1 (17 + 1.5 training credits)		Semester 2 (15 + 1.5 training credits)			
AAE3001	Fundamentals of Aerodynamics	AAE3003	Aircraft Propulsion Systems		
AAE3002	Aircraft Structures and Materials	AAE4006	Flight Mechanics and Control Systems		
AAE3004	Dynamical Systems and Control	AAE4301	Avionics Systems		
ELC3531	Professional Communication In English For Engineering Students (2 credits)	AF3625	Engineering Economics		
CAR IV ^		ISE3009	Aviation Safety and Reliability		
Service Learning ^					
IC388 Aircraft Manufacturing and Maintenance practice (3 training credits)					

# Path Planning

- Optimization Problem:
- To optimize a path that fulfilling all the constrains and by a set of certain criteria.
- Goal of this project, ***to select the best aircraft models with an optimized route that minimized the cost of the aircraft operation under given scenario.***
- ***Design the cost of the aircraft operation***
- ***Design an aircraft model (virtually) with different cost coefficients to fly safe and cheapest.***
- ***Design the path planning algorithm considering 3D, 2D + time, scenarios.***

# Expected Outcome. Every Group have different scenarios



# Model of Aircraft to select

Aircraft Model	$C_F$	$\Delta F$	$C_T$	$\Delta T$	$C_c$	$\Delta F_a$	$\Delta T_a$
PolyU-A380	1	1	2	5	10	0.2	0.2
PolyU-A381	1	1.5	3	5	10	0.3	0.4
PolyU-A382	1	2.0	4	5	10	0.4	0.5
PolyU-A383	1	2.5	5	5	10	0.5	0.1
AAE-Group 1	?	?	?	?	?	?	?
AAE-Group 2	?	?	?	?	?	?	?
AAE-Group 3	?	?	?	?	?	?	?
:	:	:	:	:	:	:	:

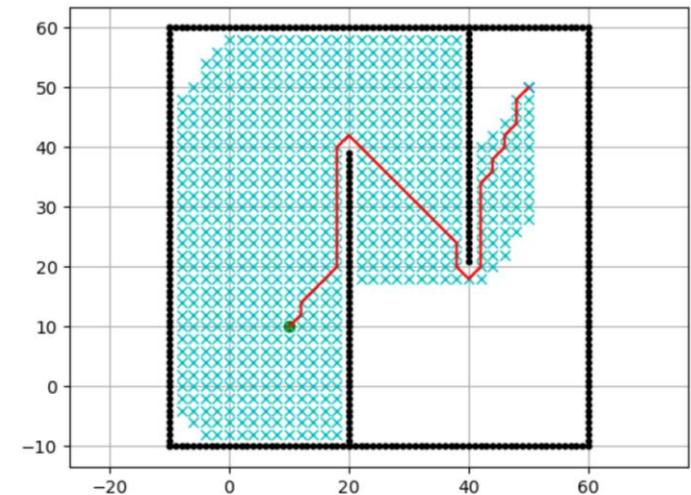
# What you are expected to learn?

Academic level of algorithm designs

- Design of a path planning algorithm and aircraft model cost function
  - 2D path planning for simplicity

Make use of the **open-resource** to work on coding-project **remotely**.

- Programming and coding
  - Python
- Online coding collaboration
  - GitHub



In this project, students will be acted as

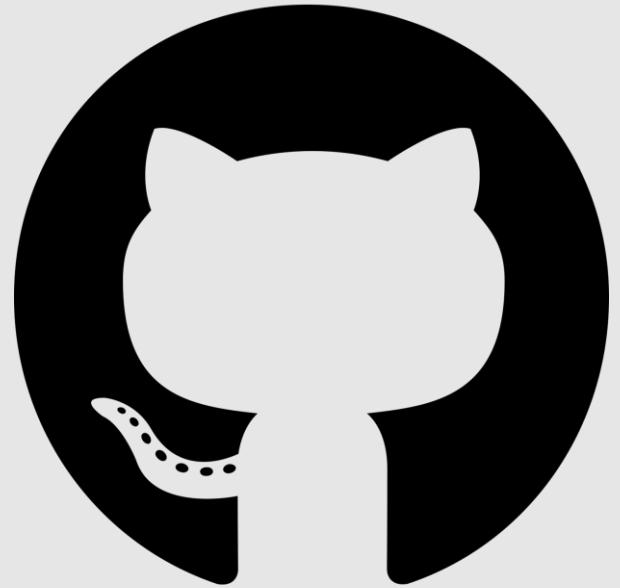
1. Group leader or members to collaborate on an online project,
2. R&D engineers to design and develop path-planning algorithm,
3. Project manager to present the designed code and prepare report.

## Assessments

- (30%) Demonstration and Presentation
- (40%) Report & reflective essay – one report per group, with individual reflective essay
- (20%) Log sheet – one per student after the first week
- (10%) Performance/participation in in-class activities (Confidential peer evaluation)

# Introduction to GitHub (Background)

# What is GitHub?



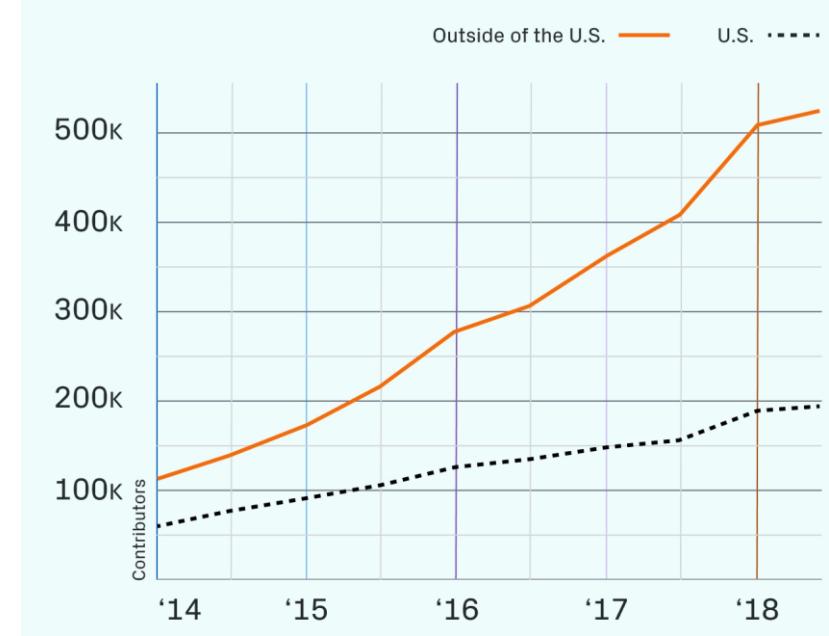
# What is Github?



- A social network and platform for software developers
  - Over 65 million users
  - A place to Share, Communicate, Collaborate with others, especially programmers
-

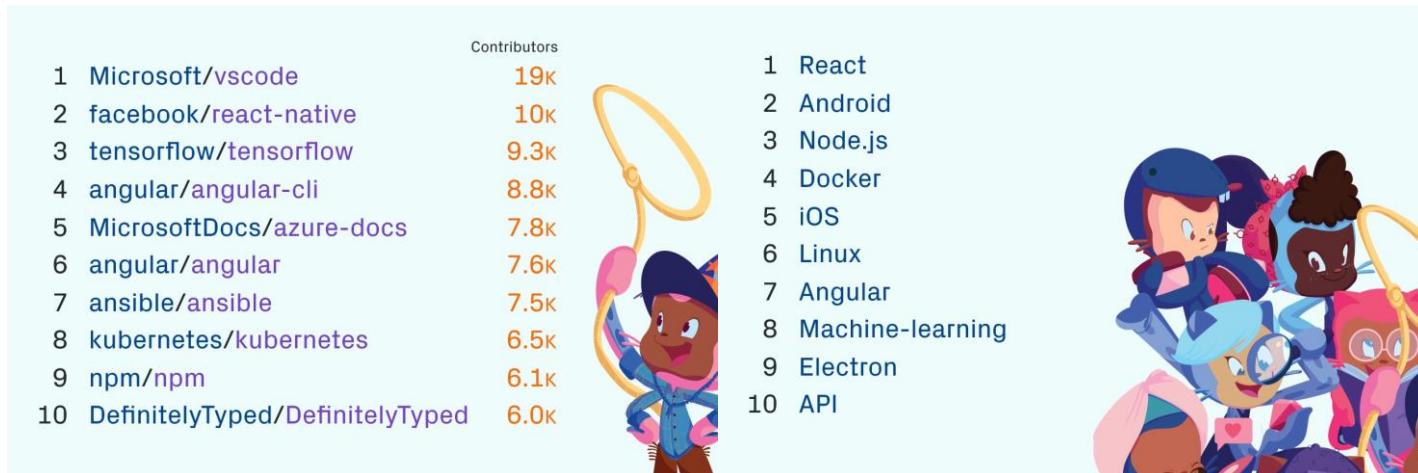
# What's on GitHub

- Over 100 million live Projects
- New projects increasing over the years
- Showing the trend of using GitHub for Software development



# Variety of GitHub

- Countless topics and projects available for the public
- Encompassing most popular topics nowadays



# BIG GitHub Pages

**Tesla, Inc.**

Open source projects and samples from Microsoft

Redmond, WA | https://opensource.microsoft.com | @OpenAtMicrosoft | opensource@microsoft.com | Verified

Repositories 45 | Packages | People 12 | Projects

Find a repository... Type Language Sort

**kafka-heilmsman**  
kafka-heilmsman is a repository of tools that focus on automating a Kafka deployment.  
Java, MIT, 18 stars, 2 issues, Updated 11 hours ago

**perf\_data\_converter**  
Forked from google/perf\_data\_converter.  
Tool to convert Linux perf files to the proto.format used by pprof.  
C++, BSD-3-Clause, 45 stars, 0 issues, Updated 12 days ago

**react-native-camera-kit**  
A high performance, easy to use, rock solid camera library for React Native apps.  
Objective-C, MIT, 342 stars, 22 issues, 6 pull requests, Updated 13 days ago

**fixed-containers**  
C++ Fixed Containers  
C++, MIT, 0 stars, 0 issues, 0 pull requests, Updated on Jul 1

**mongo-go-driver**  
Forked from mongodb/mongo-go-driver.  
The Go driver for MongoDB.  
Go, Apache-2.0, 670 stars, 2 issues, 12 pull requests, Updated on Jun 29

**coreboot**  
Coreboot sources  
C, GPL-2.0, 12 stars, 52 issues, 0 pull requests, Updated on Jun 15

**linux**  
Linux sources  
C, 149 stars, 907 issues, 0 pull requests, Updated on Jun 12

**ansible puller**

**Microsoft**

Open source projects and samples from Microsoft

Redmond, WA | https://opensource.microsoft.com | @OpenAtMicrosoft | opensource@microsoft.com | Verified

Repositories 42k | Packages | People 4.5k | Projects 12 | Sponsoring 17

Find a repository... Type Language Sort

**Graphomer**  
This is the official implementation for "Do Transformers Really Perform Bad for Graph Representation?"  
Python, MIT, 50 stars, 5 issues, 12 pull requests, Updated 3 minutes ago

**calculator**  
Windows Calculator: A simple yet powerful calculator that ships with Windows  
Windows, xaml, cssharp, cpp, uwp, windows-10  
C++, MIT, 3,969 stars, 22,426 issues, 208 pull requests, 65 issues need help, 3 updated, Updated 3 minutes ago

**v8-jsi**  
React Native V8 JSI adapter  
C++, 16 stars, 65 issues, 2 pull requests, 1 issue needs help, Updated 4 minutes ago

**ts-gyb**  
Generating native code interfaces from TypeScript  
kotlin, swift, typescript, webview, code-generation, javascriptcore, hybrid-app  
TypeScript, MIT, 1 star, 39 issues, 11 pull requests, 1 issue needs help, Updated 5 minutes ago

**onnxruntime**  
ONNX Runtime: cross-platform, high performance ML inferencing and training accelerator  
machine-learning, deep-learning, tensorflow, scikit-learn, pytorch, neural-networks, hardware-acceleration  
C++, MIT, 1,177 stars, 4,987 issues, 395 pull requests, 1 issue needs help, 125 updated, Updated 7 minutes ago

**responsible-ai-widgets**  
This project provides responsible AI user interfaces for Fairlearn, interpret-community, and Error Analysis, as well as foundational building blocks that they

**Google**  
Google ❤️ Open Source

https://opensource.google/ | @GoogleOSS | opensource@google.com | Verified

Repositories 2.1k | Packages | People 1.2k | Projects

Find a repository... Type Language Sort

**closure-compiler-npm**  
Package for managing and documenting closure-compiler for use via npm  
JavaScript, Apache-2.0, 66 stars, 303 issues, 2 pull requests, 0 issues need help, Updated 3 minutes ago

**it-cert-automation-practice**  
Google IT Automation with Python Professional Certificate - Practice files  
Python, Apache-2.0, 19,346 stars, 381 issues, 36 pull requests, 5,000+ updated, Updated 4 minutes ago

**CFU-Playground**  
Want a faster ML processor? Do it yourself! -- A framework for playing with custom opcodes to accelerate TensorFlow Lite for Microcontrollers (TFLM).  
tensorflow, tflite, tfml  
C++, Apache-2.0, 23 stars, 67 issues, 30 pull requests, 5 issues need help, Updated 7 minutes ago

**pytype**  
A static type analyzer for Python code  
python, typechecker, types, static-code-analysis, linter, static-analysis, typing  
Python, 200 stars, 3,367 issues, 93 pull requests, 1 issue needs help, 1 updated, Updated 17 minutes ago

**trax**  
Trax — Deep Learning with Clear Code and Speed  
machine-learning, reinforcement-learning, deep-learning, numpy, deep-reinforcement-learning, transformer, jax  
Python, Apache-2.0, 627 stars, 6,355 issues, 72 pull requests, 13 issues need help, 13 updated, Updated 17 minutes ago

**pigweed**  
microcontroller, embedded, cpp, embedded-systems, mcu  
C++, Apache-2.0, 7 stars, 31 issues, 0 pull requests, 0 issues need help, Updated 18 minutes ago

**Top languages**  
Python, C++, Go, Java, JavaScript

**Most used topics**  
android, security, python, java, go

**People**  
1.2k >  
A grid of 20 developer profile icons.

**Developer Program Member**

Report abuse

# BIG GitHub Pages

## Boeing

Overview Repositories 5 Packages People Projects

### Popular repositories

<a href="#">modular_navigation</a> C++ ⭐ 6 📈 6	<a href="#">modular_cartographer</a> C++ ⭐ 5 📈 5
<a href="#">cartographer</a> C++ ⭐ 5 📈 3	<a href="#">math6d</a> Python ⭐ 2 📈 1
<a href="#">image_tran</a> C++	

## Airbus Group

We design, manufacture and deliver industry-leading commercial aircraft, helicopters, military transports, satellites and launch vehicles  
Toulouse <https://www.airbus.com> Verified

Overview Repositories 2 Packages People Projects

### Popular repositories

<a href="#">scikit-decide</a> AI framework for Reinforcement Learning, Automated Planning and Scheduling Python ⭐ 14 📈 10	<a href="#">ED247_LIBRARY</a> Example of ED-247 standard implementation C++ ⭐ 13 📈 7
<a href="#">Repositories</a> Find a repository... Type Language Sort	
<a href="#">ED247_LIBRARY</a> Example of ED-247 standard implementation C++ ⭐ 13 📈 7 ⚡ 3 🔍 1	
<a href="#">scikit-decide</a> AI framework for Reinforcement Learning, Automated Planning and Scheduling Python ⭐ 14 📈 MIT 📈 10 ⚡ 2 🔍 0	

[View all repositories](#)

## NASA

Read about NASA's Open Data initiative here: <https://www.nasa.gov/open/> & Members Find Instructions here: <http://nasa.github.io/>  
United States of America <https://github.com/nasa/nasa.github.io...> [nasa-data@lists.arc.nasa.gov](mailto:nasa-data@lists.arc.nasa.gov)

Repositories 359 Packages People 42 Projects 1

### Pinned repositories

[nasa.github.io](#)  
<https://github.com/nasa/nasa.github.io/blob/master/docs/INSTRUCTIONS.md>

HTML ⭐ 238 📈 52

Find a repository... Type Language Sort

#### fprime

F - A flight software and embedded systems framework

raspberry-pi components real-time framework embedded cpp  
nasa

C++ Apache-2.0 📈 981 ⚡ 8,370 ⚡ 68 (1 issue needs help) 🔍 7 Updated 34 minutes ago

#### cumulus-orca

Python 📈 7 ⚡ 7 ⚡ 0 🔍 1 Updated 1 hour ago

#### ow\_autonomy

C++ 📈 4 ⚡ 13 ⚡ 0 🔍 0 Updated 2 hours ago

#### LHASA

R 📈 7 ⚡ 8 ⚡ 0 🔍 0 Updated 2 hours ago

#### earthdata-search

Earthdata Search is a web application developed by NASA EOSDIS to enable data discovery, search, comparison, visualization, and access across EOSDIS' Earth Science data holdings.

data-discovery hacktoberfest eosdis earthdata-search  
JavaScript 📈 202 ⚡ 618 ⚡ 14 🔍 1 Updated 3 hours ago

### Top languages

Python C C++ JavaScript  
Jupyter Notebook

### Most used topics

nasa cumulus nasa-cumulus  
eosdis satellite

### People

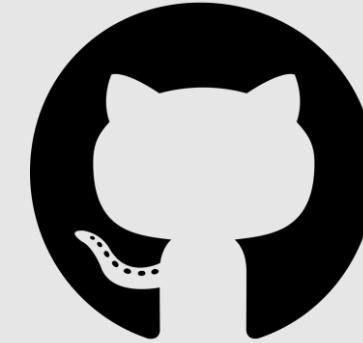
42 >



Developer Program Member

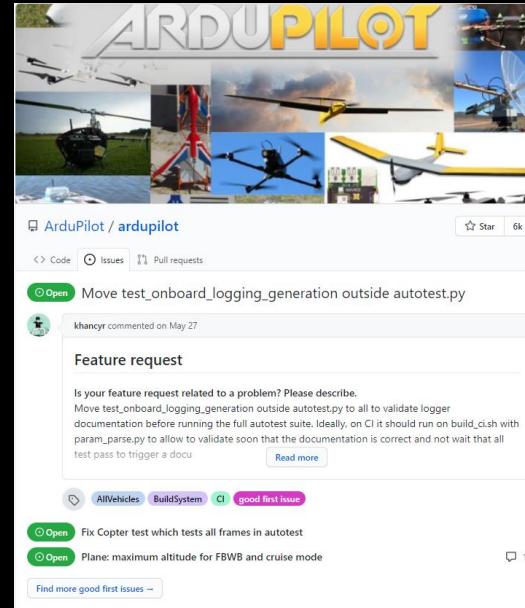
Report abuse

# What's on GitHub? How is it related to AAE?



# Flight control softwares for UAV

Ardupilot, PX4 and more



The screenshot shows the PX4 GitHub repository page. At the top is a banner with the PX4 logo and several small images of different UAVs. Below the banner, the repository name 'PX4 / PX4-Autopilot' is displayed along with a star icon and '4.7k' stars. A green button labeled 'Open' and the title 'Feature request' are visible. Below the title is a detailed description of the feature request. A 'Read more' link is also present. A 'Find more good first issues' button is located below the description. A 'Code', 'Issues', and 'Pull requests' navigation bar is at the top. Below the navigation bar, the text 'PX4 Autopilot Software' is displayed. A tag cloud below the text includes terms like 'uav', 'drone', 'ros', 'px4', 'pixhawk', 'uas', 'dronecode', 'autopilot', 'mavlink', 'autonomous', 'drones', 'dds', 'hacktoberfest', 'ugv', 'mavros', 'multicopter', 'qgroundcontrol', 'fixed-wing', 'fast-rtps', and 'avoidance'. Below the tag cloud, the text 'Updated 19 minutes ago' and 'C++' are shown.

The screenshot shows the qgroundcontrol GitHub repository page. At the top is a banner with the qgroundcontrol logo and several small images of different UAVs. Below the banner, the repository name 'mavlink / qgroundcontrol' is displayed along with a star icon and '1.9k' stars. A green button labeled 'Open' and the title 'Cross-platform ground control station for drones (Android, iOS, Mac OS, Linux, Windows)' are visible. Below the title is a detailed description of the repository's purpose. A 'Read more' link is also present. A 'Code', 'Issues', and 'Pull requests' navigation bar is at the top. Below the navigation bar, the text 'Cross-platform ground control station for drones (Android, iOS, Mac OS, Linux, Windows)' is displayed. A tag cloud below the text includes terms like 'qt', 'uav', 'drone', 'px4', 'pixhawk', 'uas', 'mavlink', and 'ardupilot'. Below the tag cloud, the text 'Updated 23 hours ago' and 'C++' are shown.

# About These Softwares

Ardupilot:

- Open source software suite
- Quadcopters, VTOL and more
- Cross platform
- Over 10 years of development and improvement



PX4:

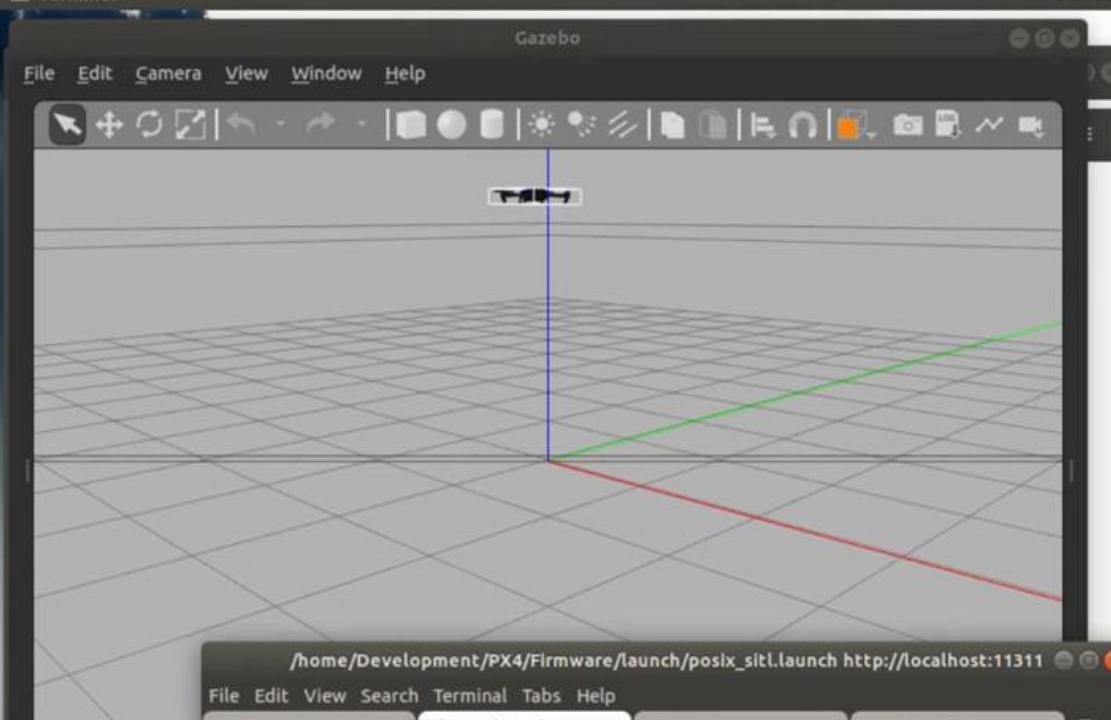
- Also open source
- Works with QGC and MAVLink (Also available in GitHub)



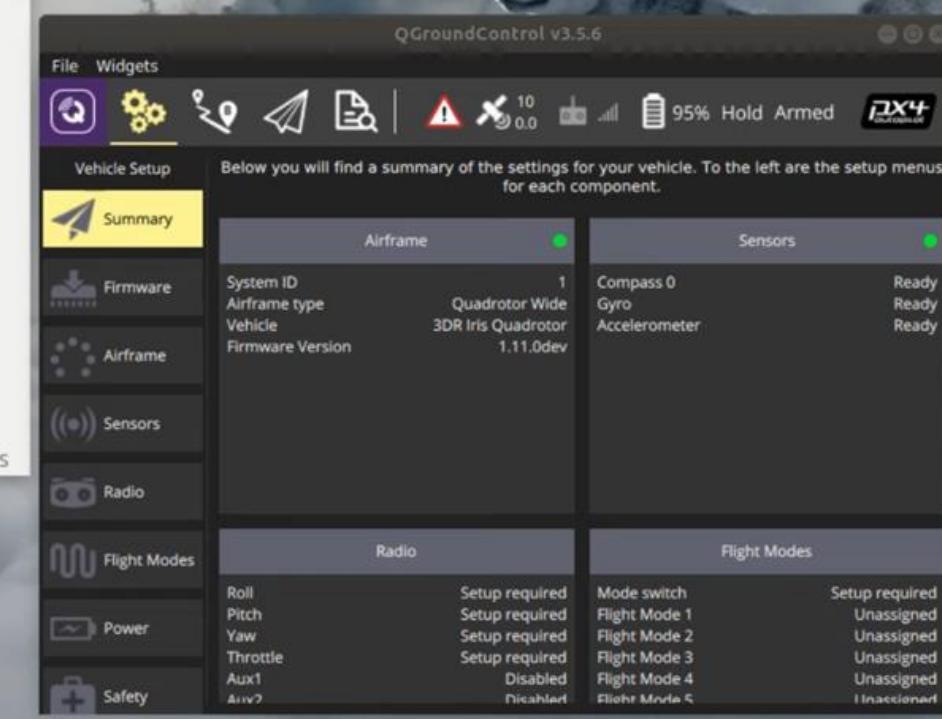
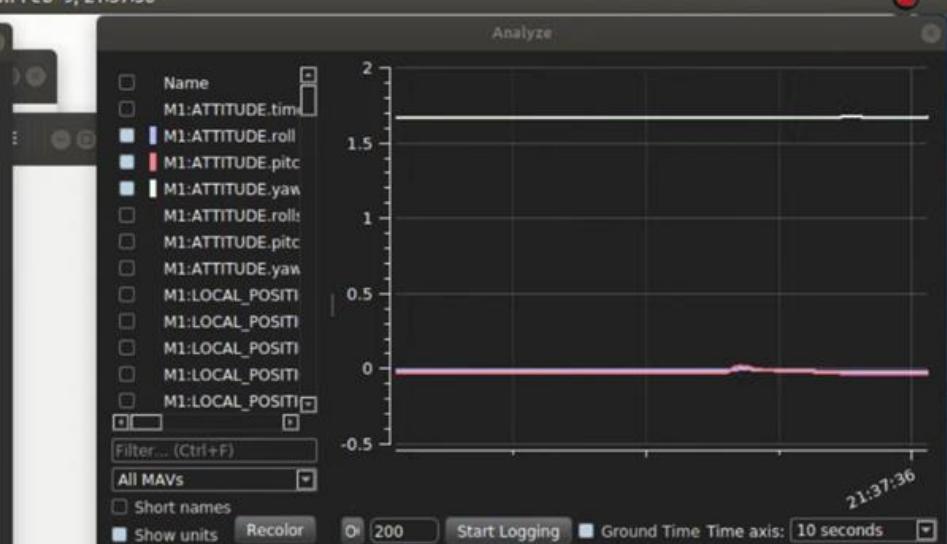
Activities Terminal

Sun Feb 9, 21:37:36

95%



```
/home/Development/PX4/Firmware/launch posix_sitl.launch http://localhost:11311
File Edit View Search Terminal Tabs Help
/gzclient:4781): dconf-WARNING **: 21:35:24.487: failed to commit changes to dco
nf: The connection is closed
(gzclient:4781): dconf-WARNING **: 21:35:24.487: failed to commit changes to dco
nf: The connection is closed
INFO [mavlink] partner IP: 127.0.0.1
INFO [mavlink] partner IP: 127.0.0.1
INFO [ecl/EKF] 468000: EKF aligned, (baro height, IMU buf: 22, OBS buf: 14)
INFO [ecl/EKF] 468000: reset position to last known position
INFO [ecl/EKF] 468000: reset velocity to zero
INFO [ecl/EKF] 644000: GPS checks passed (WGS-84 origin set)
INFO [vehicle_angular_velocity] updating filter, sample rate: 1000.000 Hz -> 25
0.000 Hz
INFO [vehicle_acceleration] updating filter, sample rate: 1000.000 Hz -> 250.00
0 Hz
INFO [ecl/EKF] 5188000: reset position to GPS
INFO [ecl/EKF] 5188000: reset velocity to GPS
INFO [ecl/EKF] 5188000: commencing GPS fusion
pxh>
pxh>
pxh> commander takeoff
pxh> INFO [commander] Takeoff detected
```



# Aviation Services Engineering

Logistics and Facility Management  
and more

# airport

Here are 148 public repositories matching this topic...

