



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
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- 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!

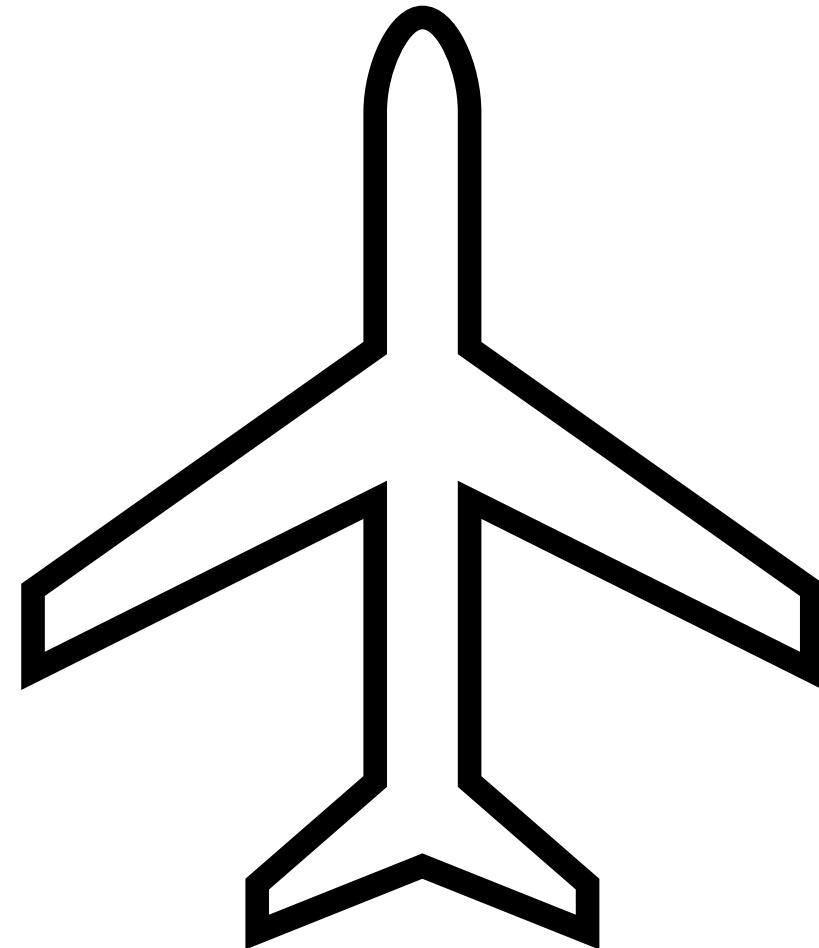
- Keep an open mind—enter the classroom dialogue with the expectation of learning something new. Look forward to learning about—and being challenged by—ideas, questions, and points of view that are different than your own.
- Arrive on time to the class and finish the class on time

Necessary Information

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

Week 1 Content

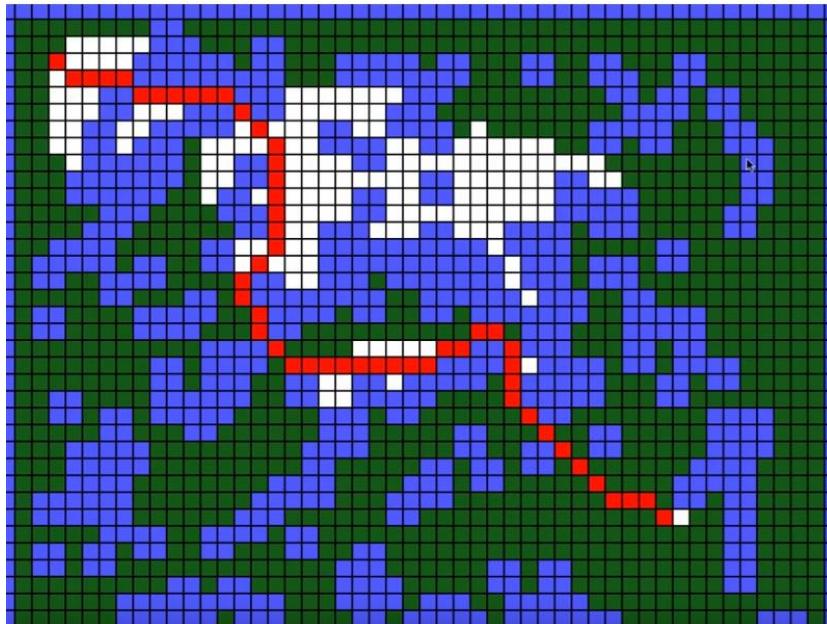
1. Introduction to Path Planning
2. Introduction to GitHub
(Background)
3. Introduction to GitHub Operations
4. Software Installation and setup
Guide