Language: All ▾

Sort: Best match ▾

Ysurac / FlightAirMap

Star 388

Code Issues Pull requests

Open source project displaying live aircrafts, ships or trackers on 2D/3D map. Browse through the data based on a particular aircraft, airline, airport, tracker or vessel to search through the database or see extensive statistics. Can use ADS-B in SBS1 format (dump1090, Radarcap...), VRS, VA (VATSIM, IVAO whazzup.txt, phpvms,...), ACARS (acarsdec, acarsdeco2), APRS, AIS as datasource.

tracker cesium crash metar airport airline flight ship vatsim aircraft iavo acars  
glidernet phpvms notam modes ads-b sbs vessel 3d-map

Updated on Nov 25, 2020 TSQL

felix-dumit / FSDAirportFlipLabel

Star 83

Code Issues Pull requests

UILabel like old Airport flipping labels

ios label ios-animation airport

Updated on Mar 9, 2018 Objective-C

Ivysauro / CNRT

Star 74

Code Issues Pull requests Discussions

中国轨道交通数据库 (非技术类) - 另一角度看地铁/ Data base of China Rail Transit (Non-tech) - Another view of Rail Transit

bus metro payment railway china airport subway rail-transit

Updated 3 days ago SCSS

gravity-EDDS / EDDS-freeware-releases

Star 57

Code Issues Pull requests

# Logistics and Facility Management

- Data analysis resources
- System modelling and simulations
- Logistical models

## Machine learning for data analysis

- Faster analysis
- Potential extra self-learning for students
- Extremely beneficial to their careers

The screenshot shows a GitHub repository page for 'LogisticsPipes'. At the top, it displays '4 branches' and '11 tags'. Below the repository name, there's a list of commits from 'Michał-MK' with details like date, file changes, and descriptions. To the right, there are sections for 'Releases' (17), 'Packages' (No packages published), 'Contributors' (60), and 'Languages' (Java 84.4%, Kotlin 15.6%).

The screenshot shows a GitHub search results page for 'Machine Learning'. It includes a sidebar with repository statistics (339K repositories, 8M code, 271K commits, etc.) and a language section (Jupyter Notebook 132,549, Python 72,791, etc.). The main area shows search results for 'Machine Learning' with details like repository name, description, language, and update date.

# Aeronautical Engineering

## Material, aircraft designs, CFD and more

# computational-fluid-dynamics

Here are 198 public repositories matching this topic...

Language: All ▾

Sort: Best match ▾

doyubkim / fluid-engine-dev

Star 1.1k

Code Issues Pull requests

Fluid simulation engine for computer graphics applications

c-plus-plus visual-studio sdk animation computer-graphics physics-engine computational-physics fluid-simulation-engine computational-fluid-dynamics

Updated on Apr 25 C++

CubbyFlow / CubbyFlow

Star 175

Code Issues Pull requests

Voxel-based fluid simulation engine for computer games

cplusplus cpp computer-graphics physics-engine computational-physics cpp17 fluid-simulation-engine computational-fluid-dynamics

Updated 6 days ago C++

AvtechScientific / ASL

Star 153

Code Issues Pull requests

Advanced Simulation Library - hardware accelerated multiphysics simulation platform.

crystallography gpgpu scientific-computing high-performance-computing design-space-exploration computational-fluid-dynamics virtual-sensing image-guided-surgery computer-aided-engineering

Updated on Dec 21, 2018 C++

loliverhennigh / Steady-State-Flow-With-Neural-Nets

Star 119

Code Issues Pull requests

A Tensorflow re-implementation of the paper Convolutional Neural Networks for Steady Flow Approximation

# aircraft-design

Here are 21 public repositories matching this topic...

Language: All ▾

Sort: Best match ▾

JSBSim-Team / jsbsim

Star 394

Code Issues Pull requests Discussions

Open XML validation

14

bcoconni commented on Jan 12, 2019

JSBSim provides schemas for XML validation ( JSBSim.xsd for flight models, JSBSimScript.xsd for script files and JSBSimSystem.xsd for system files) but they have not been updated for a while so they might reject perfectly valid XML files.

XML files can be tested with xmllint

> xmllint --noout --schema JSBSim.xsd file.xml [Read more](#)

bug help-wanted good-first-issue

Aero Sandbox

by Peter Sharpe



peterdsharpere / AeroSandbox

Sponsor Star 236

Code Issues Pull requests

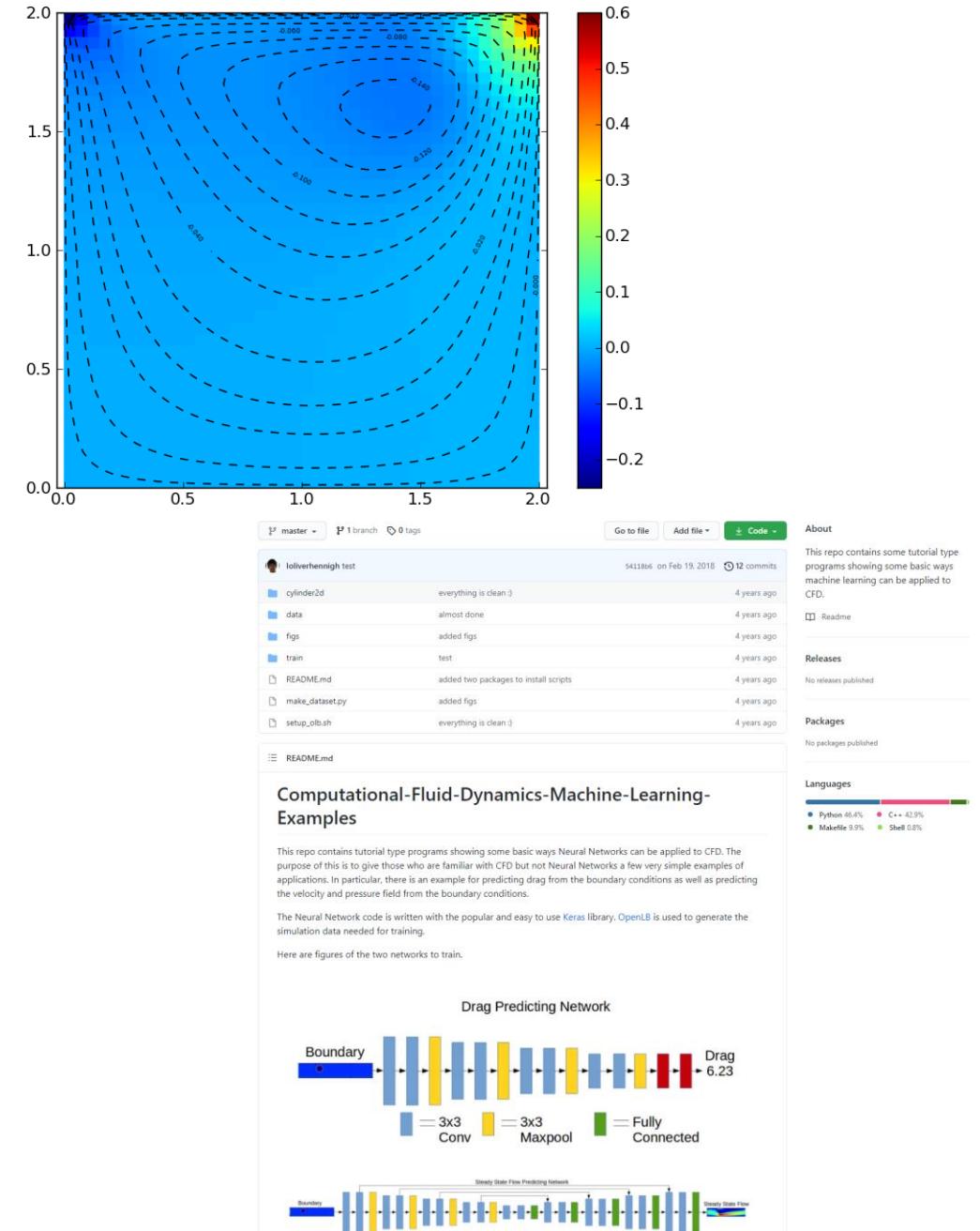
Aircraft design optimization made fast through modern automatic differentiation. Plug-and-play analysis tools for aerodynamics, propulsion, structures, trajectory design, and much, much more.

python analysis optimization aerospace automatic-differentiation airplane cfd aircraft aerodynamics vlm xfoil aircraft-design indra mdao aerodynamic-analysis 3d-panel

Updated 4 days ago Jupyter Notebook

# CFD Python

- Full course for CFD Python
- Course Materials (Lectures and video)
- Software resources



# Aircraft Maintenance

## Propulsion, NDT and more

NASA Jet Propulsion Laboratory  
A world leader in the robotic exploration of space  
Pasadena, California, US <http://www.jpl.nasa.gov> [github@jpl.nasa.gov](mailto:github@jpl.nasa.gov)

Overview Repositories 26 Packages 6 People 6 Projects

Pinned

**open-source-rover**  
A build-it-yourself, 6-wheel rover based on the rovers on Mars!  
Gnuplot 6.8k 1.1k

**osr-rover-code**  
Code that runs on the Open Source Rover  
Python 267 96

**COVID-19-respirators**  
JPL designed 3D and tested printed respirators to help with the COVID-19 pandemic response.  
G-code 104 18

**osr-android-app**  
Android application used to control the Open Source Rover  
Java 59 30

**SPOC**  
A website showcasing SPOC (Soil Property and Object Classification), a deep learning-based terrain classifier for Mars rovers  
HTML 6 1

**spoc\_lite**  
A light-weight, experimental terrain classifier for Mars rovers  
C++ 7 4

Repositories

Find a repository... Type Language Sort

**itslive**  
A NASA MEaSUREs project to provide automated, low latency, global glacier flow and elevation change datasets  
Jupyter Notebook 4 MIT 0 3 0

**LiveViewLegacy**  
Real-time tools for Imaging Spectroscopy Data  
C++ 18 7 0 0 0

**open-source-rover**  
A build-it-yourself, 6-wheel rover based on the rovers on Mars!  
Gnuplot 6,785 Apache-2.0 1,104 34 (1 issue needs help) 8

**itslive-projects**  
Jupyter Notebook 0 MIT 0 0 0

**sstmp**  
Solar System Treks Mosaic Pipeline  
Python 4 Apache-2.0 0 21 0

**jsd**  
Just SOEM Drivers

# Example on NDT

- Resources on the whole conference
  - 20th World Conference on Non-Destructive Testing
- Documentation and software resources
- Applying LSTM to NDT

master 3 branches 0 tags Go to file Add file Code

vewald Merge branch 'master' of https://github.com/xaviergoby/LSTMforSHM 0f00291 on Oct 21, 2020 67 commits

File	Description	Time Ago
configs_and_settings	recent work	10 months ago
literature	non-code commit	13 months ago
results	Merge branch 'master' of https://github.com/xaviergoby/LSTMforSHM	10 months ago
src	recent work	10 months ago
.gitignore	recent work	10 months ago
LICENSE	Initial commit	2 years ago
README.md	Revert "Results Update"	13 months ago
__init__.py	1st commit of og Vicent lstm & my data_loading script w/ data and labels	2 years ago
call_mainscript.py	Update results	10 months ago
main.py	recent work	10 months ago
main_v2.py	Merge branch 'master' of https://github.com/xaviergoby/LSTMforSHM	10 months ago
main_v3_xav.py	recent work	10 months ago
p2atR.jpg	non-code commit	13 months ago
settings.py	recent work	10 months ago

Readme MIT License

Releases No releases published

Packages No packages published

Contributors 2 xaviergoby Alexander Xavier O'Rour... vewald

Environments 1 github-pages Active

Languages Python 100.0%

About Application of LSTM network for Structural Health Monitoring & Non-Destructive Testing

xaviergoby.github.io/convlstm-compu...

computer-vision timeseries tensorflow keras cnn waves lstm supervised-learning classification shm ultrasonic-sensor ndt structural-engineering structural-analysis convlstm structural-health-monitoring lambwaves pzt aircraft-inspection non-destructive-testing

Sequential Modelling in Data-Driven Approach for Structural Health Monitoring by Recurrent Convolutional Neural Networks

Conference: 20th World Conference on Non-Destructive Testing  
Location & Date: South Korea, Seoul - June 2020  
Co-authors: Ewald V., Goby X., Groves R.M. & Benedictus R.  
Labarotory: TU Delft Aerospace NDT Lab

Usage Instruction

In order to make use of this project all you need mainly be concerned with is the main.py Python script. In it you shall (hopefully) find yourself a more than sufficient amount of documentation in order to understand and be able to make use of it!

Dev Progress Log-Journal, Data Characteristics & Background Information

Notes:

# Navigation and Positioning

RTKLIB, VINS, ORB\_SLAM3, ROS and more

The image displays three GitHub repository pages side-by-side:

- UZ-SLAMLab / ORB\_SLAM3**: This page shows the repository's code history. It includes a list of 49 commits from Richard Elvira, dated from April 2021 to March 2022. The commits cover various files like Examples, Thirdparty, Vocabulary, and Evaluation. The repository has 165 issues, 27 pull requests, and 1 branch.
- tomojitakasu / RTKLIB**: This page shows the repository's code history. It includes a list of 69 commits from tomojitakasu, dated from January 2018 to January 2020. The commits cover files such as app, bin, brd, data, doc, lib, and src. The repository has 303 issues, 39 pull requests, and 2 branches.
- HKUST-Aerial-Robotics / VINS-Mono**: This page shows the repository's code history. It includes a list of 76 commits from shaozu, dated from March 2019 to March 2021. The commits cover files like ar\_demo, benchmark\_publisher, camera\_model, config, docker, feature\_tracker, pose\_graph, support\_files, vins\_estimator, and README.md. The repository has 231 issues, 4 pull requests, and 3 branches.

# Repository Examples

- UAV Powering Programmes
- Weather and Traffic Receiver
- Radio demodulator
- Proximity awareness systems
- Traffic visualization
- And more!!
- <https://github.com/topics/aviation>

The screenshot shows the GitHub search interface for the topic '# aviation'. It displays three repository cards:

- generalized-intelligence / GAAS**: A repository for an open-source program designed for fully autonomous VTOL (a.k.a. flying cars) and drones. It stands for Generalized Autonomy Aviation System. The repository has 1.6k stars. It was updated on Oct 25, 2021, and is written in C++.
- cyoung / stratus**: A repository for an aviation weather and traffic receiver based on RTL-SDR. It uses C and C++. The repository has 842 stars. It was last updated 6 days ago.
- szpaider / RTLSDR-Airband**: A repository for an RTLSDR-based airband receiver. It uses C and C++. The repository has 469 stars.

At the top of the search results, there are filters for 'Language: All' and 'Sort: Best match'.

# Other related Repositories

- UAV simulation platforms
- ADS-B Decoder
- Aircraft design optimization
- Aircraft design toolbox
- <https://github.com/topics/aircraft>

Explore in your free time and you might find out something interesting!

The screenshot shows the GitHub search interface for the topic '# aircraft'. It displays 287 public repositories matching the search term. The first repository listed is `wiedehopf/tar1090`, which provides an improved webinterface for use with ADS-B decoders. The second repository is `JSBSim-Team/jsbsim`, which provides schemas for XML validation. The third repository is `robin-shaun/XTDrone`, which is a UAV Simulation Platform based on PX4, ROS and Gazebo.



# What Will You will Learn and Experience?

- Pull Request (Basic Features)
  - Allowing leaders to **double check** modifications done by teammates
- Code Synchronization (Version Control on Web, VS, MATLAB etc)
  - Ensuring everyone is working on the **latest** code version
- Self-learning using GitHub resources
- Look for interesting issues on GitHub

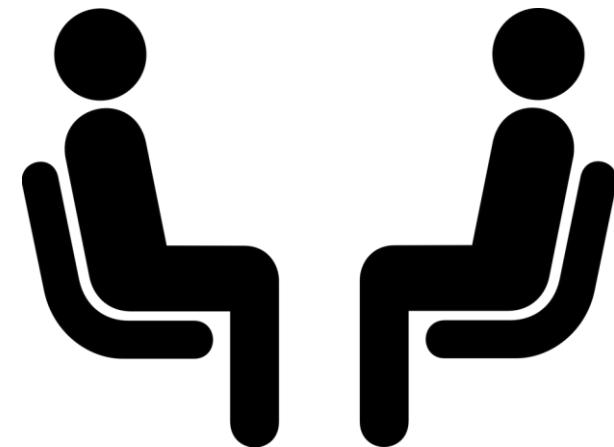


For Your Career

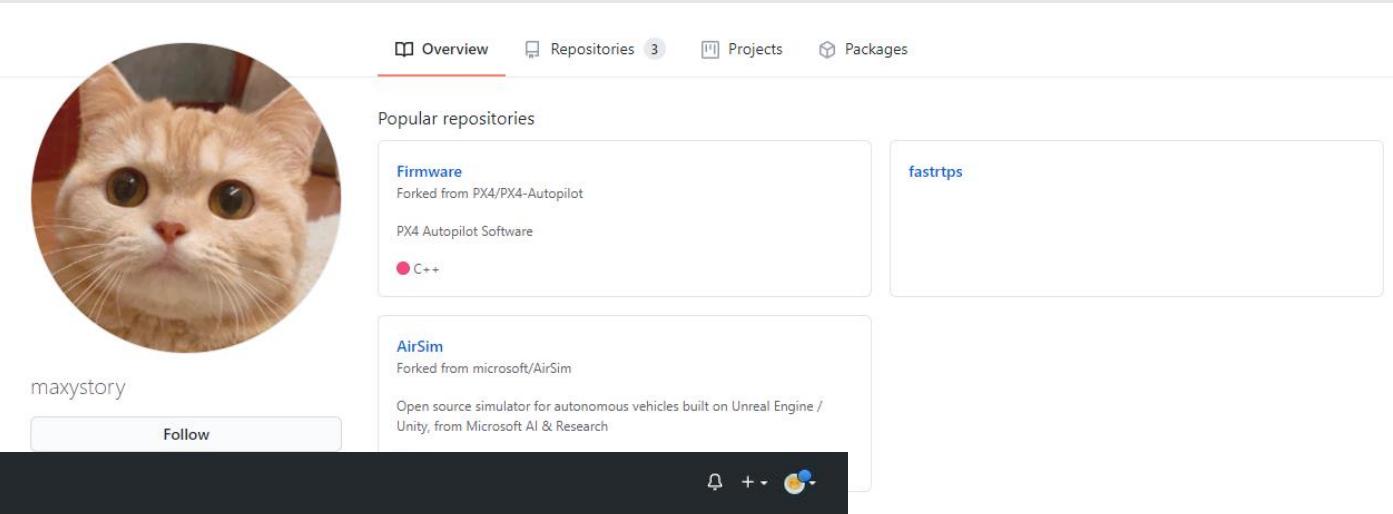


# GitHub Facilitated Job Hunting

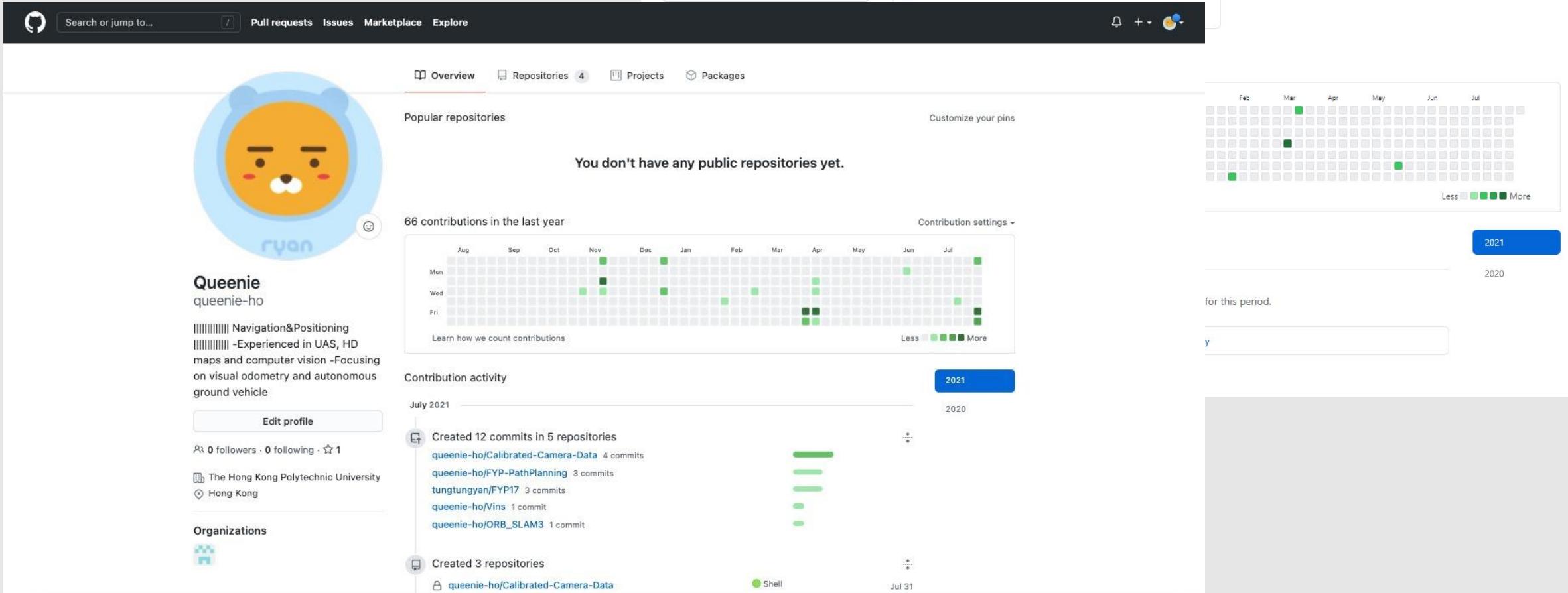
- A online digital profile for students
  - Indicating interests
  - Show past work
  - Roadmap of students' development career
- Let people know that you are looking for a job
- During job hunting
  - Better first impression
  - Better understanding
  - Appears more enthusiastic



# Develop Personal Profiles Starting from AAE UG



The screenshot shows a GitHub profile for the user 'maxystory'. The profile picture is a close-up of an orange cat's face. Below the picture, the username 'maxystory' is displayed, along with a 'Follow' button. The top navigation bar includes links for Overview, Repositories (3), Projects, and Packages. The 'Popular repositories' section lists 'Firmware' (forked from PX4/PX4-Autopilot) and 'AirSim' (forked from microsoft/AirSim). The 'Firmware' repository is described as 'PX4 Autopilot Software' and is tagged with 'C++'. The 'AirSim' repository is described as an 'Open source simulator for autonomous vehicles built on Unreal Engine / Unity, from Microsoft AI & Research'.



The screenshot shows a GitHub profile for the user 'queenie-ho'. The profile picture is a cartoon character with a yellow face and blue ears. Below the picture, the username 'queenie-ho' is displayed, along with a 'Follow' button. The top navigation bar includes links for Overview, Repositories (4), Projects, and Packages. The 'Popular repositories' section displays a message: 'You don't have any public repositories yet.' The 'Contribution activity' section shows a heatmap of contributions over the last year, indicating 66 contributions. The 'Contribution settings' dropdown is open, showing options for 'Less' (light green), 'More' (medium green), and 'More' (dark green). The 'Contribution activity' section also shows a timeline from July 2021 to Jul 31, 2021, with a summary: 'Created 12 commits in 5 repositories' and 'Created 3 repositories'. The 'queenie-ho/Calibrated-Camera-Data' repository is listed with 4 commits. The 'queenie-ho/FYP-PathPlanning' repository is listed with 3 commits. The 'tungtungyan/FYP17' repository is listed with 3 commits. The 'queenie-ho/Vins' repository is listed with 1 commit. The 'queenie-ho/ORB\_SLAM3' repository is listed with 1 commit. The 'Edit profile' button is visible at the bottom left of the profile section.



B.X.W  
baaixw

Follow

Visual SLAM GNSS

At 8 followers · 15 following · ⭐ 42

Intelligent Positioning and Navigation L...  
Hong Kong

Achievements



Block or Report

Overview Repositories 33 Projects Packages

Popular repositories

remoteSensing2020  
Improved VINS based on the adaptive covariance and adaptive M-estimator  
C++ 4 2

ios\_logger  
Forked from Vanvarilos\_ios\_logger  
Application for camera and sensor data logging (IOS)  
Objective-C++ 1

vins-application  
Forked from engcang/vins-application  
VINS-Mono and Fusion application of different sets of cameras and imu on different board including desktop and jetson xavier  
C++ 1

catkin  
Original vins-fusion for validation some data. The related path has been revised to ourself path.  
C++ 1

CV\_GNSS  
Forked from weisongwen/CV\_GNSS  
CV Aided GNSS  
C++

tutorials



# Up to Phd Studies

Overview Repositories 24 Projects Packages

Pinned

e3372-web-management  
Getting HUAWEI E3372 info with official API, such as device info, data switch and send sms etc  
CSS 8 2

protobuf-over-nanomsg-example  
Protobuf over nanomsg (C++ as server, and nodejs as client)  
C++

weisongwen/UrbanNavDataset  
UrbanNav: an Open-Sourcing Localization Data Collected in Asian Urban Canyons, Including Tokyo and Hong Kong  
139 32

Darren Wong  
DarrenWong

Follow

move fast

At 18 followers · 16 following · ⭐ 95

Hong Kong  
darrenwongf@gmail.com

Achievements

IPNL @IPNL-POLYU @HKUST-Aerial-Robotics

Organizations

IPNL

Block or Report

98 contributions in the last year

Learn how we count contributions

Less More

Activity overview

Contributed to IPNL-POLYU/UrbanNavDataset, IPNL-POLYU/ipnl-sensor-kit, DarrenWong/benchmark\_lo and 5 other repositories

Code review

100% Commit Issues

2021  
2020  
2019  
2018  
2017  
2016  
2015  
2014  
2013

 [Overview](#) [Repositories 38](#) [Projects](#) [Packages](#)

### Pinned

- js-stopwatch**  
JavaScript Stopwatch class. Output can be controlled using a simple callback!  
JavaScript ⭐ 24 ⚡ 7
- drag-check-js**  
Library for checking multiple checkboxes by click-and-dragging over them. Paint your selection!  
JavaScript ⭐ 21 ⚡ 9
- ClamshellOpen**  
App to allow running your laptop in clamshell mode with an open lid for Lion (10.7) and Mountain Lion (10.8)  
Objective-C ⭐ 5
- chargenow**  
See DriveNow EVs in your area that needs charging. First react project.  
JavaScript ⭐ 1
- d3d-strategy**  
Exam assignment to write a C# program. I chose to write a Direct 3D Strategy game. Graphics for this game was borrowed from C&C: Red Alert. For legal reasons, they are not included in the repository.  
C# ⭐ 1
- lolphuse**  
MacOS utility app to pause League of Legends GUI Flash client while game is activate to lower CPU consumption  
Objective-C ⭐ 1

**44 contributions in 2021**



Learn how we count contribution.

**Seph Soliman**  
scarlac

[Follow](#)

Tattoodo, Bitbucket, Konstellation. Software entrepreneur, developer and true full stack developer.

64 followers · 7 following · 71

 Tesla  
 San Francisco  
<https://www.seph.dk>

**Achievements**



**Organizations**

  
[Block or Report](#)

 [Overview](#) [Repositories 79](#) [Projects](#) [Packages](#)

### Popular repositories

- anki**  
Go library to read Anki \*.apk files  
Go ⭐ 18 ⚡ 3
- go-pouchdb**  
GopherJS bindings for PouchDB ⚠ NOTICE ⚡ this package has been superseded by https://github.com/go-kivik/kivik  
Go ⭐ 13 ⚡ 1
- onload**  
Onload handler for GopherJS without the bloat of jQuery  
Go ⭐ 10 ⚡ 1
- go-sql.js**  
GopherJS bindings for SQL.js  
Go ⭐ 9
- minimal-pairs**  
Tool for finding minimal pairs given a corpus of words  
HTML ⭐ 5 ⚡ 1
- jsblob**  
GopherJS bindings for JavaScript Blob objects  
Go ⭐ 3

**977 contributions in the last year**



Learn how we count contributions.

**Jonathan Hall**  
flimzy

You can also find me on GitLab: <https://gitlab.com/flimzy>

[Follow](#) [...](#)

139 followers · 32 following · 45

Amsterdam, NL  
<https://jhall.io/>  
@DevOpsHabits

**Highlights**

\* Arctic Code Vault Contributor

**Organizations**



 [Overview](#) [Repositories 79](#) [Projects](#) [Packages](#)

### Popular repositories

- anki**  
Go library to read Anki \*.apk files  
Go ⭐ 18 ⚡ 3
- go-pouchdb**  
GopherJS bindings for PouchDB ⚠ NOTICE ⚡ this package has been superseded by https://github.com/go-kivik/kivik  
Go ⭐ 13 ⚡ 1
- onload**  
Onload handler for GopherJS without the bloat of jQuery  
Go ⭐ 10 ⚡ 1
- go-sql.js**  
GopherJS bindings for SQL.js  
Go ⭐ 9
- minimal-pairs**  
Tool for finding minimal pairs given a corpus of words  
HTML ⭐ 5 ⚡ 1
- jsblob**  
GopherJS bindings for JavaScript Blob objects  
Go ⭐ 3

**Jonathan Hall**  
flimzy

You can also find me on GitLab: <https://gitlab.com/flimzy>

[Follow](#) [...](#)

139 followers · 32 following · 45

Amsterdam, NL  
<https://jhall.io/>  
@DevOpsHabits

**Highlights**

\* Arctic Code Vault Contributor

**Organizations**



**977 contributions in the last year**



Learn how we count contributions.

Contribution activity

2020

## Making GitHub Part of your Work

Now you have an empty GitHub profile. How do you make it shine?

The following tips are roughly organized according to effort. Practically anyone can implement at least some of them. The later suggestions will be more discretionary, depending on your interests and time.

### Star interesting projects

Whenever you run across a GitHub project that piques your interest, "star" it. Your starred projects appear on your public profile, and if nothing else, they provide recruiters and hiring managers an indication of what sorts of projects you find interesting.

### Follow interesting people

GitHub also allows you to follow interesting people, and these people will appear on your public profile, as well. In addition to signaling to the world whom you find interesting, when people you follow make contributions to their projects, you will



# Introduction to GitHub Operations

# Mutual editing on a document with collaborators remotely?

 acceptance	26/3/2021 11:58 AM	File folder	
 final submission	2/8/2021 11:38 AM	File folder	
 ieee_taes_novatel_heatmap	29/7/2020 2:44 PM	File folder	
 My EndNote Library.Data	20/7/2020 9:17 PM	File folder	
 My EndNote Library.enl.unzipped	14/7/2020 9:26 AM	File folder	
 revision 1	28/12/2020 5:31 PM	File folder	
 Artical file (single column).docx	24/8/2020 3:55 PM	Microsoft Word D...	4,036 KB
 Article Processing Charges.pdf	19/4/2021 9:33 AM	Adobe Acrobat D...	118 KB
 cover letter.docx	28/7/2020 12:26 PM	Microsoft Word D...	17 KB
 figure.pptx	22/6/2020 11:11 AM	Microsoft PowerP...	7,122 KB
 ieee_taes_3dma_rtk (20200612 Ivan).docx	22/6/2020 10:12 AM	Microsoft Word D...	4,103 KB
 ieee_taes_3dma_rtk (20200622 GH).docx	22/6/2020 2:52 PM	Microsoft Word D...	4,112 KB
 ieee_taes_3dma_rtk (20200709 WS).docx	9/7/2020 3:38 PM	Microsoft Word D...	4,294 KB
 ieee_taes_3dma_rtk (20200714 LT).docx	15/7/2020 5:47 PM	Microsoft Word D...	4,306 KB
 ieee_taes_3dma_rtk (20200722 lucy).docx	23/7/2020 4:49 PM	Microsoft Word D...	7,319 KB
 ieee_taes_novatel_heatmap.rar	29/7/2020 2:42 PM	WinRAR archive	13,851 KB
 Manuscript_two_columns.docx	13/10/2020 1:45 PM	Microsoft Word D...	4,030 KB
 My EndNote Library.enl	8/1/2021 10:42 AM	EndNote Library	141 KB
 References.docx	14/7/2020 9:16 AM	Microsoft Word D...	18 KB

Download files from various channels, such as mail, whatsapp, etc?

Can we edit the documents online ? Google, Microsoft has the solutions!

Can we edit the “code” online? **Github**

# Archive your coding online (in the cloud)

Pull

Pull: *To update local branch with remote, update all remote tracking branches*

Video: **VSC-Git Basic Operations**

Cloud repository (project)

Clone : *To download a repository to your local machine*

Clone/  
Fetch

Local repository (project)

Fetch : *To pull a branch to your local machine*

Push

Push: *To upload the commit made on a local branch to GitHub*

Check out to: *Switch to a specific branch*

Open file and  
Check out to

Code and Debugger

Commit

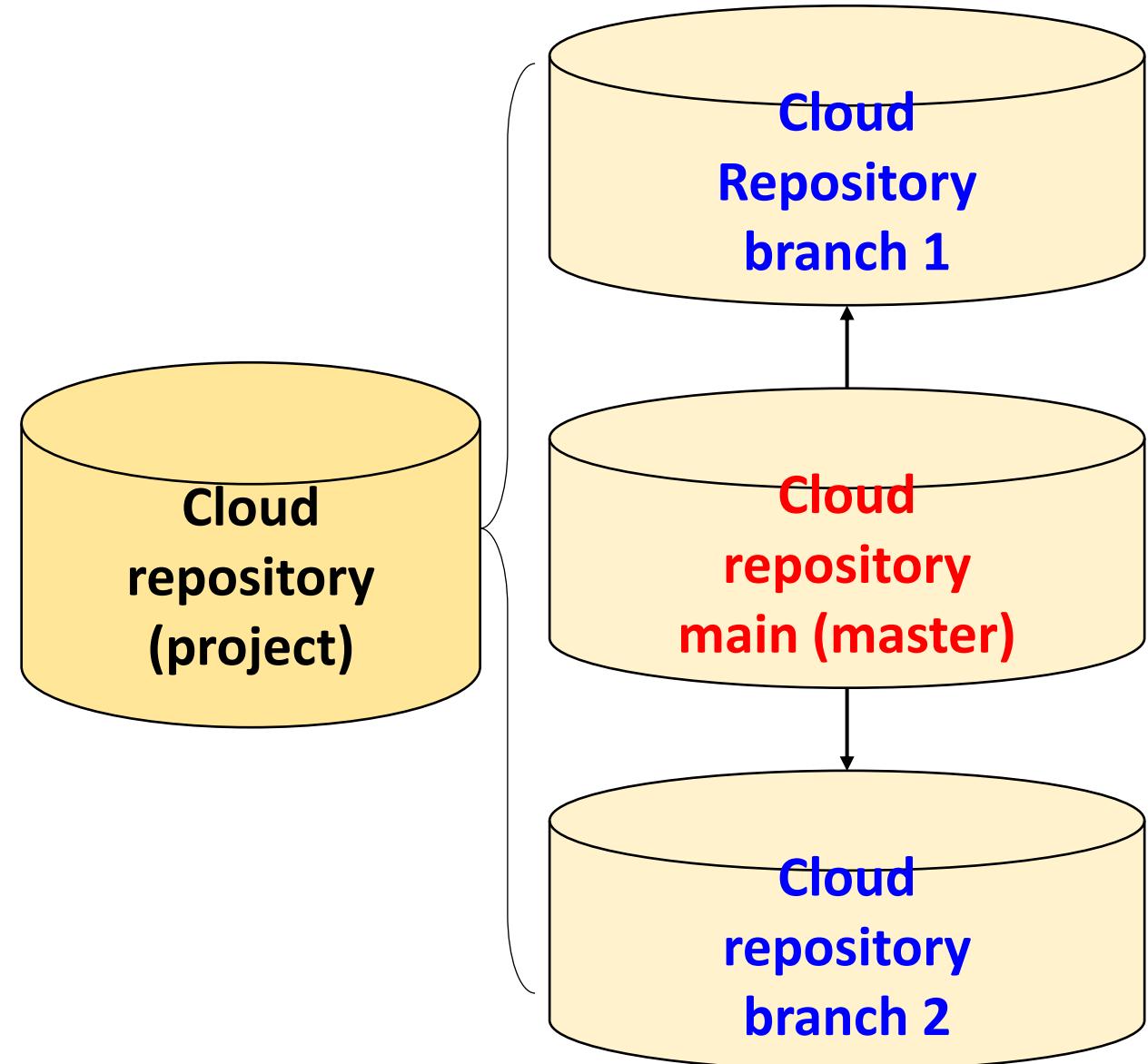
New Version

Add (Stage)

Commit: *To create a snapshot of the repository*

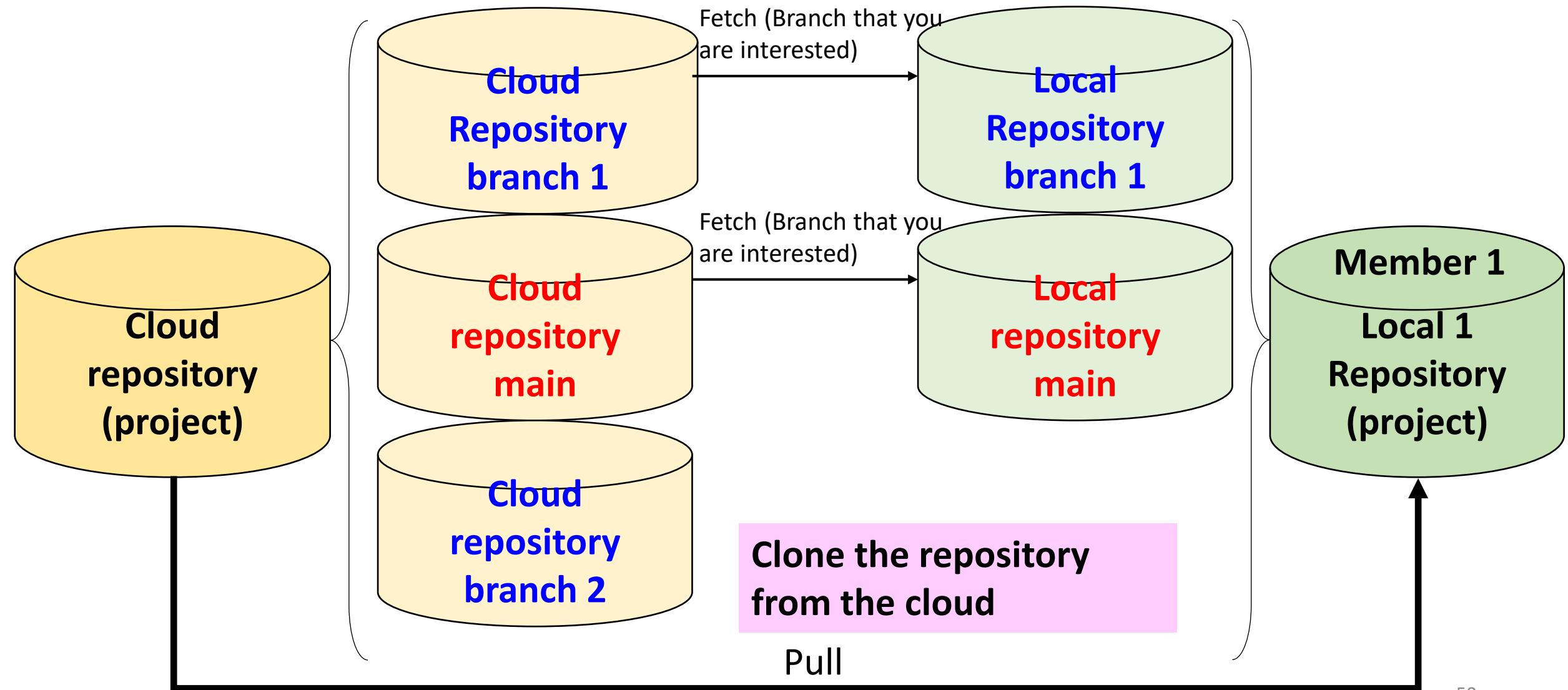
Add (Stage): *To add files or segments in the next commit*

## Collaborative coding online – Generate Branch (Member)

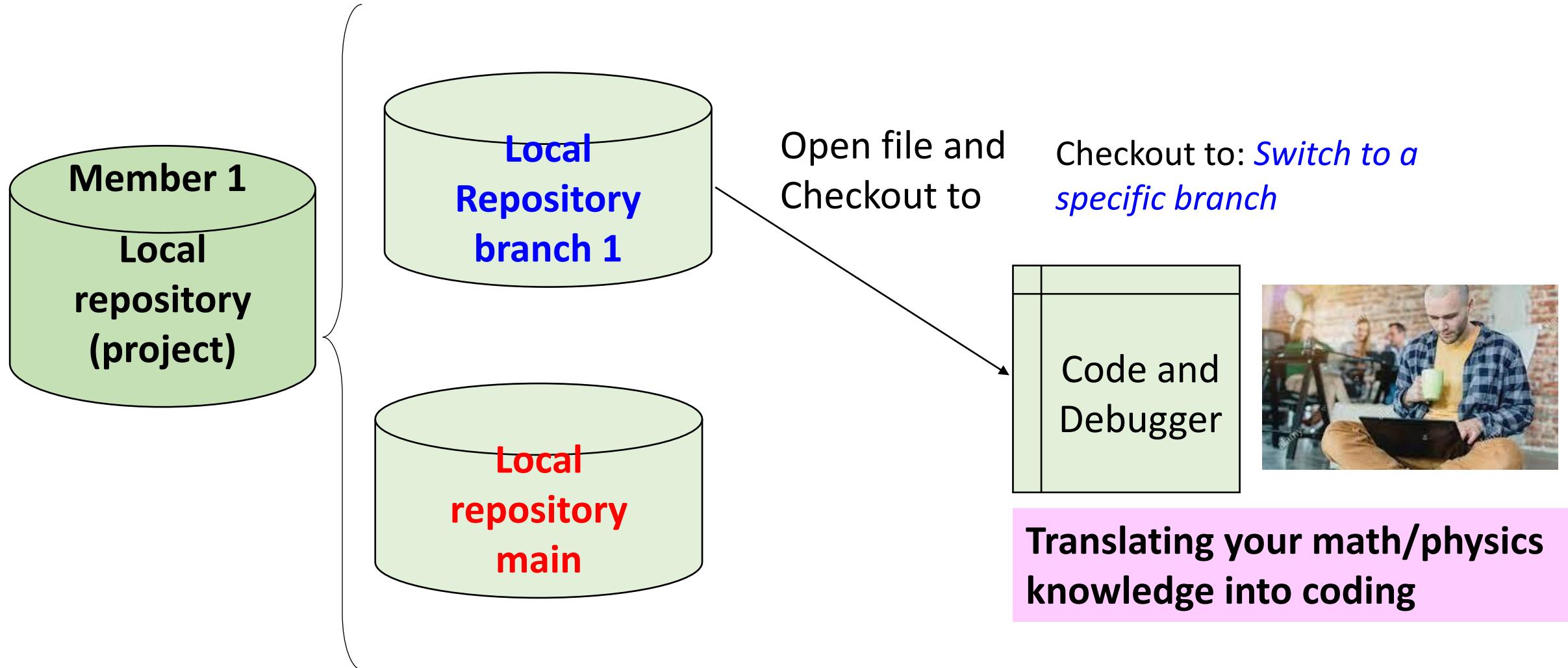


To generate a branch for different member that participant the project, creating a contained area of your repository to develop features, fix bugs and more.