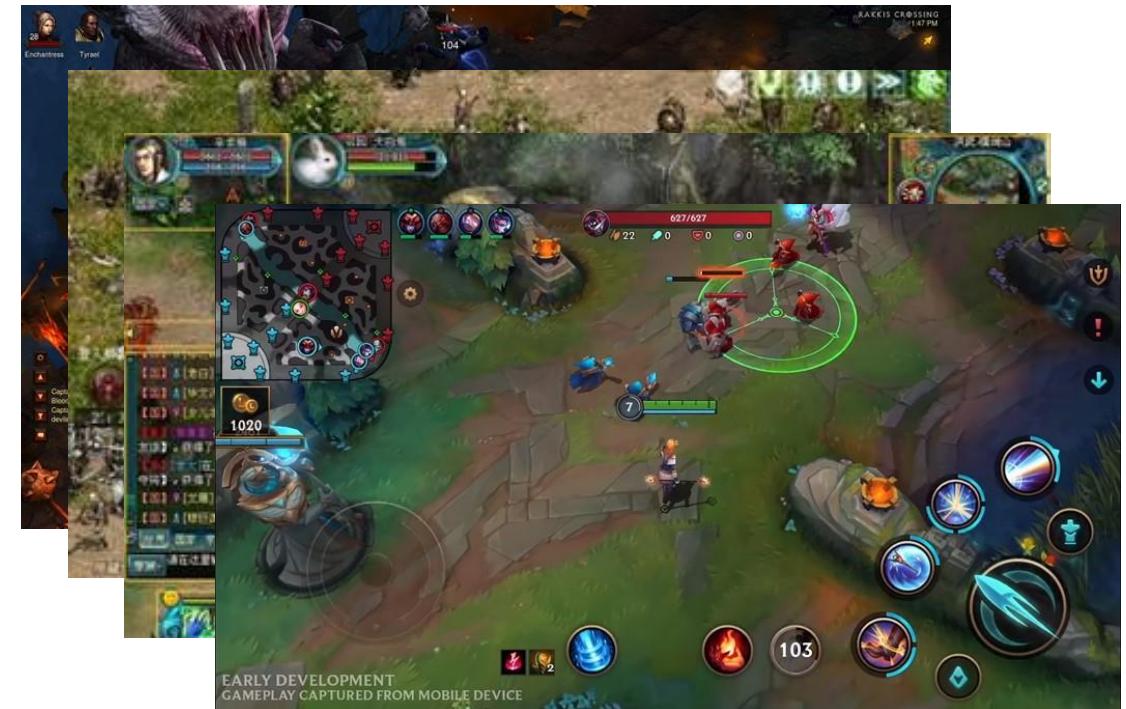
Introduction to Path Planning

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**.