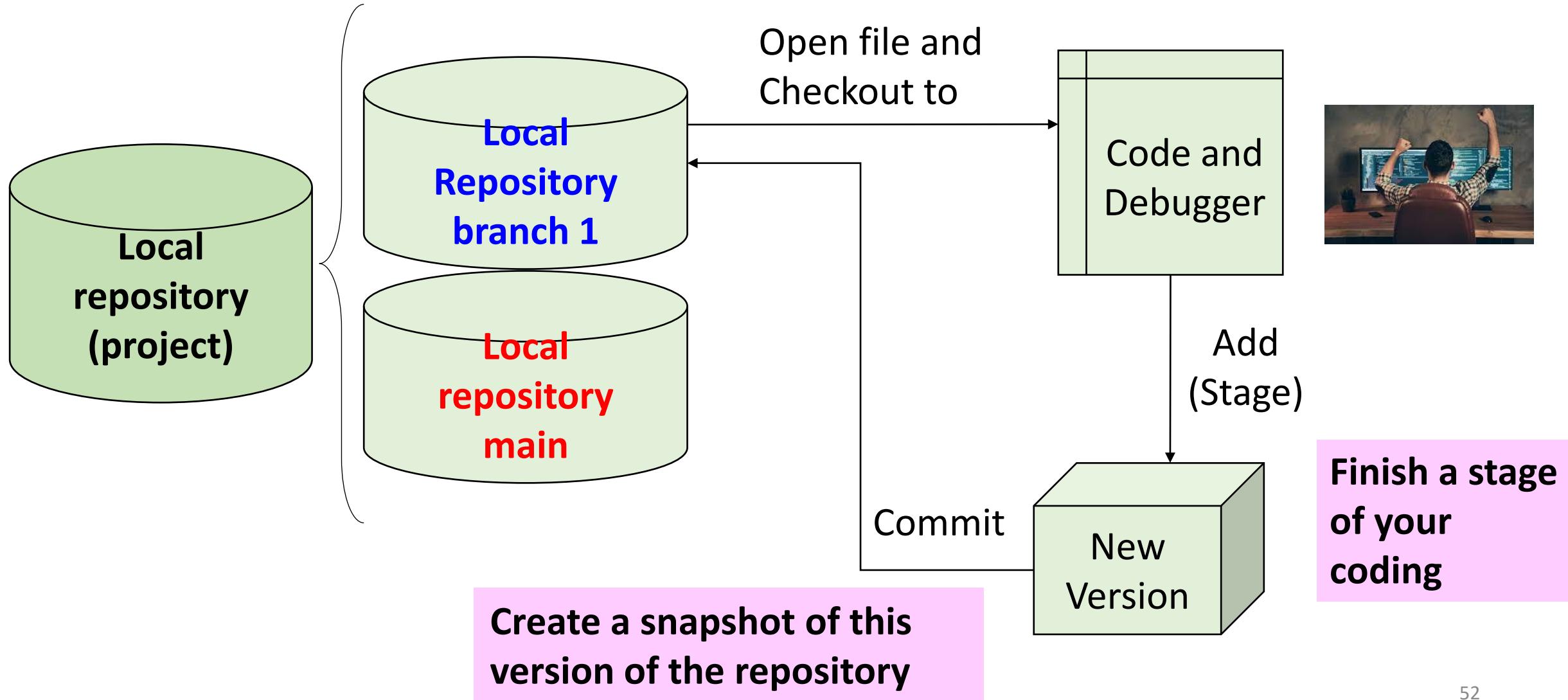
# Collaborative coding online – Fetch/Pull Branch from Cloud



# Collaborative coding online – Edit the code in the local computer



# Collaborative coding online – Edit the code in the local computer

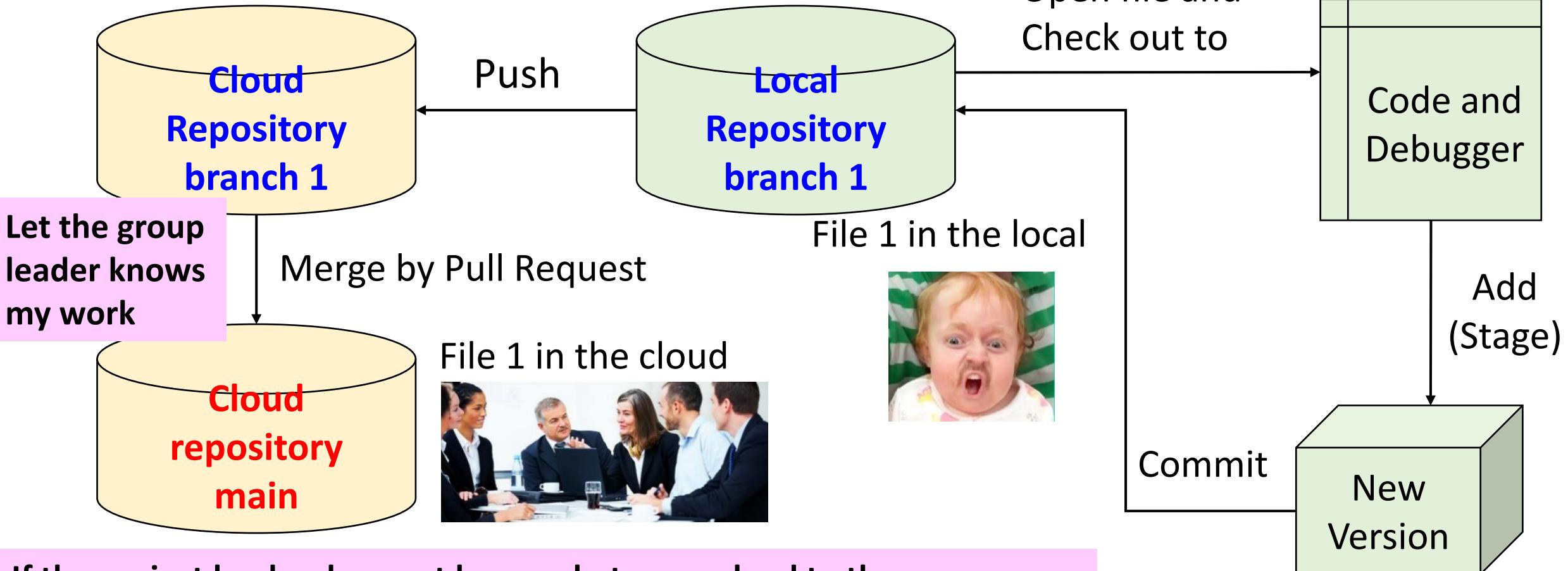


# Concept of collaborative coding online

Web based

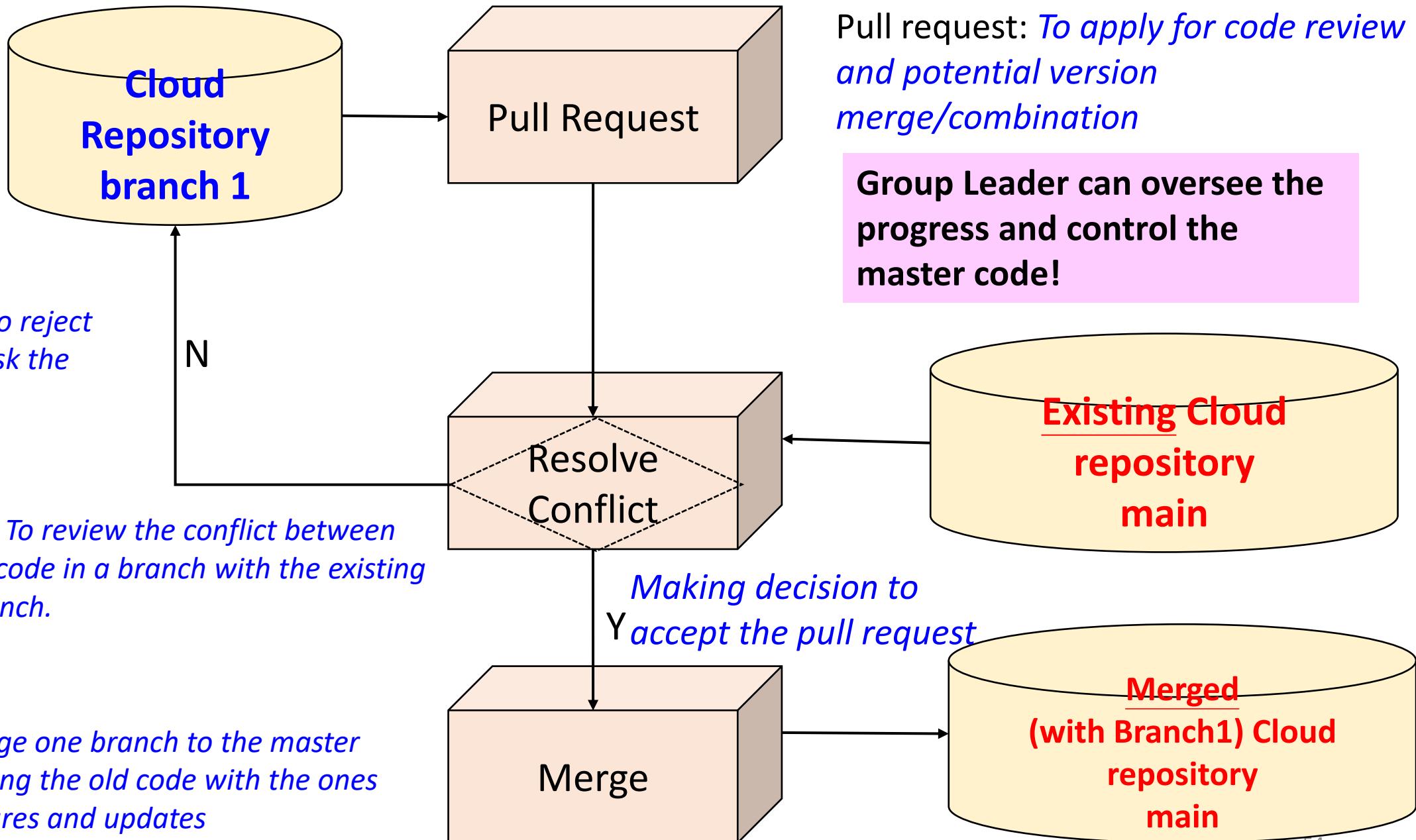
Video: [VSC-Git  
Branches](#)

Ready to update to the cloud branch!

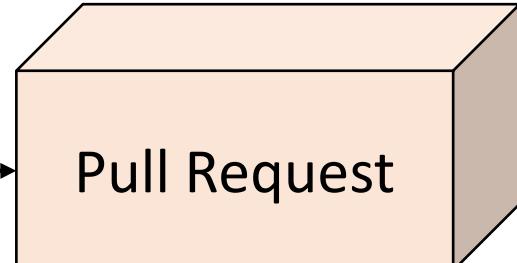
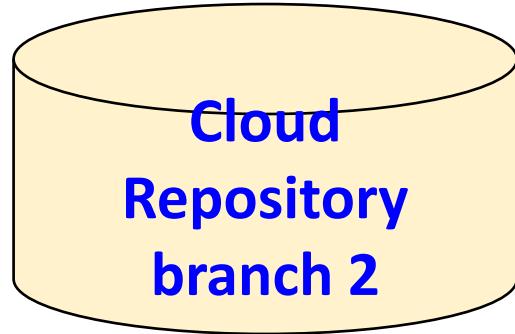


If the project leader does not know what you upload to the source code, you will create a lot of confusions!

Web based



Web based

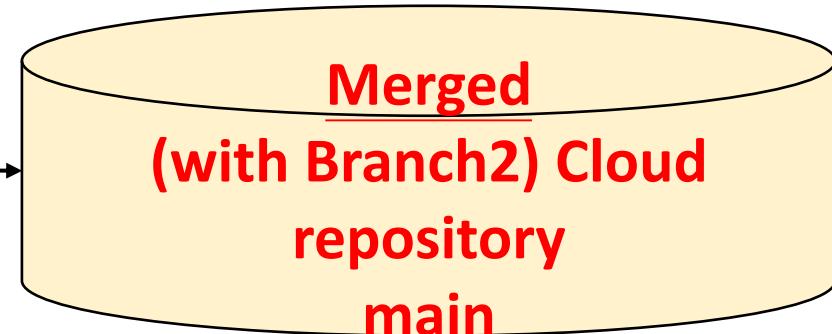
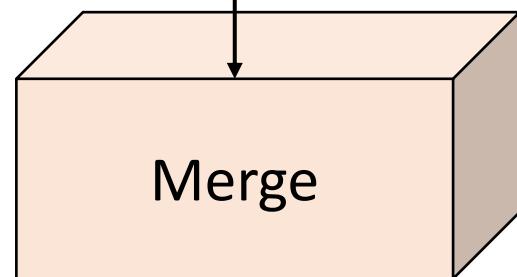
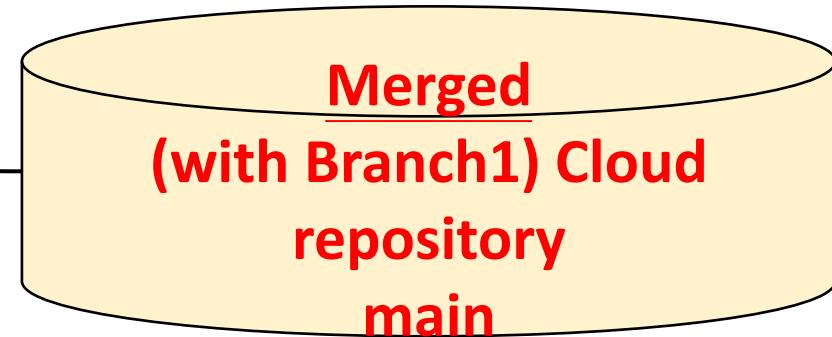
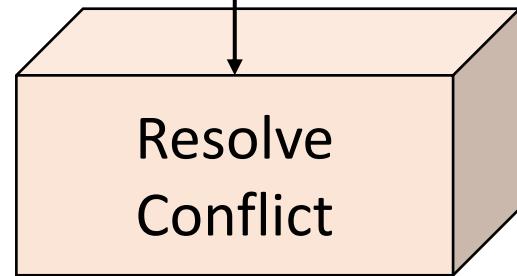


Group Leader can oversee the progress and control the master code!

Resolve Conflict: *To review the conflict between the new version code in a branch with the existing code in main branch.*

[More conflict!](#)

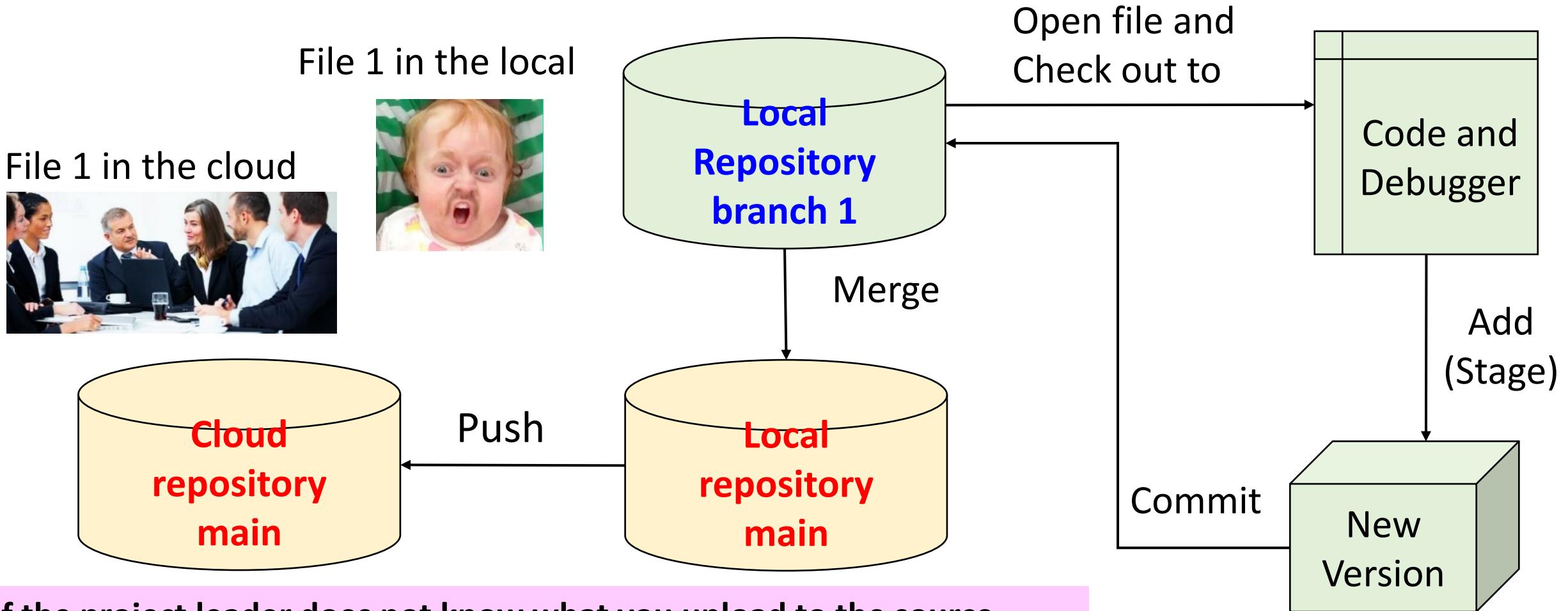
*After reviewing, making decision to change or reject the pull request.*



# Concept of collaborative coding online

VS code based

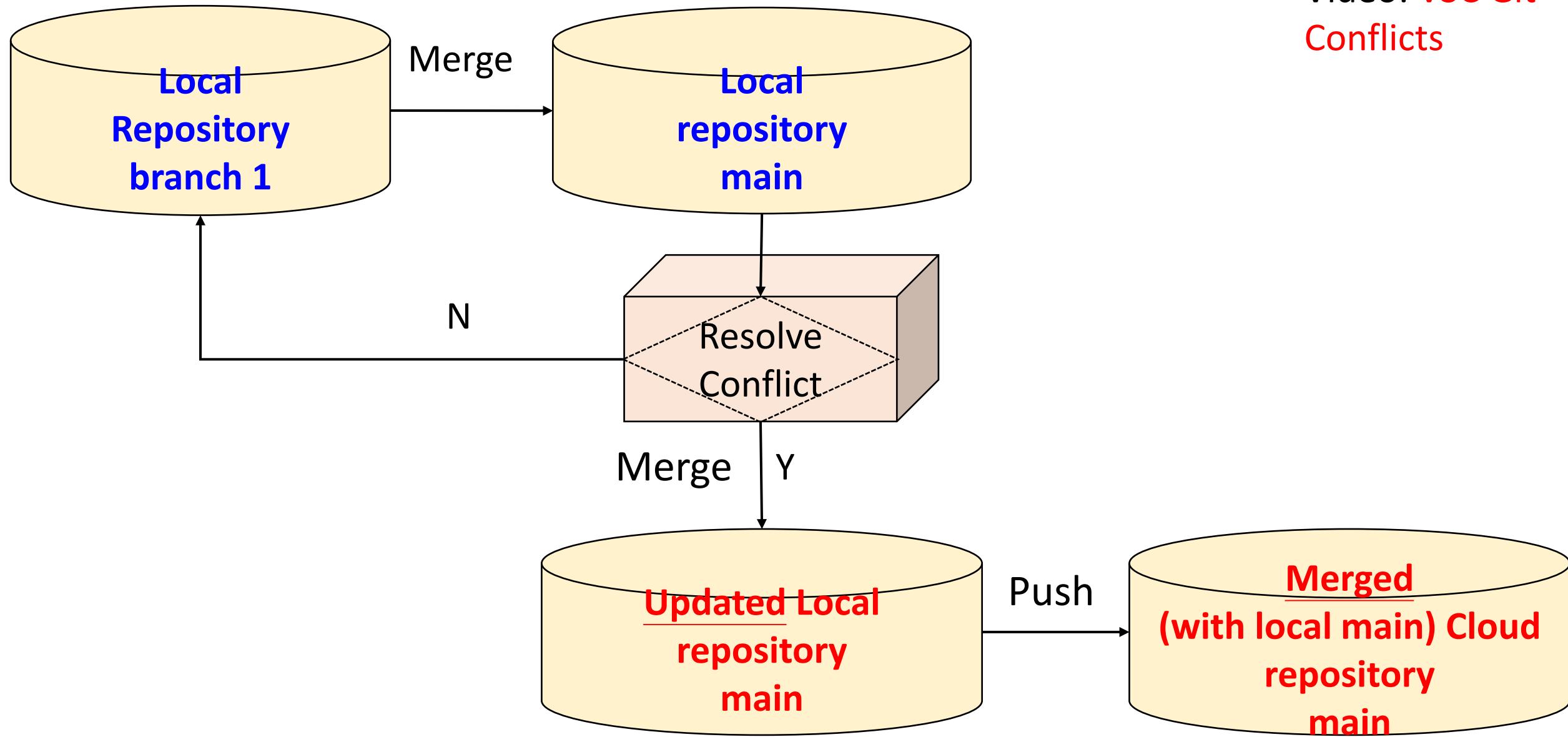
Video: [VSC Git Conflicts](#)



If the project leader does not know what you upload to the source code, you will create a lot of confusions!

VS code based

Video: [VSC Git Conflicts](#)



# GitHub Tutorial Videos (Web Version)

- **Signing Up:**  
[https://www.youtube.com/watch?v=djwgi6YpZWY&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=djwgi6YpZWY&ab_channel=POLYUIPNL)
- **Group Leader Operations:**  
[https://www.youtube.com/watch?v=xmy9UaXZqAI&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=xmy9UaXZqAI&ab_channel=POLYUIPNL)
- **Group Member Operations:**  
[https://www.youtube.com/watch?v=xVtce克斯7EA&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=xVtce克斯7EA&ab_channel=POLYUIPNL)
- **Creating New Repository + Setup:**  
[https://www.youtube.com/watch?v=fD6x3wborEI&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=fD6x3wborEI&ab_channel=POLYUIPNL)
- **Commit & Merge:**  
[https://www.youtube.com/watch?v=34bSuMcdHP4&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=34bSuMcdHP4&ab_channel=POLYUIPNL)
- **Commit & Merge (rejected):**  
[https://www.youtube.com/watch?v=6zPyvGKE804&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=6zPyvGKE804&ab_channel=POLYUIPNL)
- **Searching and Downloading:**  
[https://www.youtube.com/watch?v=5rtr63yCO0c&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=5rtr63yCO0c&ab_channel=POLYUIPNL)

# GitHub Tutorial Videos (With VS Code)

- **VSC Setup with GitHub:**  
[https://www.youtube.com/watch?v=GXbxHbjQDc&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=GXbxHbjQDc&ab_channel=POLYUIPNL)
- **VSC Setup with GitHub (Mac):**  
[youtube.com/watch?v=iUyr8iG1G8k&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=iUyr8iG1G8k&ab_channel=POLYUIPNL)
- **VSC Git Basic Operation:**  
[youtube.com/watch?v=juEEJkgq6fI&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=juEEJkgq6fI&ab_channel=POLYUIPNL)
- **VSC Git Branches:**  
[https://www.youtube.com/watch?v=5qUDlFg5gAM&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=5qUDlFg5gAM&ab_channel=POLYUIPNL)
- **VSC Git Conflicts:**  
[https://www.youtube.com/watch?v=4JrCfXhmavg&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=4JrCfXhmavg&ab_channel=POLYUIPNL)
- **VSC Commits & Pushes with web merges:**  
[https://www.youtube.com/watch?v=34bSuMcdHP4&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=34bSuMcdHP4&ab_channel=POLYUIPNL)
- **VSC Pushing (No web):**  
[https://www.youtube.com/watch?v=dSWB5QCUpE&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=dSWB5QCUpE&ab_channel=POLYUIPNL)

# Software Installation and setup Guide

# Install Python in Windows 10

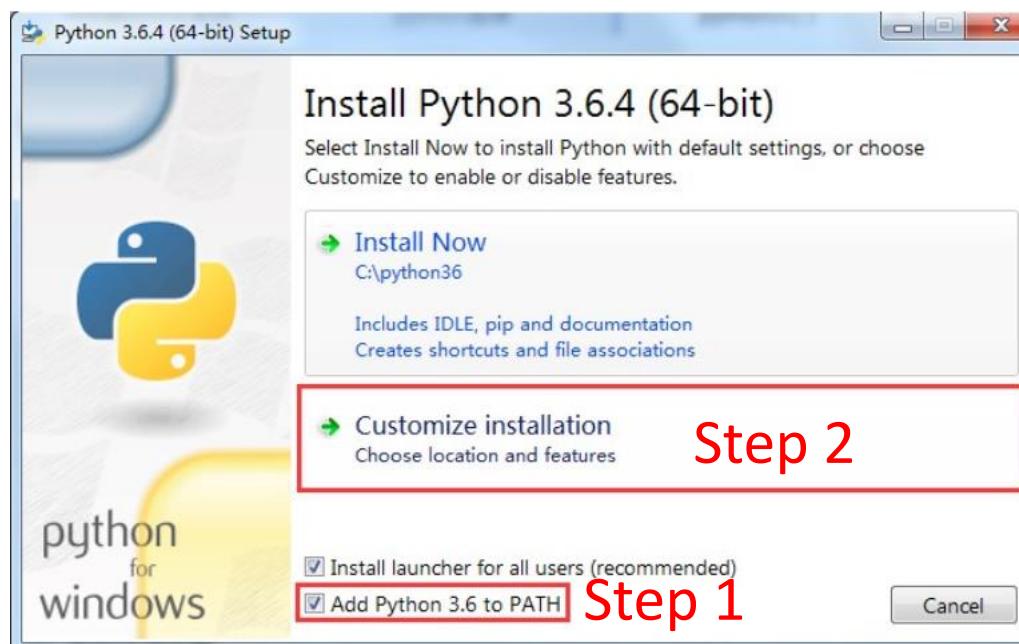
Tutorial Video:

[https://www.youtube.com/watch?v=wJEZ08M2j4Q&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=wJEZ08M2j4Q&ab_channel=POLYUIPNL)

Step 1: Download Python 3.6.4

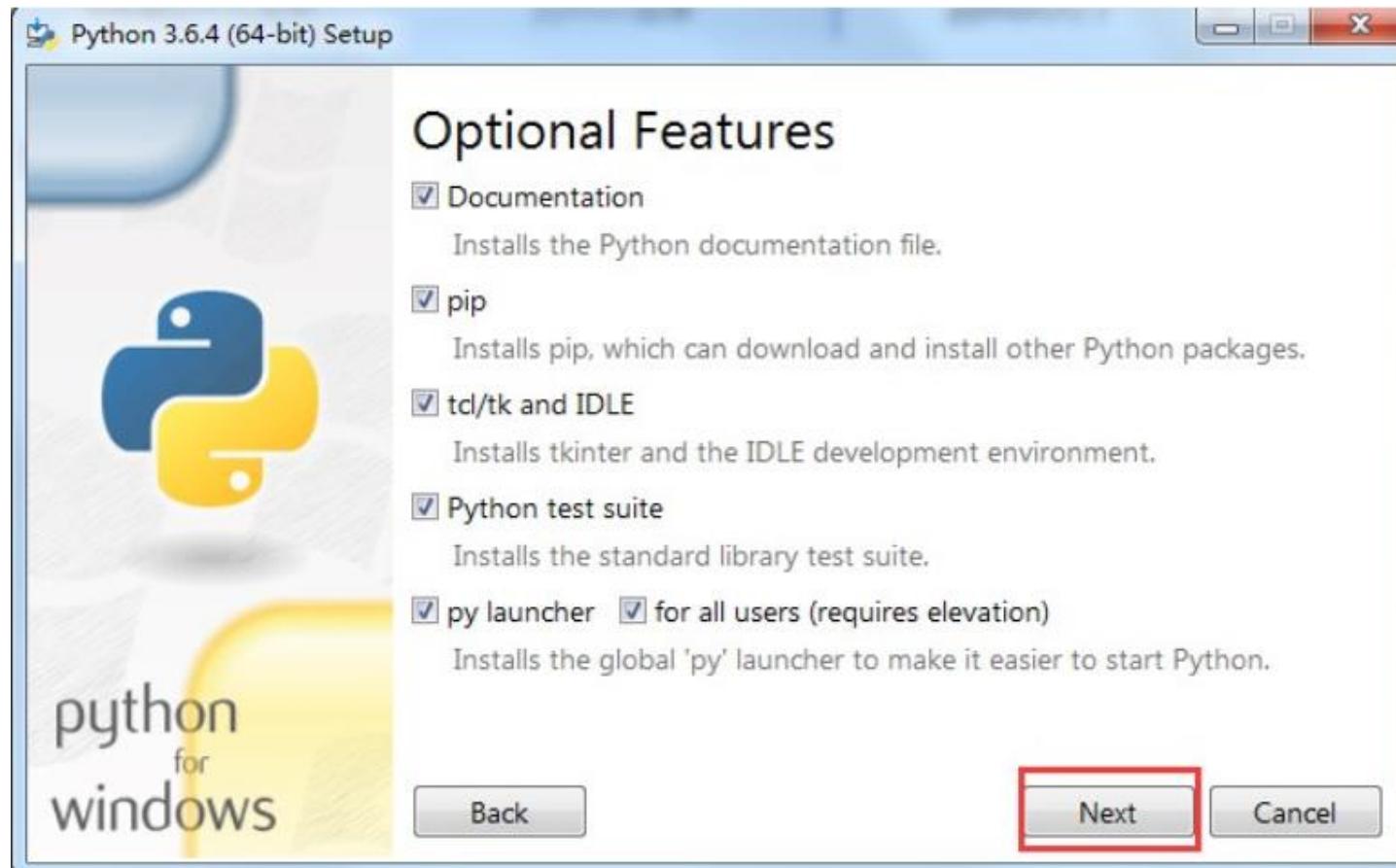
<https://www.python.org/ftp/python/3.6.4/python-3.6.4-amd64.exe>

Step 2: Install Python 3.6.4 in Windows 10



Python is an interpreted, high-level, general-purpose programming language. Created by Guido van Rossum and first released in 1991, Python's design philosophy emphasizes code readability with its notable use of significant whitespace.

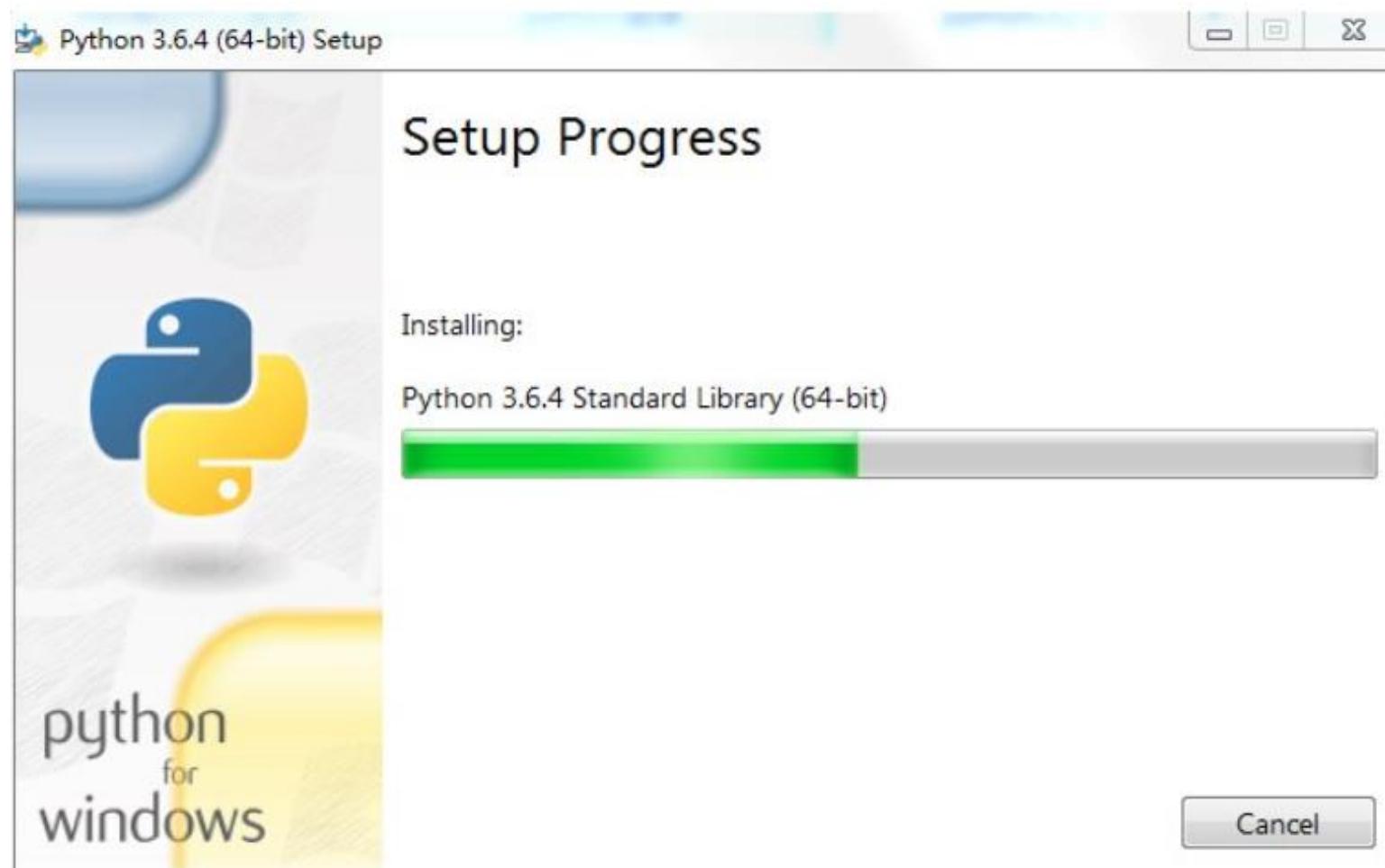
# Install Python in Windows 10



# Install Python in Windows 10



# Install Python in Windows 10



# Install Python in Windows 10



# Install VS code in Windows 10

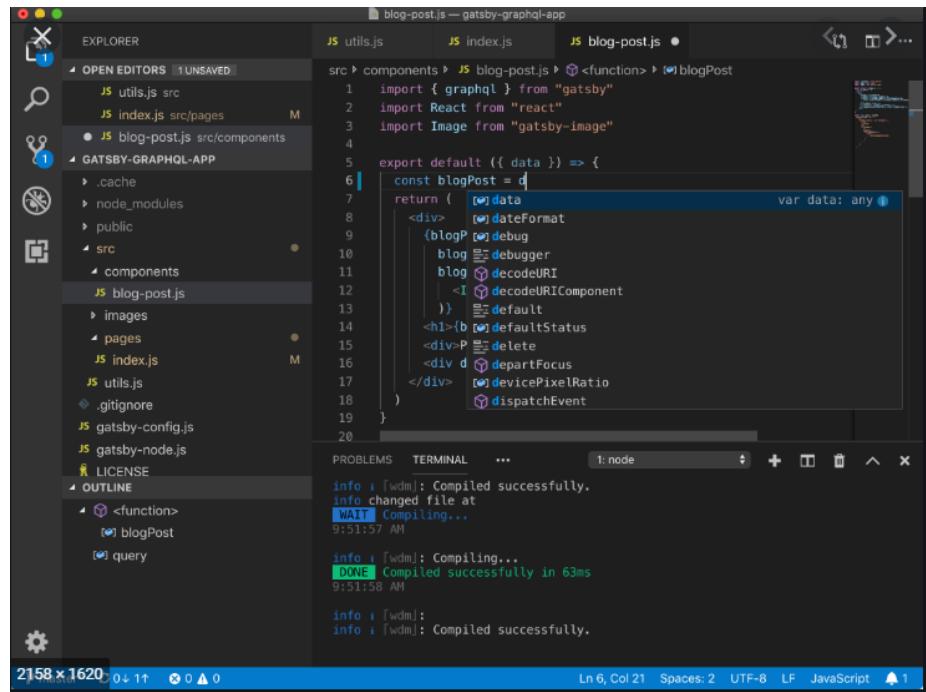
## Step 1: Download the latest VS code

<https://code.visualstudio.com/download>

## Tutorial Video:

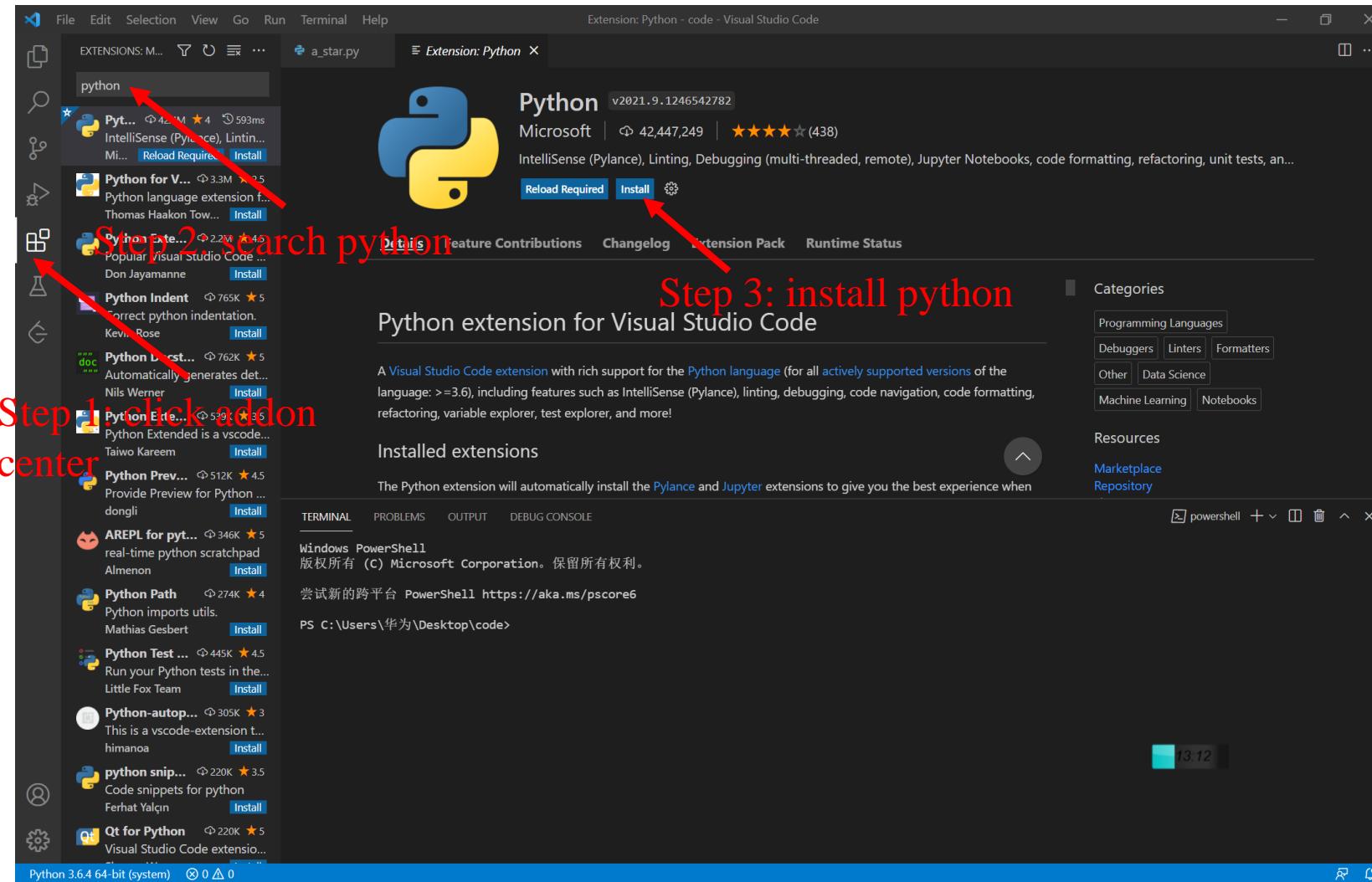
[https://www.youtube.com/watch?v=MZzw7VU9T4c&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=MZzw7VU9T4c&ab_channel=POLYUIPNL)

## Step 2: Install latest VS code in Windows 10

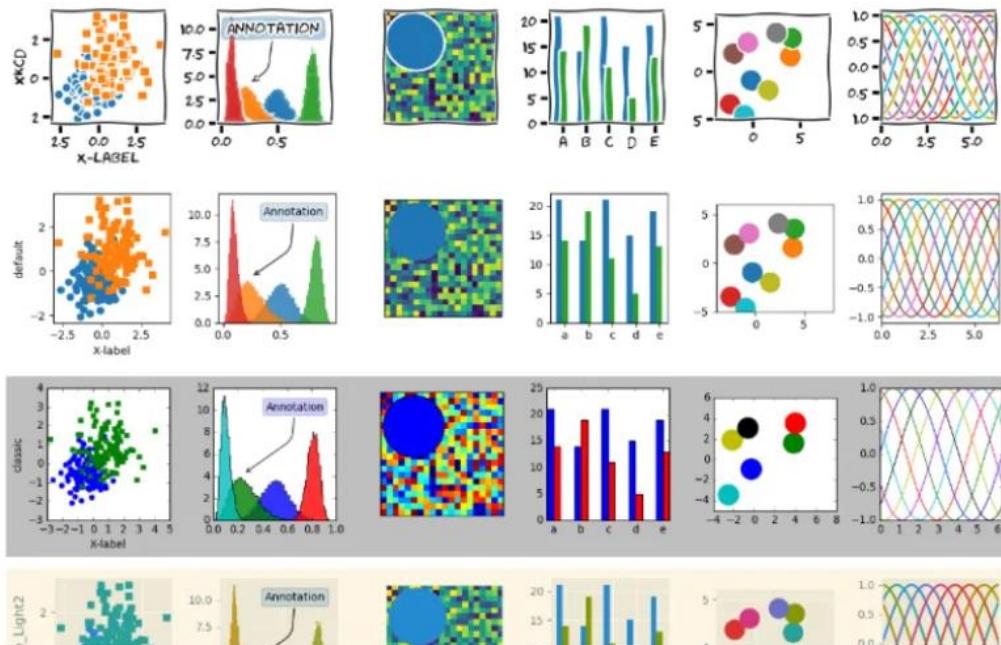


Visual Studio Code is a free source-code editor made by Microsoft for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git.

# Install Python addon in VS code in Windows 10



# Install matplotlib



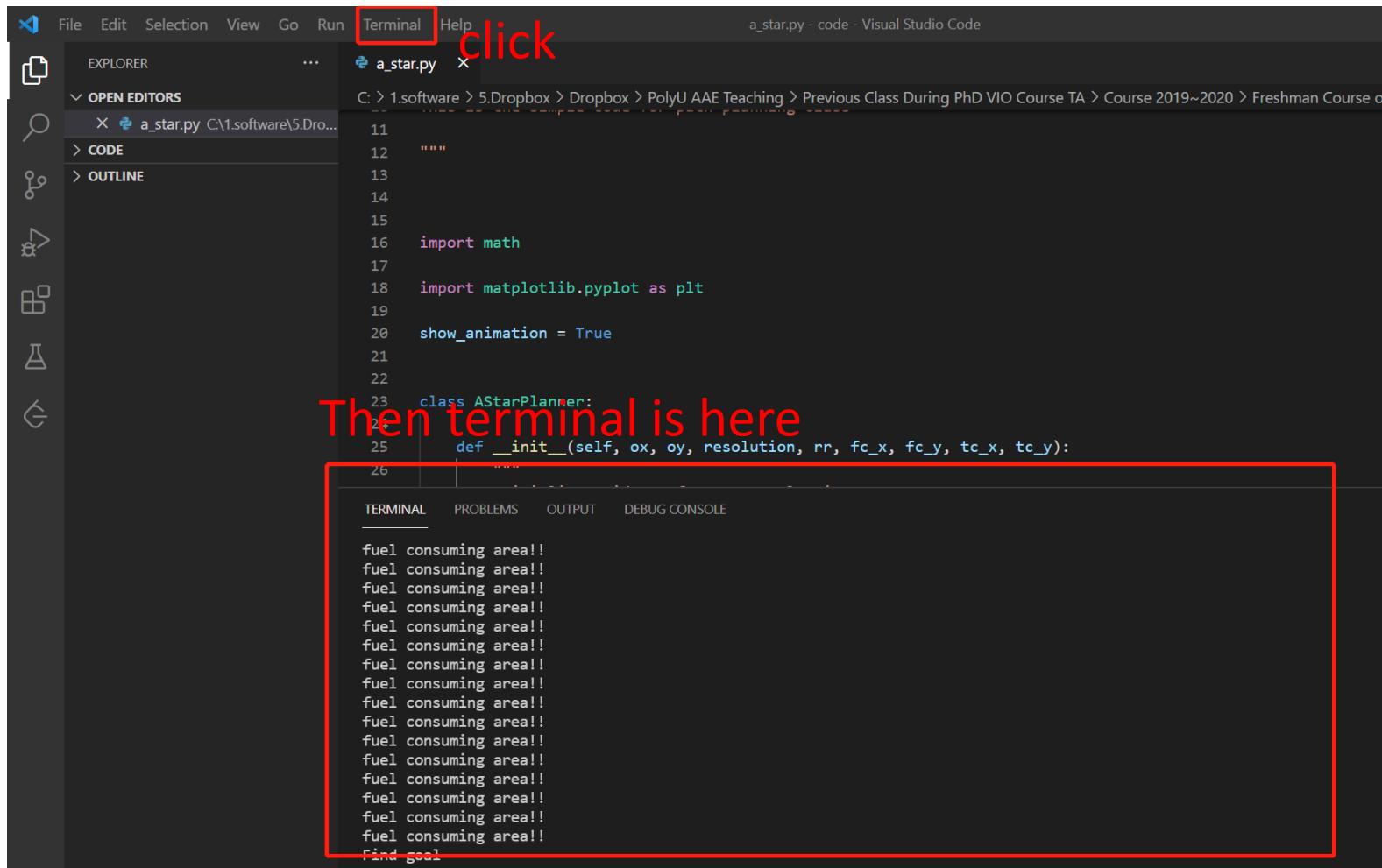
Source:

<https://www.gnuband.org/2017/12/29/gallery-of-xkcd-and-other-python-matplotlib-styles/>

Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK+.

# Install matplotlib

- step 1: Open VS code, and then click Terminal



# Install matplotlib

- step 2: Print following command into terminal>

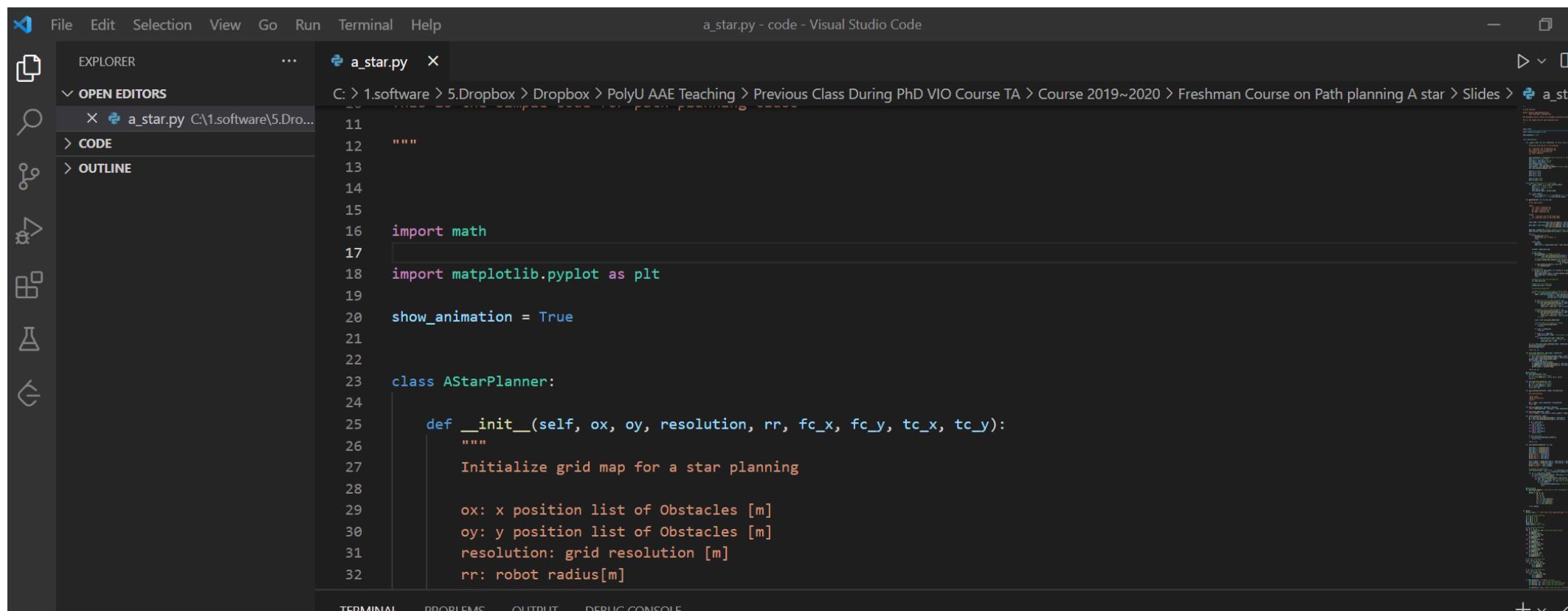
The screenshot shows a Visual Studio Code interface. In the center, there is a code editor with a Python file named 'a\_star.py'. The code imports 'math' and 'matplotlib.pyplot as plt', defines a class 'AStarPlanner', and includes a constructor '\_init\_'. Below the code editor is a terminal window with the following content:

```
Windows PowerShell
版权所有 (C) Microsoft Corporation。保留所有权利。
尝试新的跨平台 PowerShell https://aka.ms/pscore6
PS C:\Users\华为\Desktop\code> pip install matplotlib==3.0.3
```

The terminal window has tabs for 'TERMINAL', 'PROBLEMS', 'OUTPUT', and 'DEBUG CONSOLE'. The status bar at the bottom right shows the time as 11:30.

# Test matplotlib

- step 3: Open the code sample by VS code



The screenshot shows the Visual Studio Code interface with the following details:

- File Bar:** File, Edit, Selection, View, Go, Run, Terminal, Help.
- Title Bar:** a\_star.py - code - Visual Studio Code.
- Left Sidebar (Icon Bar):** Explorer, Open Editors, Code, Outline.
- Open Editors:** a\_star.py (active tab).
- Code Editor:** The file content is as follows:

```
11
12
13
14
15
16 import math
17
18 import matplotlib.pyplot as plt
19
20 show_animation = True
21
22
23 class AStarPlanner:
24
25     def __init__(self, ox, oy, resolution, rr, fc_x, fc_y, tc_x, tc_y):
26         """
27             Initialize grid map for a star planning
28
29             ox: x position list of Obstacles [m]
30             oy: y position list of Obstacles [m]
31             resolution: grid resolution [m]
32             rr: robot radius[m]
33         
```

The code editor shows lines 11 through 32 of the Python script. The script imports math and matplotlib.pyplot, defines a class AStarPlanner, and includes a constructor \_\_init\_\_ with parameters ox, oy, resolution, rr, fc\_x, fc\_y, tc\_x, and tc\_y. The constructor's docstring describes initializing a grid map for A\* planning with obstacle lists, resolution, and robot radius.