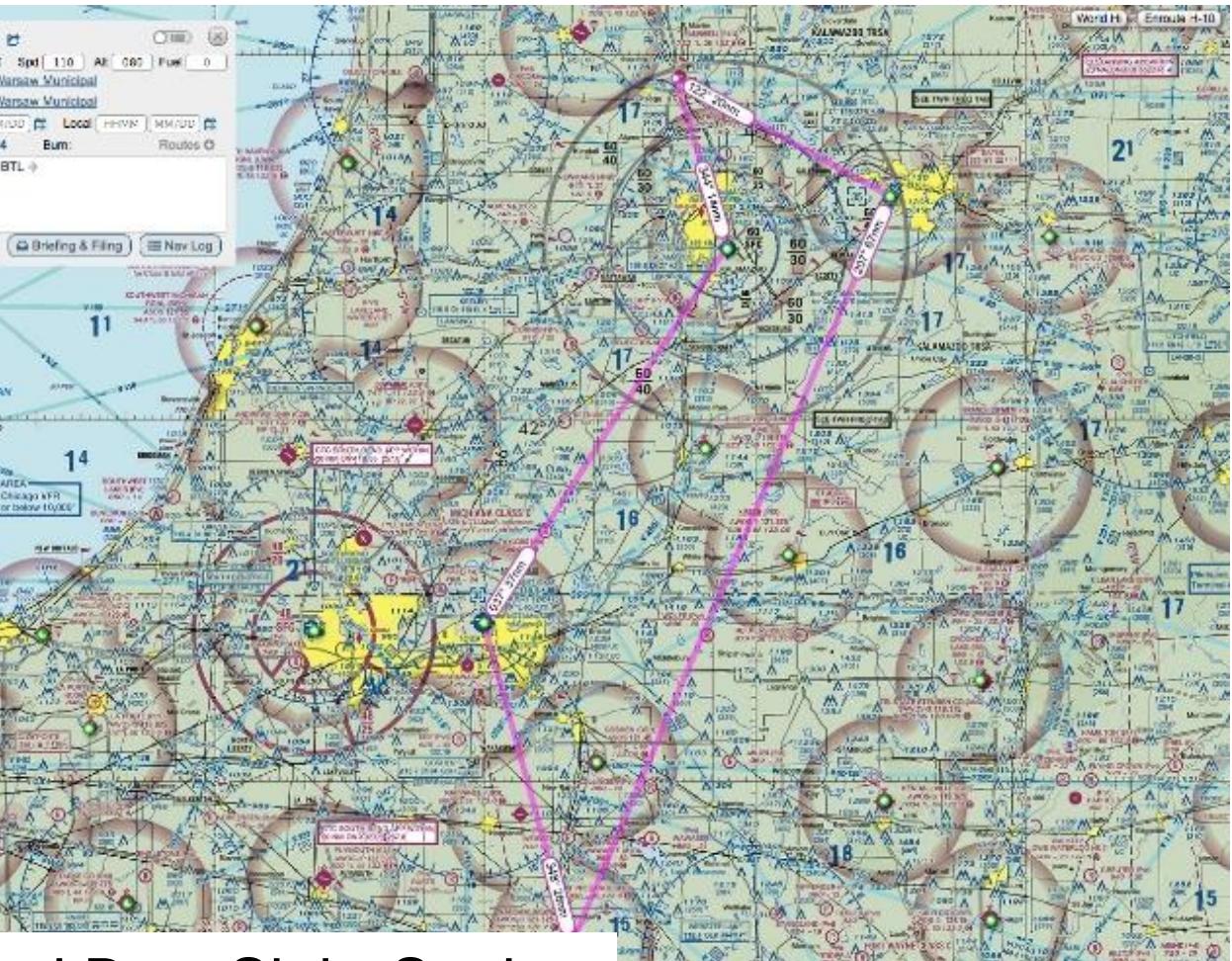
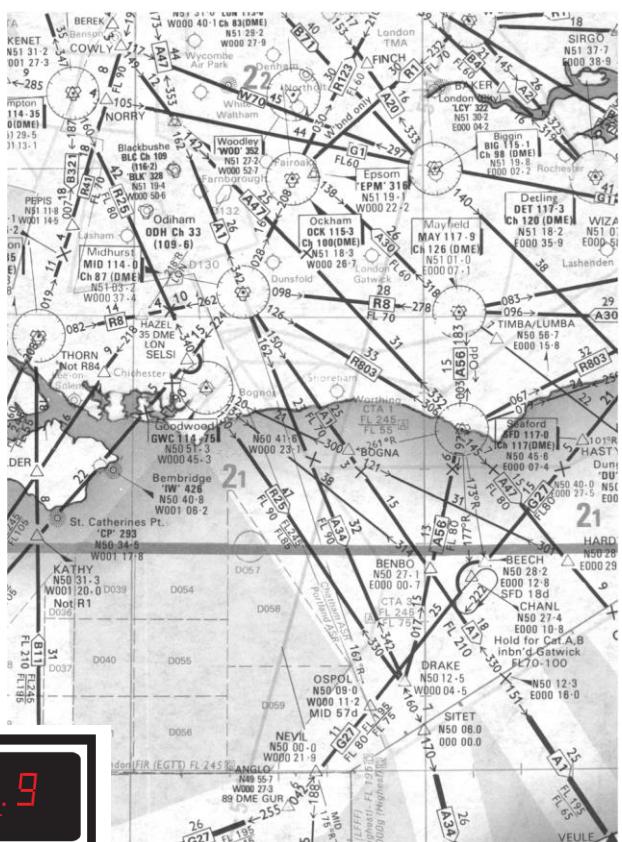
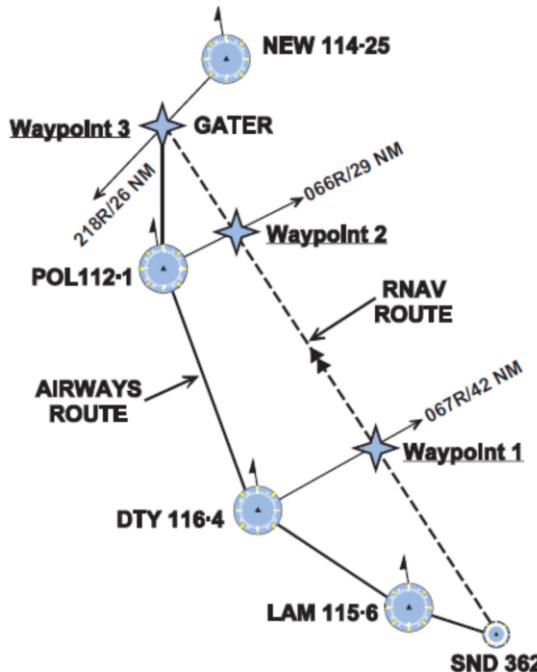


How to go from A to B considering factors!