# Test matplotlib

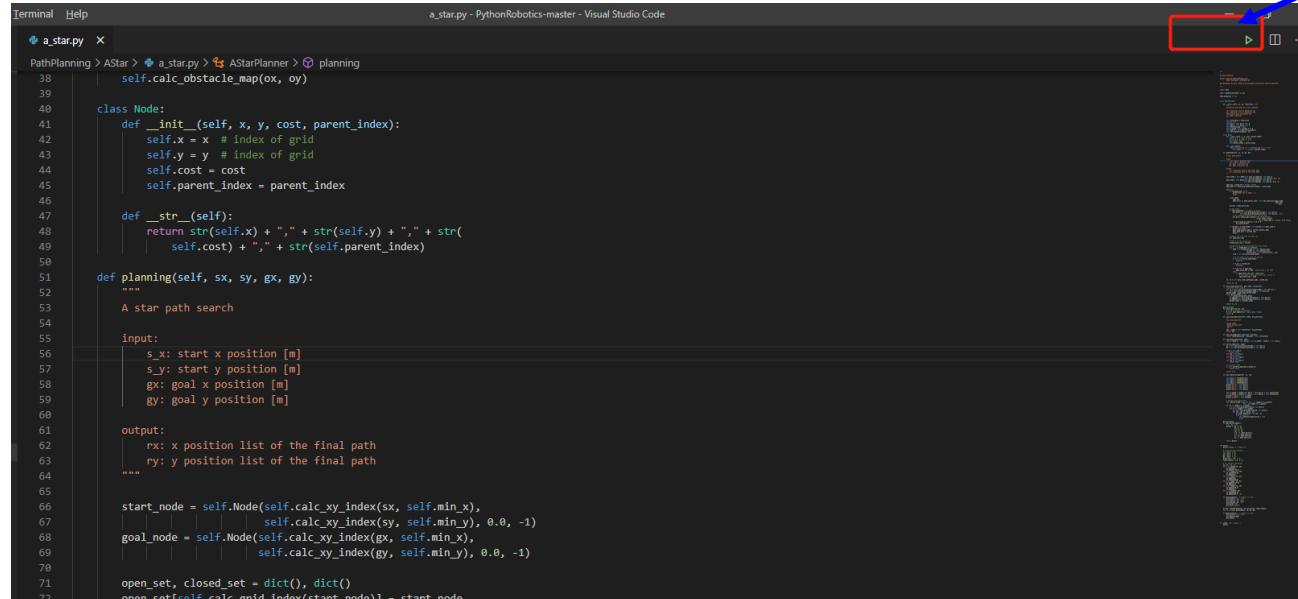
- step 4: Run the demo

The screenshot shows a Visual Studio Code interface with the following components:

- File Explorer:** Shows the file `a_star.py` is open.
- Code Editor:** Displays the Python code for the A\* algorithm. The code includes imports for `math` and `matplotlib.pyplot`, and defines a class `AStarPlanner` with an `__init__` method. The code also includes a terminal output section with repeated "fuel consuming area!!" messages and a "Find goal" message.
- Terminal:** Shows the terminal output from running the script.
- Output:** Shows the output from the script's execution.
- Debug Console:** Shows the output from the script's execution.
- Figure View:** A subplot titled "Figure 1" showing a 2D grid-based map. The grid ranges from -10 to 60 on both axes. The map contains several obstacles: a red rectangular wall from (15, 15) to (25, 30), a vertical green rectangle from (35, 10) to (35, 40), and a vertical blue rectangle from (45, 10) to (45, 50). A red line represents the path calculated by the A\* algorithm, starting from a green circle at approximately (15, 10) and ending at a green circle at approximately (45, 50).
- Activity Bar:** Includes icons for file operations, search, and other development tools.
- Status Bar:** Shows the time "05:48".

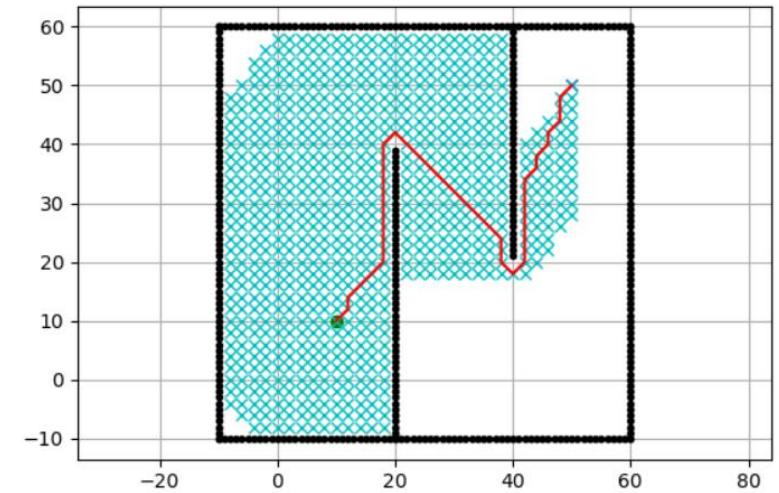
# Run A Star in VS code

Run the code



```
a_star.py - PythonRobotics-master - Visual Studio Code
Terminal Help
a_star.py > AStar > a_star.py > AStarPlanner > planning
38     self.calc_obstacle_map(ox, oy)
39
40 class Node:
41     def __init__(self, x, y, cost, parent_index):
42         self.x = x # index of grid
43         self.y = y # index of grid
44         self.cost = cost
45         self.parent_index = parent_index
46
47     def __str__(self):
48         return str(self.x) + "," + str(self.y) + "," + str(
49             self.cost) + "," + str(self.parent_index)
50
51 def planning(self, sx, sy, gx, gy):
52     """
53     A star path search
54
55     input:
56         sx: start x position [m]
57         sy: start y position [m]
58         gx: goal x position [m]
59         gy: goal y position [m]
56
57     output:
58         rx: x position list of the final path
59         ry: y position list of the final path
56
57     """
58
59     start_node = self.Node(self.calc_xy_index(sx, self.min_x),
60                           self.calc_xy_index(sy, self.min_y), 0.0, -1)
61     goal_node = self.Node(self.calc_xy_index(gx, self.min_x),
62                           self.calc_xy_index(gy, self.min_y), 0.0, -1)
63
64     open_set, closed_set = dict(), dict()
65     open_set[self.calc_grid_index(start_node)] = start_node
66
67     while True:
68         cur_node = None
69         for node in open_set:
70             if cur_node == None or open_set[node].f < open_set[cur_node].f:
71                 cur_node = node
72
73         if cur_node == None:
74             print("A* failed to find a path")
75             break
76
77         if cur_node.x == gx and cur_node.y == gy:
78             print("A* found a path")
79             rx, ry = self.reconstruct_path(cur_node)
80             break
81
82         for i, j in self.get_neighboor_index(cur_node.x, cur_node.y):
83             if i < 0 or i > self.grid_size[0] - 1 or j < 0 or j > self.grid_size[1] - 1:
84                 continue
85             neighbor = self.Node(self.calc_xy_index(i, self.min_x),
86                                 self.calc_xy_index(j, self.min_y),
87                                 self.g_cost(i, j, cur_node), cur_node.index)
88             if neighbor in closed_set:
89                 continue
90             if neighbor in open_set and open_set[neighbor].f > neighbor.f:
91                 continue
92             open_set[neighbor] = neighbor
93
94             self.set_g_value(neighbor, i, j, cur_node)
95
96         closed_set[cur_node.index] = cur_node
97
98         self.show_grid()
99
100        if self.is_collision(neighbor):
101            del open_set[neighbor]
```

Figure 1



A\* is a graph traversal and path search algorithm, which is often used in many fields of computer science due to its completeness, optimality, and optimal efficiency. One major practical drawback is its space complexity, as it stores all generated nodes in memory.

# Troubleshoot: Connect Github page via command in VS Code

- Input the command below to the terminal (change the blue to your info)
  - *git config --global user.name weisongwen*
  - *git config --global user.email wenwsrobo@gmail.com*

The screenshot shows the Visual Studio Code interface with the following details:

- Terminal Tab:** The "Terminal" tab is highlighted in red.
- Code Editor:** An editor window titled "a\_star.py" is open, showing Python code for an A\* planner. The code includes imports for math and matplotlib.pyplot, and defines a class AStarPlanner with an \_\_init\_\_ method.
- Terminal Output:** The terminal window at the bottom displays repeated text "fuel consuming area!!" followed by "Find goal".
- Annotations:** The text "click" is written above the terminal tab, and "Then terminal is here" is written above the terminal output.
- File Path:** The status bar at the bottom shows the file path: C:\1.software > 5.Dropbox > Dropbox > PolyU AAE Teaching > Previous Class During PhD VIO Course TA > Course 2019~2020 > Freshman Course on

Mac Version

# Python Installation

Tutorial Video:

[https://www.youtube.com/watch?v=p-joFbfB57c&ab\\_channel=POLYUIPNL](https://www.youtube.com/watch?v=p-joFbfB57c&ab_channel=POLYUIPNL)

A screenshot of a search results page from a search engine. The top navigation bar includes 'All', 'Videos', 'Images', 'News', 'Shopping', 'More', and 'Tools'. Below the search bar, it says 'About 92,100,000 results (0.60 seconds)'. The first result is titled 'How to Install Python on a Mac' and contains a numbered list of steps: 1. Navigate to the Python download site with your browser. ... 2. Click the appropriate link for your version of OS X: ... 3. Double-click python. ... 4. Click Continue three times. ... 5. Select the Volume (hard drive or other media) that you want to use for installing Python and click Continue. ... 6. Click Install. There is also a 'More items...' link. Below the result, the URL 'https://www.dummies.com › programming › how-to-inst... ::' is shown, followed by the title 'How to Install Python on a Mac - dummies'. At the bottom of the snippet, there are links for 'About featured snippets' and 'Feedback'. A large orange circle highlights the title 'Python Releases for macOS' on the main page below.

All Videos Images News Shopping More Tools

About 92,100,000 results (0.60 seconds)

**How to Install Python on a Mac**

1. Navigate to the Python download site with your browser. ...
2. Click the appropriate link for your version of OS X: ...
3. Double-click python. ...
4. Click Continue three times. ...
5. Select the Volume (hard drive or other media) that you want to use for installing Python and click Continue. ...
6. Click Install.

[More items...](#)

<https://www.dummies.com> › programming › how-to-inst... ::

**How to Install Python on a Mac - dummies**

About featured snippets · Feedback

<https://www.python.org> › downloads › macOS ::

**Python Releases for macOS**

No files for this release. Python 3.8.9 - April 2, 2021. Download macOS 64-bit Intel installer ·

[Python 3.9.2 - Feb 2021](#) ·

You visited this page on 9/22/21.

Click it

# Python Installation

The screenshot shows the Python.org website with a dark blue header. The top navigation bar includes links for Python, PSF, Docs, PyPI, and Jobs. Below the header is a main menu with links for About, Downloads, Documentation, Community, Success Stories, News, and Events. A search bar and a 'Donate' button are also present. The page title is 'Python >>> Downloads >>> macOS'. The main content area is titled 'Python Releases for macOS' and lists two items under 'Stable Releases': 'Latest Python 3 Release - Python 3.9.7' and 'Latest Python 2 Release - Python 2.7.18'. An orange circle highlights the first item. Below this, there are sections for 'Stable Releases' and 'Pre-releases', each containing a single item with a download link.

Python >>> Downloads >>> macOS

## Python Releases for macOS

- [Latest Python 3 Release - Python 3.9.7](#)
- [Latest Python 2 Release - Python 2.7.18](#)

### Stable Releases

- [Python 3.7.12 - Sept. 4, 2021](#)
  - No files for this release.
- [Python 3.6.15 - Sept. 4, 2021](#)
  - No files for this release.
- [Python 3.9.7 - Aug. 30, 2021](#)

### Pre-releases

- [Python 3.10.0rc2 - Sept. 7, 2021](#)
  - Download [macOS 64-bit universal2 installer](#)
- [Python 3.10.0rc1 - Aug. 2, 2021](#)
  - Download [macOS 64-bit universal2 installer](#)
- [Python 3.10.0b4 - July 10, 2021](#)
  - **Click it**

# Python Installation

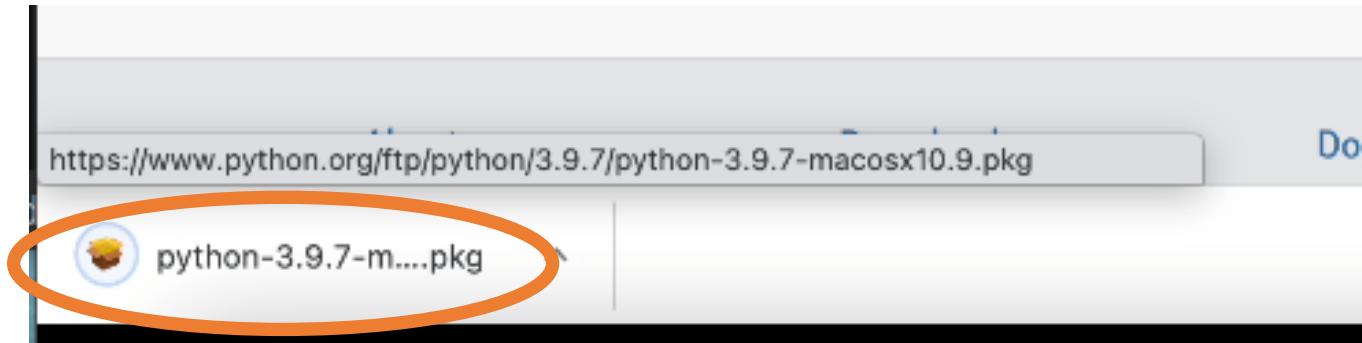
[Full Changelog](#)

## Files

Version	Operating System	Description	MD5 Sum	File Size	GPG
<a href="#">Gzipped source tarball</a>	Source release		5f463f30b1fdcb545f156583630318b3	25755357	<a href="#">SIG</a>
<a href="#">xz compressed source tarball</a>	Source release		fddb060b483bc01850a3f412eea1d954	19123232	<a href="#">SIG</a>
<a href="#">macOS 64-bit Intel installer</a>	macOS	for macOS 10.9 and later	ce8c2f885f26b09536857610644260d4	30038206	<a href="#">SIG</a>
<a href="#">macOS 64-bit universal2 installer</a>	macOS	for macOS 10.9 and later, including macOS 11 Big Sur on Apple Silicon (experimental)	825067610b16b03ec814630df1b65193	38144099	<a href="#">SIG</a>
<a href="#">Windows embeddable package (32-bit)</a>	Windows		6d12e3e0f942830de8466a83d30a45fb	7652688	<a href="#">SIG</a>
<a href="#">Windows embeddable package (64-bit)</a>	Windows		67e19ff32b3ef62a40bccd50e33b0f53	8473919	<a href="#">SIG</a>
<a href="#">Windows help file</a>	Windows		b92a78506ccf258d5ad0d98c341fc5d1	9263789	<a href="#">SIG</a>
<a href="#">Windows installer (32-bit)</a>	Windows		0d949bdfdbd0c8c66107a980a95efd85	27811736	<a href="#">SIG</a>
<a href="#">Windows installer (64-bit)</a>	Windows	Recommended	cc3eabc1f9d6c703d1d2a4e7c041bc1d	28895456	<a href="#">SIG</a>

**Click it**

# Python Installation



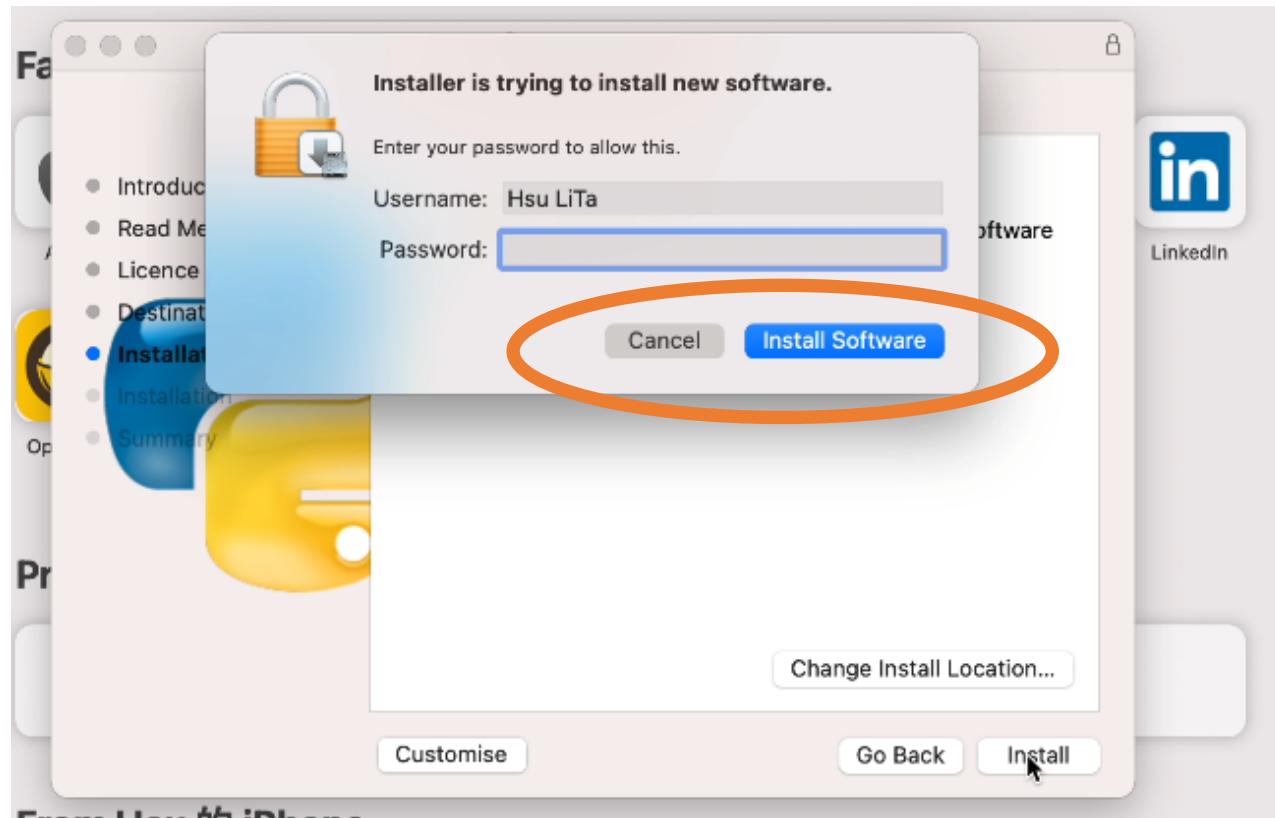
Click it

# Python Installation



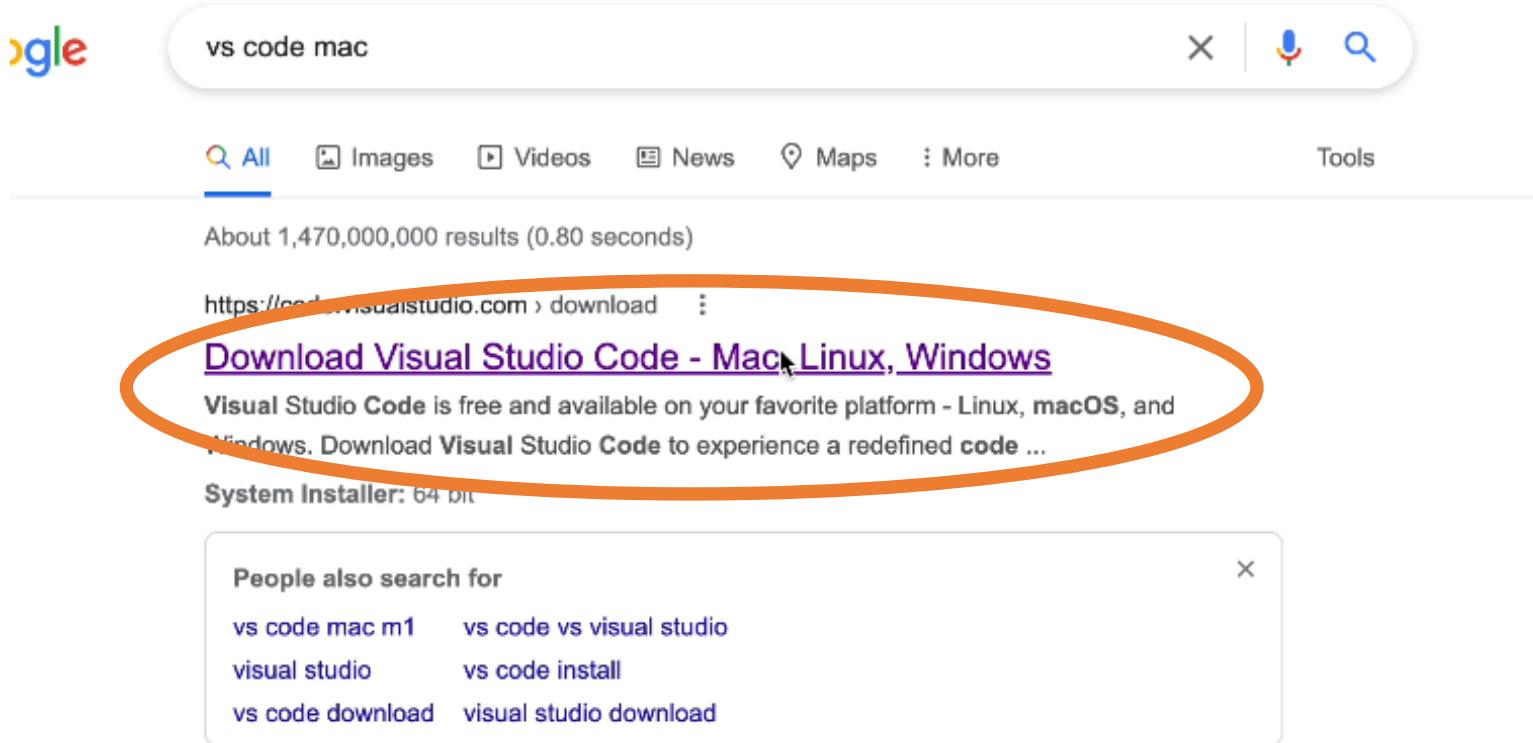
Click it

# Python Installation



Click it

# Visual Studio Code Installation

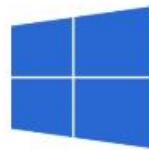


Click it

# Visual Studio Code Installation

## Download Visual Studio Code

Free and built on open source. Integrated Git, debugging and extensions.



↓ Windows

Windows 7, 8, 10

User Installer  
System Installer  
.zip



↓ .deb

Debian, Ubuntu



↓ .rpm

Red Hat, Fedora, SUSE

.deb  
.rpm  
.tar.gz

Snap Store



↓ Mac

macOS 10.11+

.zip  
Universal  
Intel Chip  
Apple Silicon



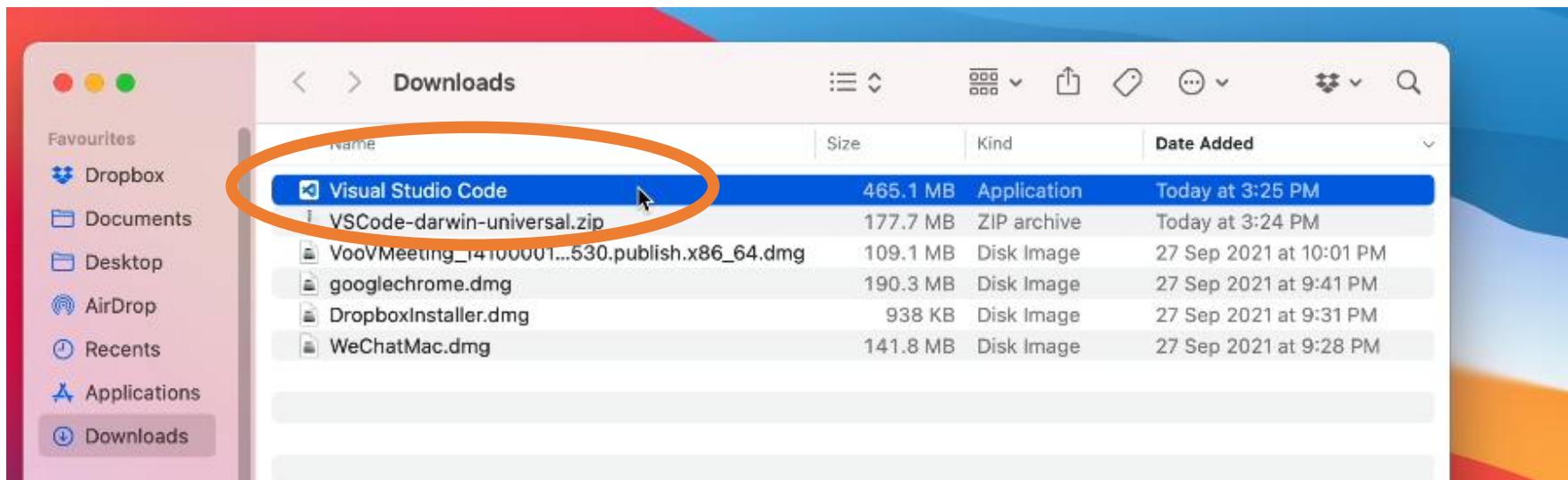
Click it

# Visual Studio Code Installation



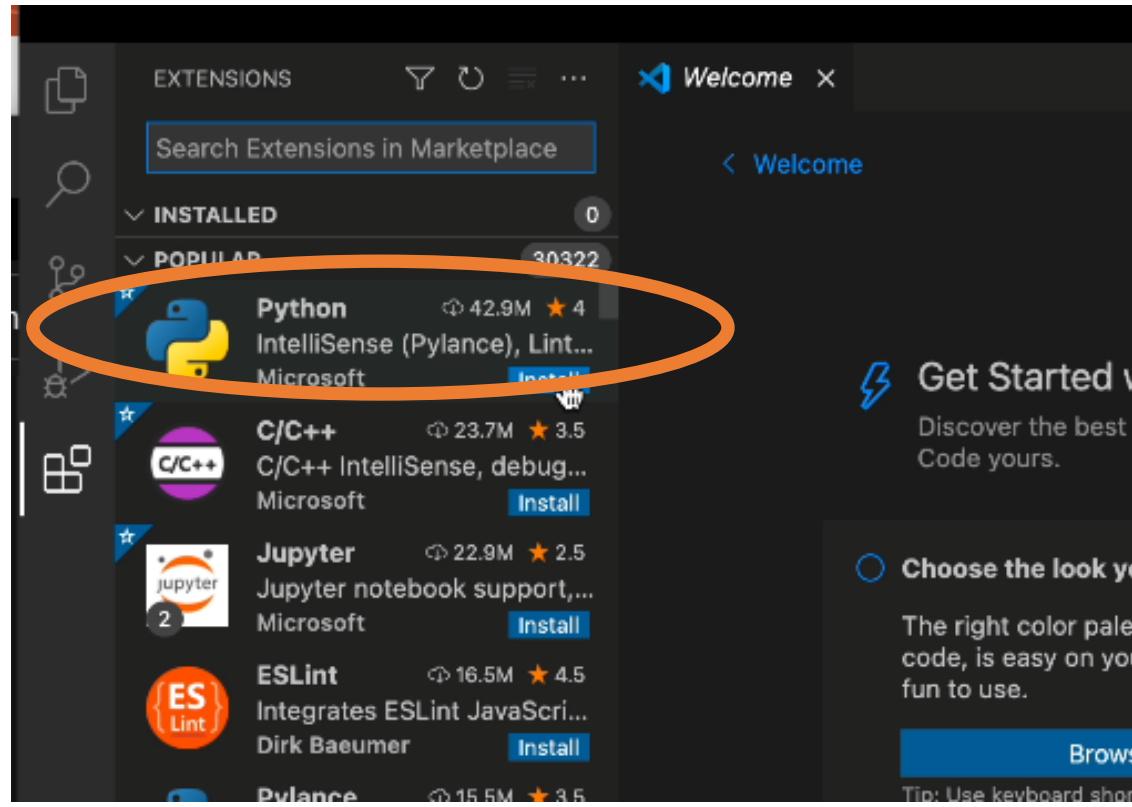
Click it

# Visual Studio Code Installation



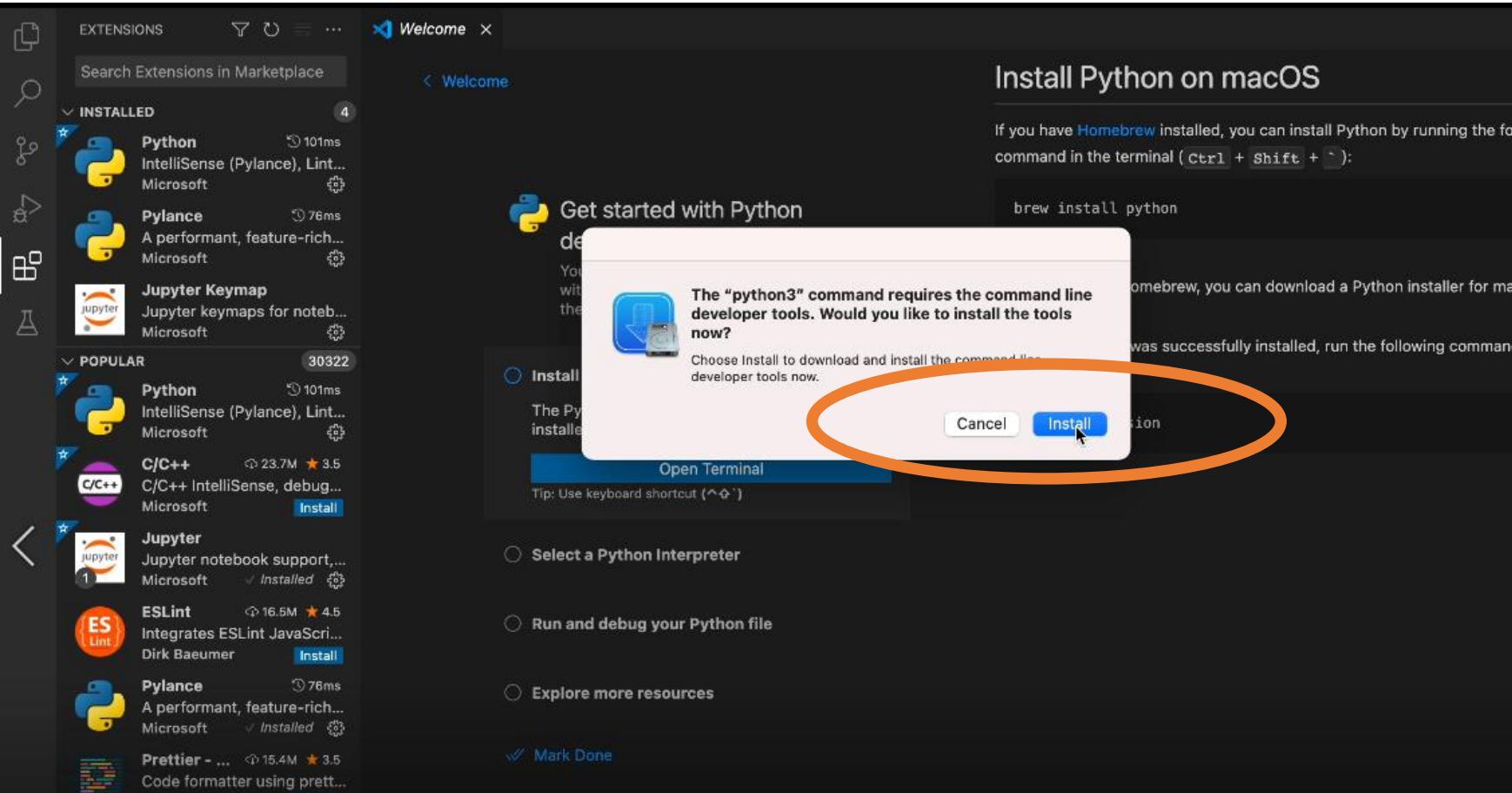
Click it

# Visual Studio Code Installation



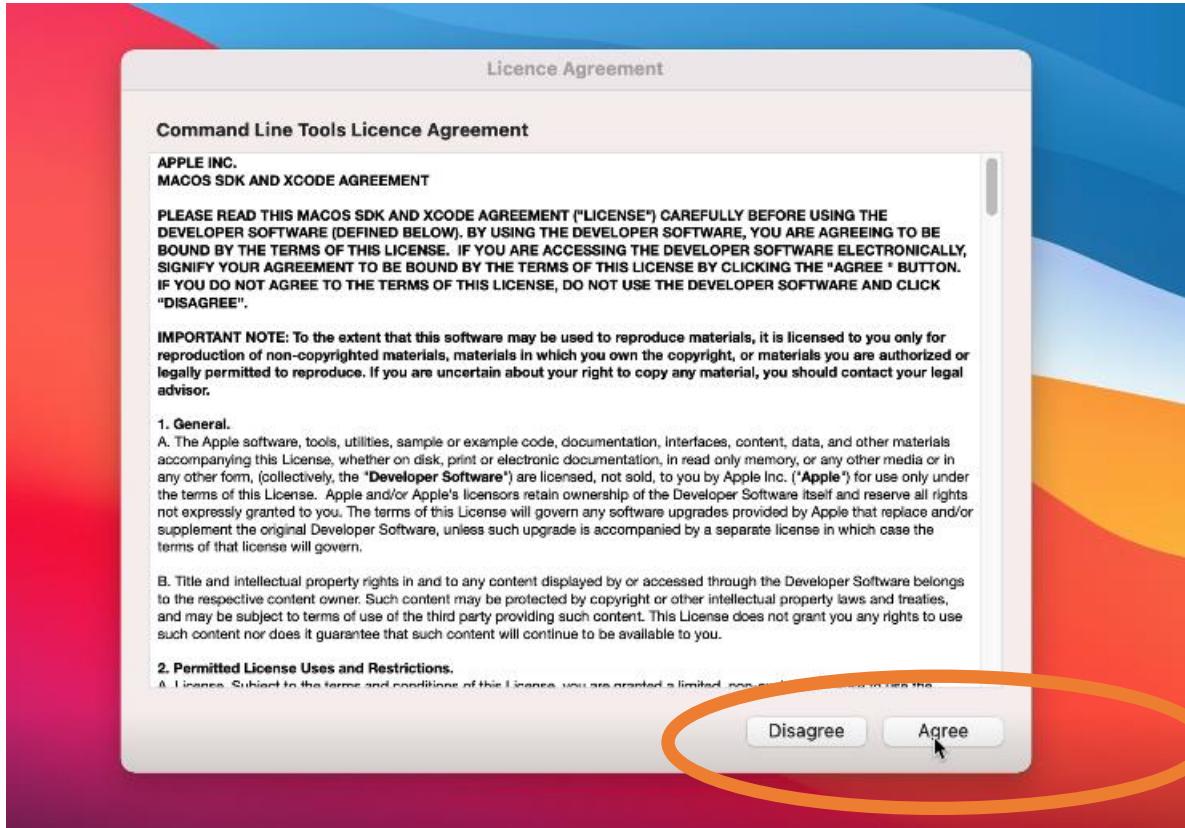
Click it

# Visual Studio Code Installation



Click it

# Visual Studio Code Installation



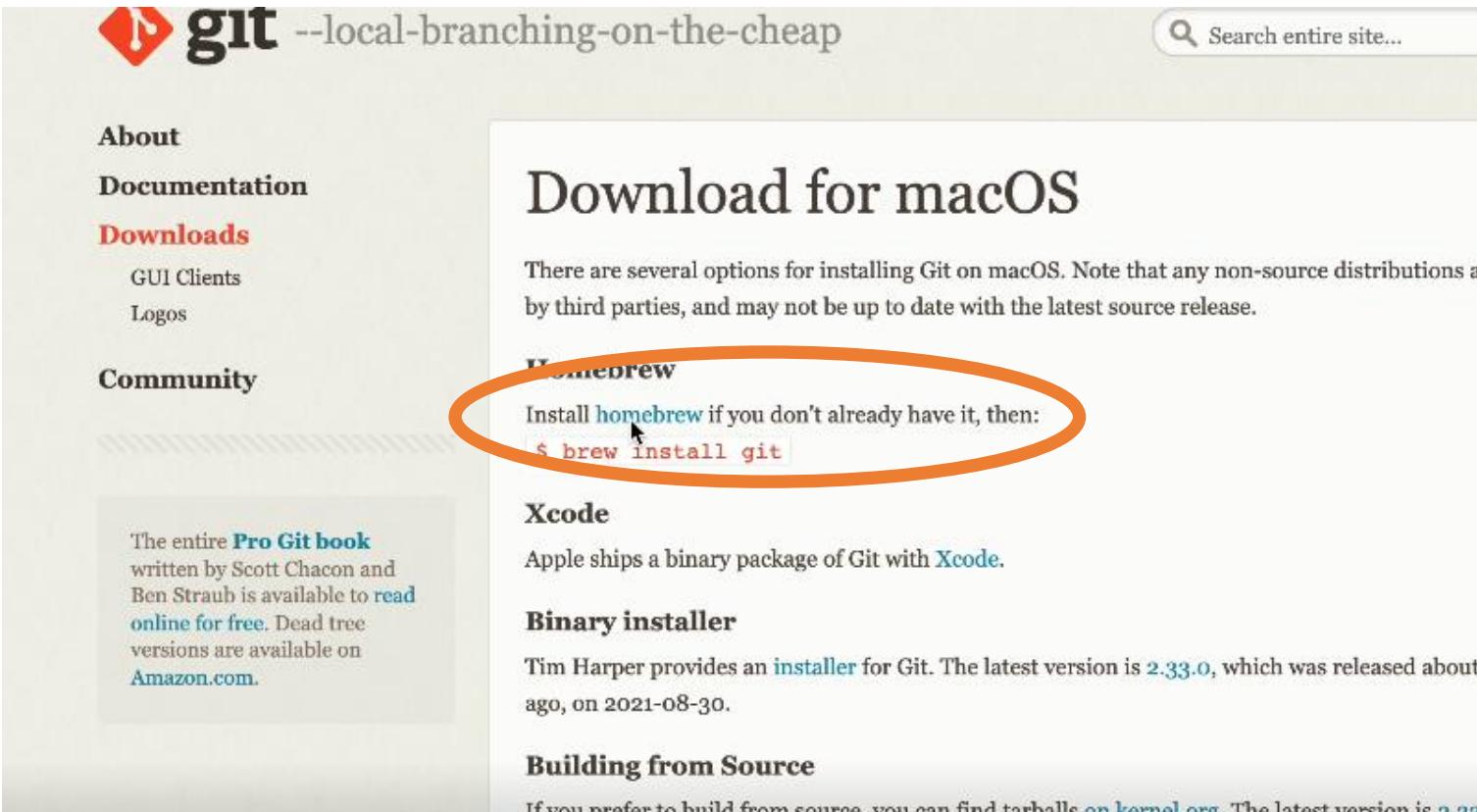
Click it

# Git Installation

A screenshot of a Google search results page. The search query "git install mac" is entered in the search bar. Below the search bar, there are filters for "All", "Videos", "Images", "Shopping", "News", and "More". The "All" filter is selected. To the right of these filters is a "Tools" button. Below the filters, it says "About 40,800,000 results (0.74 seconds)". The first result is from the "git-scm.com" website, titled "1.5 Getting Started - Installing Git". The text below the title says: "There are several ways to install Git on a Mac. The easiest is probably to install the Xcode Command Line Tools. On Mavericks (10.9) or above you can do this ...". A link "https://git-scm.com > book > Getting-Started-Installing-..." is shown. Below this, another link "https://git-scm.com > download > macOS" is followed by the text "Download for macOS - Git". This link is circled in orange. Below the orange circle, there is a snippet of text: "There are several options for installing Git on macOS. Note that any non-source ... Install homebrew if you don't already have it, then: \$ brew install git ...".

Click it

# Git Installation



The screenshot shows the official Git website ([git-scm.com](https://git-scm.com)) with the following content:

- Header:** git --local-branching-on-the-cheap
- Search bar:** Search entire site...
- Navigation menu:**
  - About
  - Documentation
  - Downloads**
    - GUI Clients
    - Logos
  - Community
- Download for macOS**

There are several options for installing Git on macOS. Note that any non-source distributions are provided by third parties, and may not be up to date with the latest source release.

**Homebrew**

Install homebrew if you don't already have it, then:  
`$ brew install git`

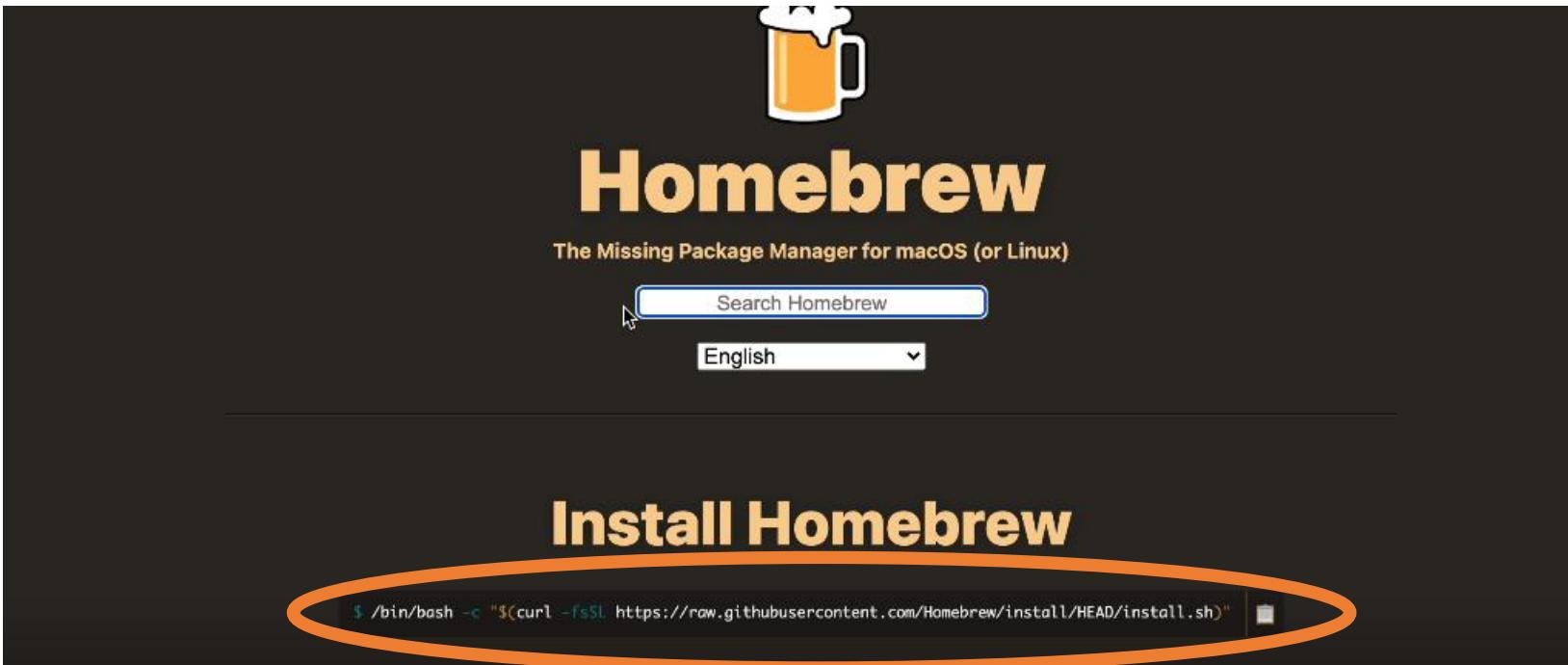
**Xcode**  
Apple ships a binary package of Git with Xcode.

**Binary installer**  
Tim Harper provides an [installer](#) for Git. The latest version is [2.33.0](#), which was released about ago, on 2021-08-30.

**Building from Source**  
If you prefer to build from source, you can find tarballs [on kernel.org](#). The latest version is [2.33](#).