How is Path Planning important to Aviation Engineering?

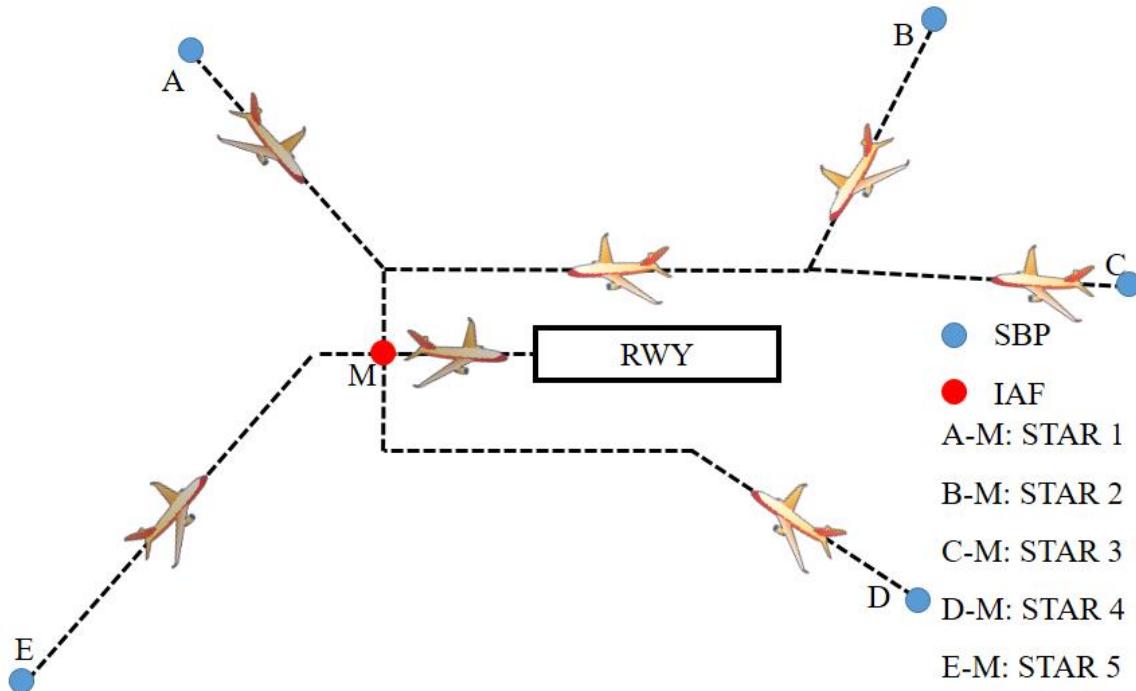
- Private pilots do the path plan before the flight to make sure the navigation aid is available