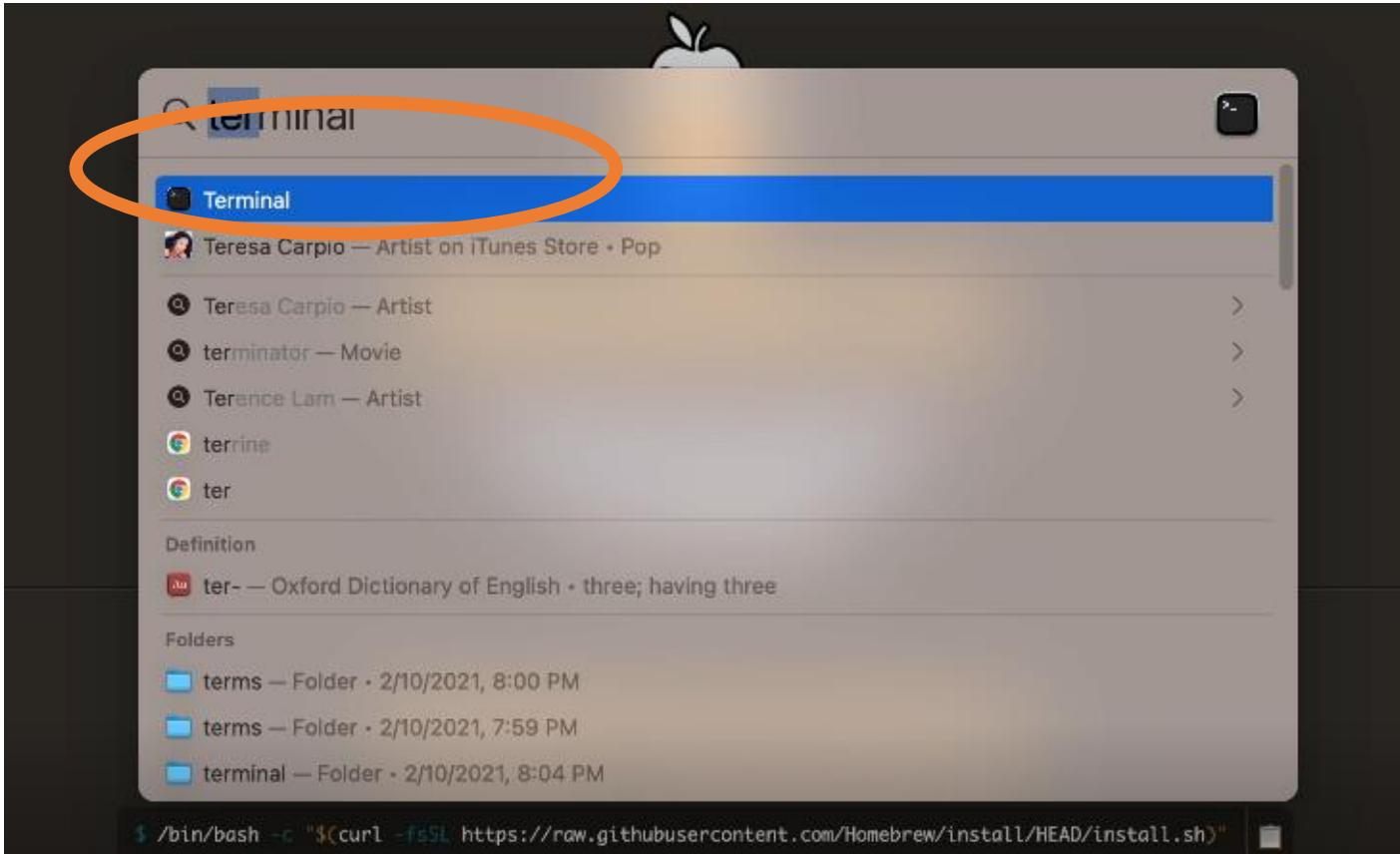
Click it

# Git Installation



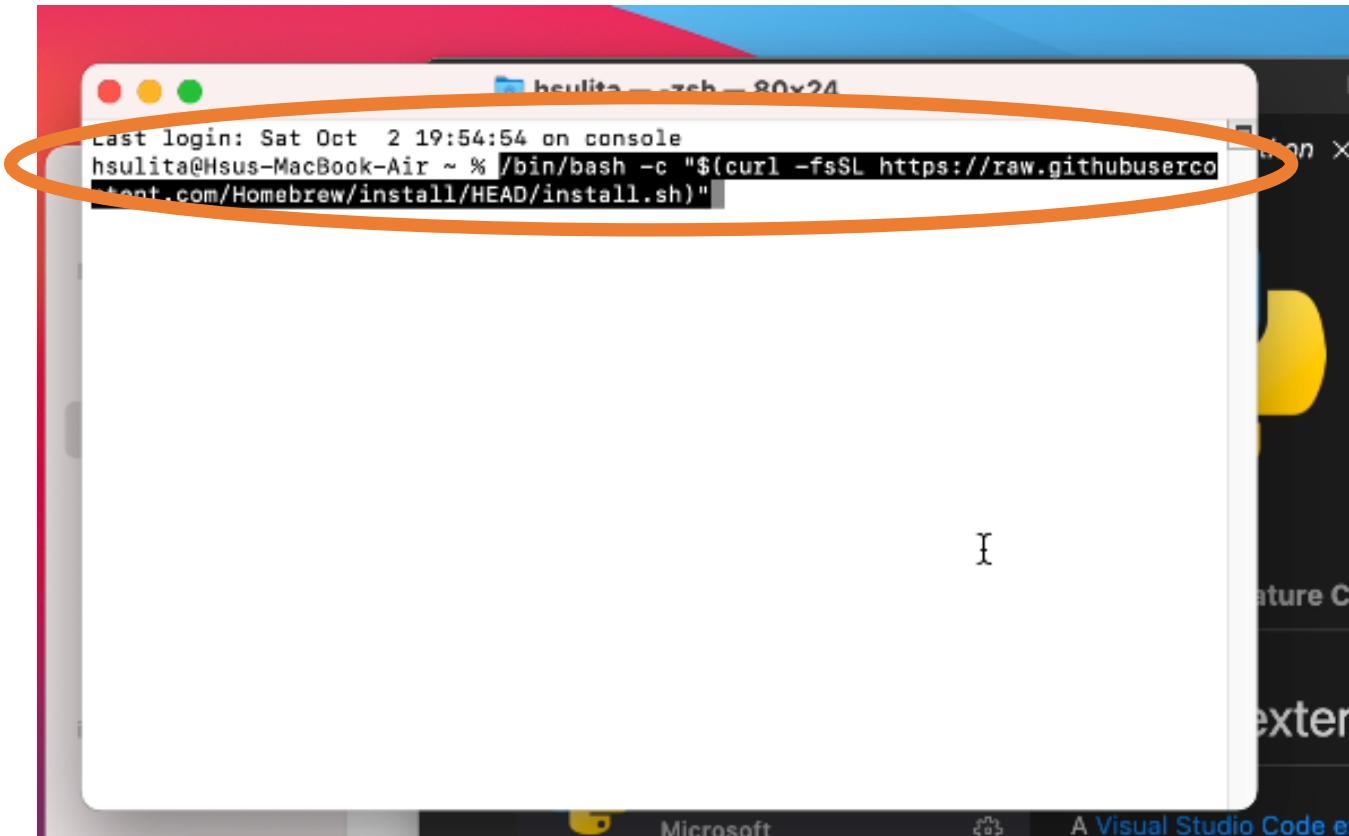
Copy this command

# Git Installation



Click it

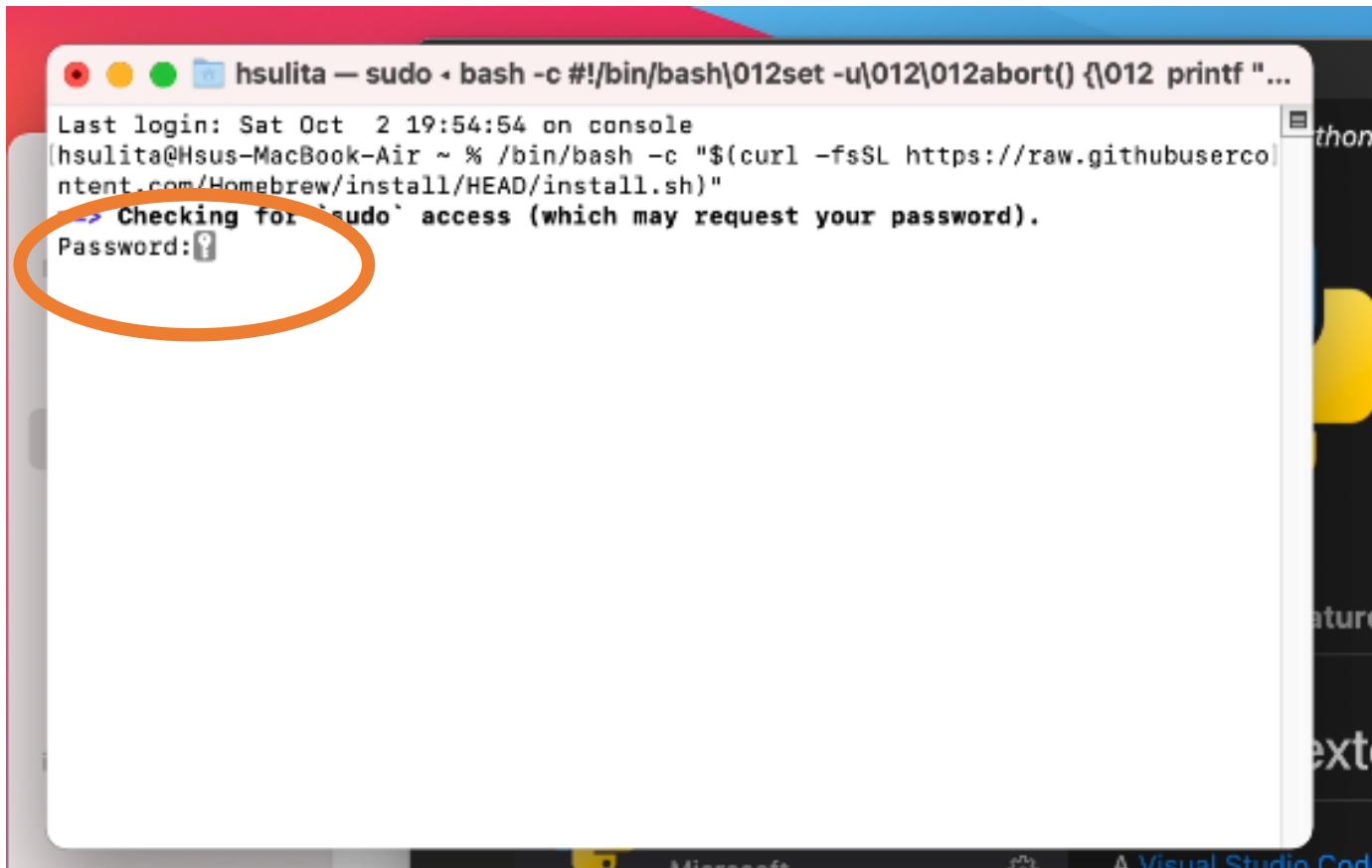
# Git Installation



A screenshot of a macOS terminal window titled "hsulita" with a resolution of "80x24". The window shows the command: "Last login: Sat Oct 2 19:54:54 on console hsulita@Hsus-MacBook-Air ~ % /bin/bash -c "\$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"". An orange oval highlights the command line.

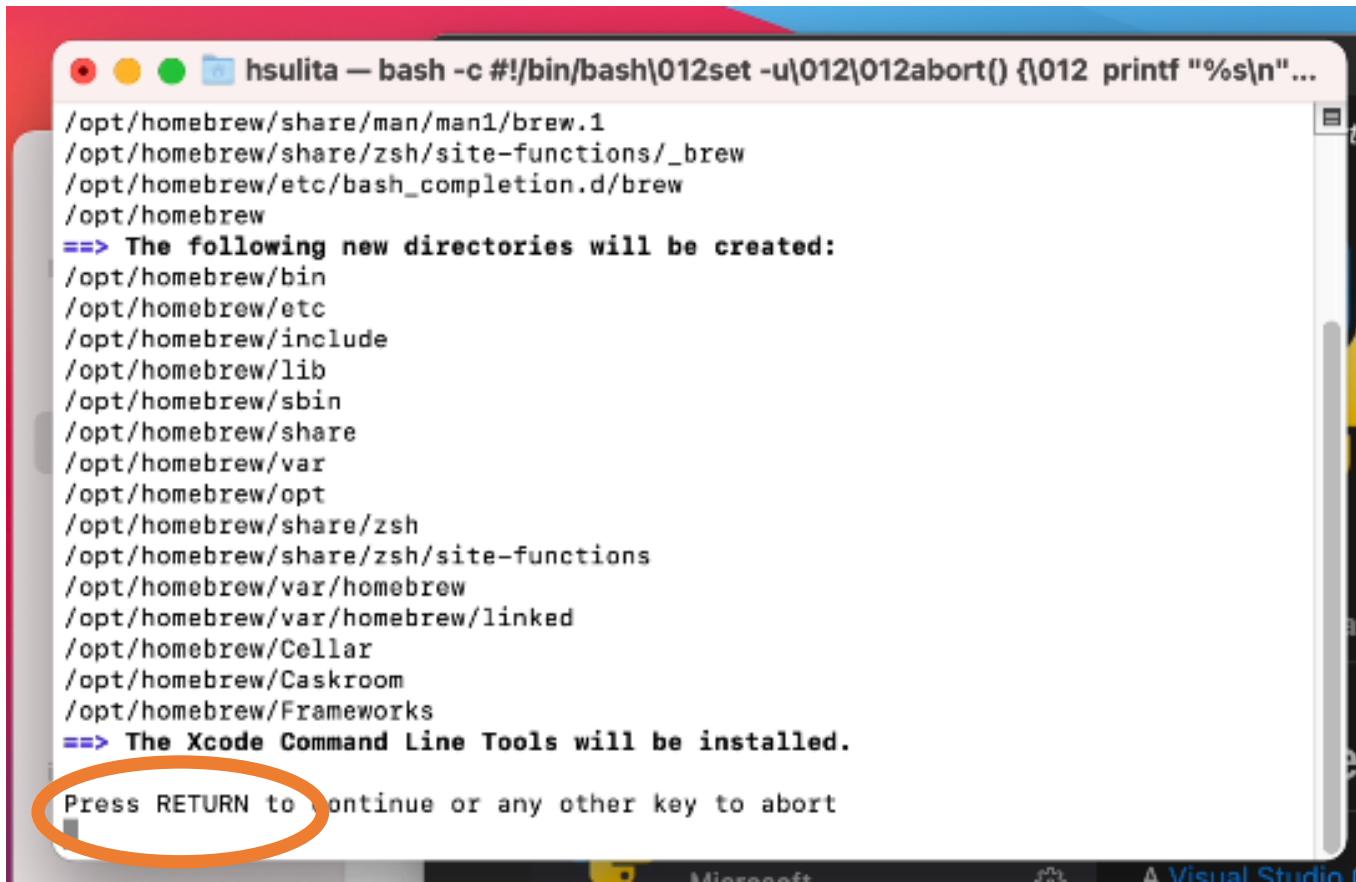
Paste the command

# Git Installation



Enter your password

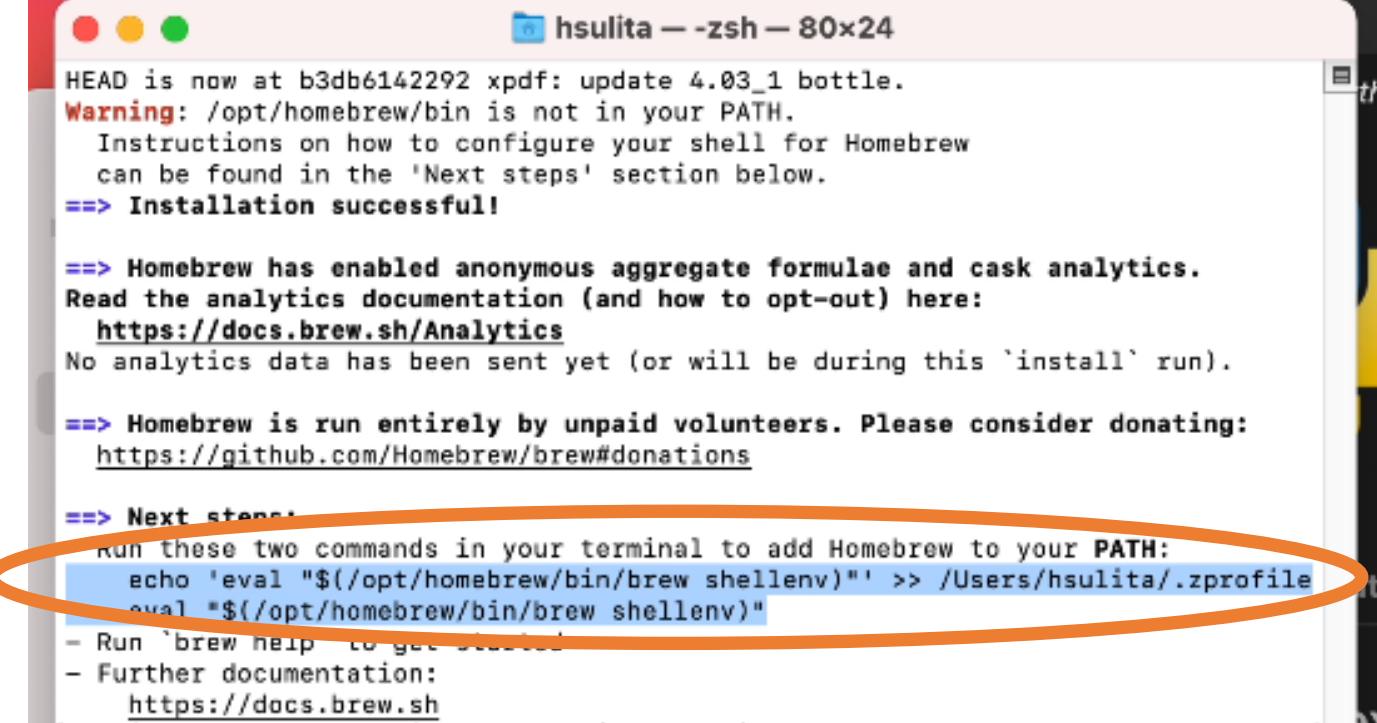
# Git Installation



```
hsulita — bash -c #!/bin/bash\n12set -u\n12|012abort() {\n012 printf "%s\\n"...\n\n/opt/homebrew/share/man/man1/brew.1\n/opt/homebrew/share/zsh/site-functions/_brew\n/opt/homebrew/etc/bash_completion.d/brew\n/opt/homebrew\n==> The following new directories will be created:\n/opt/homebrew/bin\n/opt/homebrew/etc\n/opt/homebrew/include\n/opt/homebrew/lib\n/opt/homebrew/sbin\n/opt/homebrew/share\n/opt/homebrew/var\n/opt/homebrew/opt\n/opt/homebrew/share/zsh\n/opt/homebrew/share/zsh/site-functions\n/opt/homebrew/var/homebrew\n/opt/homebrew/var/homebrew/linked\n/opt/homebrew/Cellar\n/opt/homebrew/Caskroom\n/opt/homebrew/Frameworks\n==> The Xcode Command Line Tools will be installed.\n\nPress RETURN to continue or any other key to abort
```

Press RETURN

# Git Installation



```
HEAD is now at b3db6142292 xpdf: update 4.03_1 bottle.
Warning: /opt/homebrew/bin is not in your PATH.
  Instructions on how to configure your shell for Homebrew
  can be found in the 'Next steps' section below.
--> Installation successful!

--> Homebrew has enabled anonymous aggregate formulae and cask analytics.
Read the analytics documentation (and how to opt-out) here:
  https://docs.brew.sh/Analytics
No analytics data has been sent yet (or will be during this 'install' run).

--> Homebrew is run entirely by unpaid volunteers. Please consider donating:
  https://github.com/Homebrew/brew#donations

--> Next steps:
Run these two commands in your terminal to add Homebrew to your PATH:
  echo 'eval "$( /opt/homebrew/bin/brew shellenv )"' >> /Users/hsulita/.zprofile
  eval "$(/opt/homebrew/bin/brew shellenv)"
- Run 'brew help' to get started
- Further documentation:
  https://docs.brew.sh
```

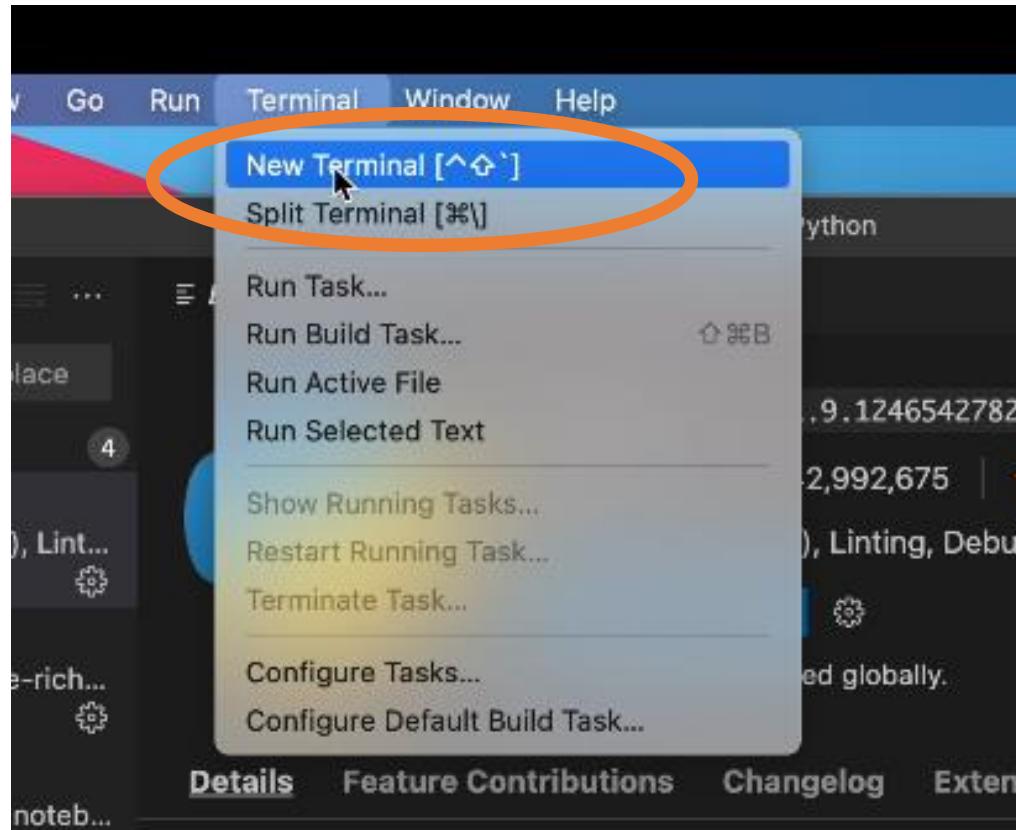
Copy this command

# Git Installation

```
| hsulita@Hsus-MacBook-Air ~ %      echo 'eval "$( /opt/homebrew/bin/brew shellenv )"' |  
|   >> /Users/hsulita/.zprofile  
| [ eval "$(/opt/homebrew/bin/brew shellenv)"  
| [hsulita@Hsus-MacBook-Air ~ % brew install git
```

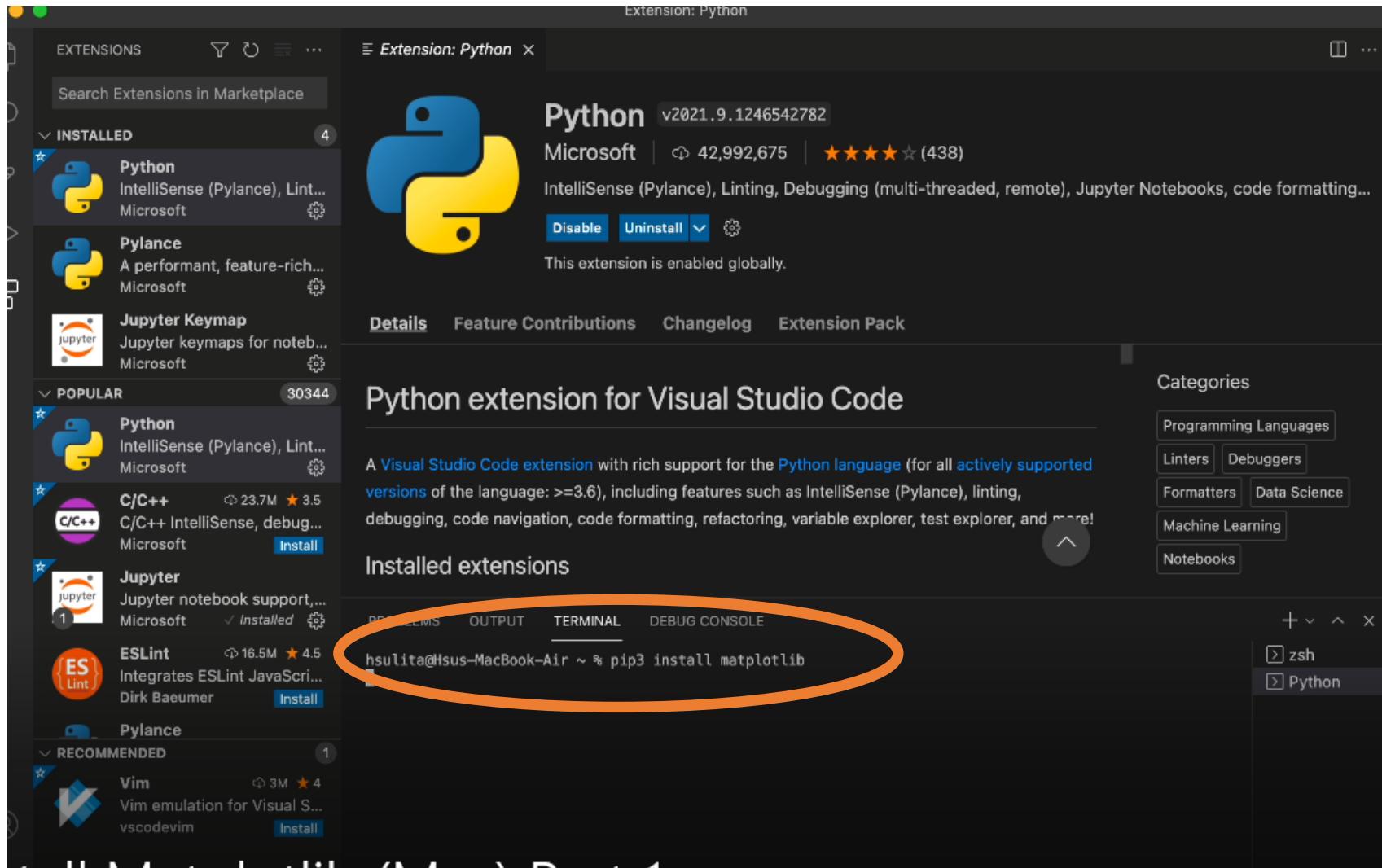
Type the command

# Matplotlib Installation



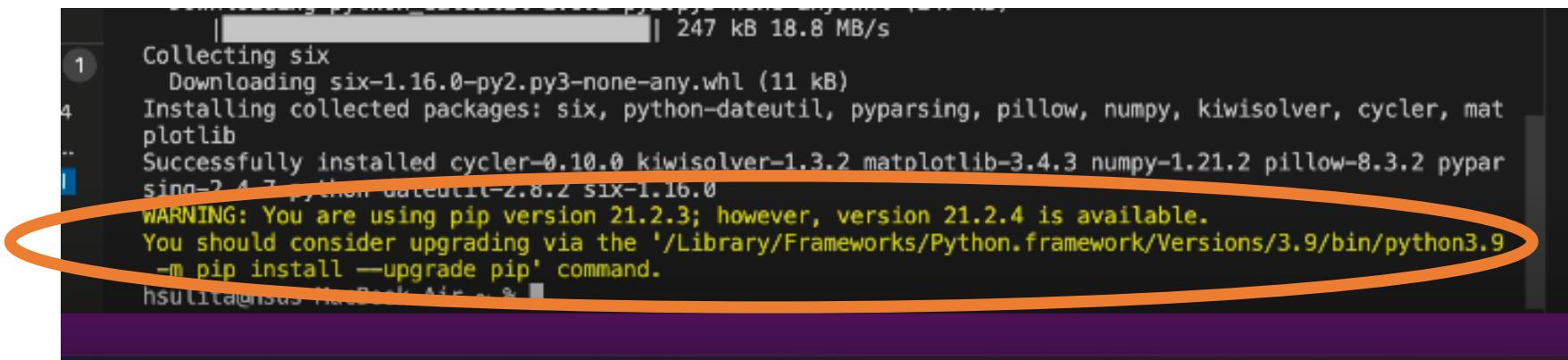
Click it

# Matplotlib Installation



Type the command

# Matplotlib Installation



```
|██████████| 247 kB 18.8 MB/s
1 Collecting six
  Downloading six-1.16.0-py2.py3-none-any.whl (11 kB)
4 Installing collected packages: six, python-dateutil, pyparsing, pillow, numpy, kiwisolver, cycler, mat
plotlib
--> Successfully installed cycler-0.10.0 kiwisolver-1.3.2 matplotlib-3.4.3 numpy-1.21.2 pillow-8.3.2 pypar
sing-2.4.7 python-dateutil-2.8.2 six-1.16.0
WARNING: You are using pip version 21.2.3; however, version 21.2.4 is available.
You should consider upgrading via the '/Library/Frameworks/Python.framework/Versions/3.9/bin/python3.9
-m pip install --upgrade pip' command.
hsultimo@hsultimo-MacBook-Air ~ %
```

You may encounter this problem

# Matplotlib Installation

```
WARNING: You are using pip version 21.2.3; however, version 21.2.4 is available.  
You should consider upgrading via the  
/Library/Frameworks/Python.framework/Versions/3.9/bin  
/python3.9 -m pip install --upgrade pip command.  
bsulita@Hsus-MacBook-Air: ~ %
```

Copy this command

# Matplotlib Installation

```
Successfully installed cycler-0.10.0 kiwisolver-1.3.2 matplotlib-3.4.3 numpy-1.21.2 pillow-8  
.3.2 pyparsing-2.4.7 python-dateutil-2.8.2 six-1.16.0  
WARNING: You are using pip version 21.2.3; however, version 21.2.4 is available.  
You should consider upgrading via the '/Library/Frameworks/Python.framework/Versions/3.9/bin  
/python3.9 -m pip install --upgrade pip' command.  
hsulita@Hsus-MacBook-Air ~ % pip install --upgrade pip  
zsh: command not found: pip  
hsulita@Hsus-MacBook-Air ~ % pip3 install --upgrade pip3  
ERROR: Could not find a version that satisfies the requirement pip3 (from versions: none)  
ERROR: No matching distribution found for pip3  
WARNING: You are using pip version 21.2.3; however, version 21.2.4 is available.  
You should consider upgrading via the '/Library/Frameworks/Python.framework/Versions/3.9/bin  
/python3.9 -m pip install --upgrade pip' command.  
hsulita@Hsus-MacBook-Air ~ % /Library/Frameworks/Python.framework/Versions/3.9/bin/python3.9  
-m pip install --upgrade pip
```

Paste the command

# Matplotlib Installation

```
PROBLEMS    OUTPUT    TERMINAL    DEBUG CONSOLE

hsulita@Hsus-MacBook-Air ~ % /Library/Frameworks/Python.framework/Versions/3.9/bin/python3.9
-m pip install --upgrade pip
Requirement already satisfied: pip in /Library/Frameworks/Python.framework/Versions/3.9/lib/
python3.9/site-packages (21.2.3)
Collecting pip
  Downloading pip-21.2.4-py3-none-any.whl (1.6 MB)
    |████████████████████████████████| 1.6 MB 5.6 MB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 21.2.3
    Uninstalling pip-21.2.3:
      Successfully uninstalled pip-21.2.3
Successfully installed pip-21.2.4
hsulita@Hsus-MacBook-Air ~ % pip3 install matplotlib
```

Type the command