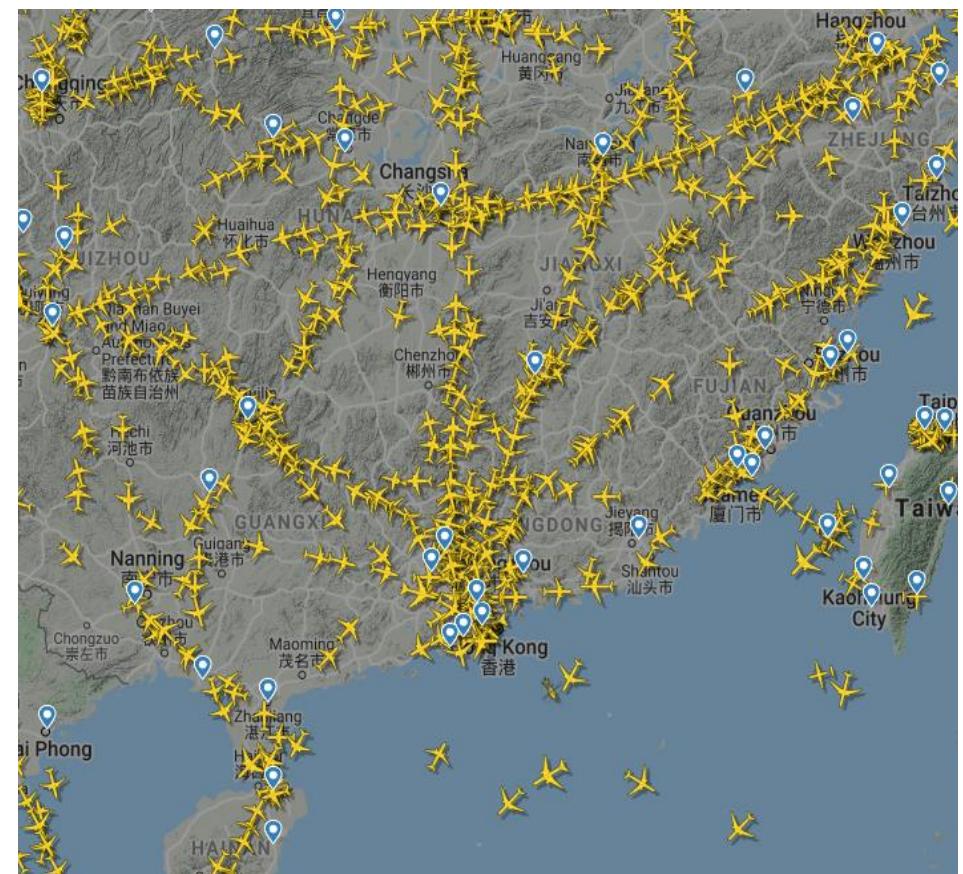
Objective: Safe and Best Sight Seeing

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

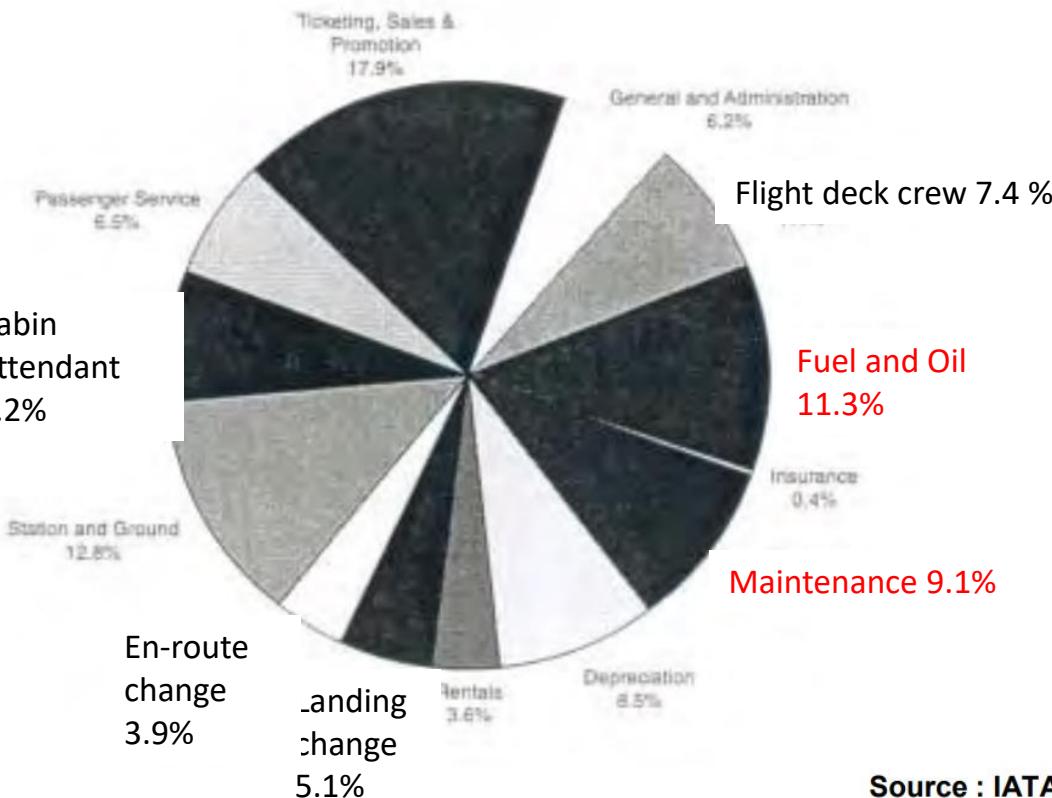


How is Path Planning important to Aviation Engineering?

- 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
 ΔF = trip fuel
 ΔT = 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 (± 2) cabin crews.

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

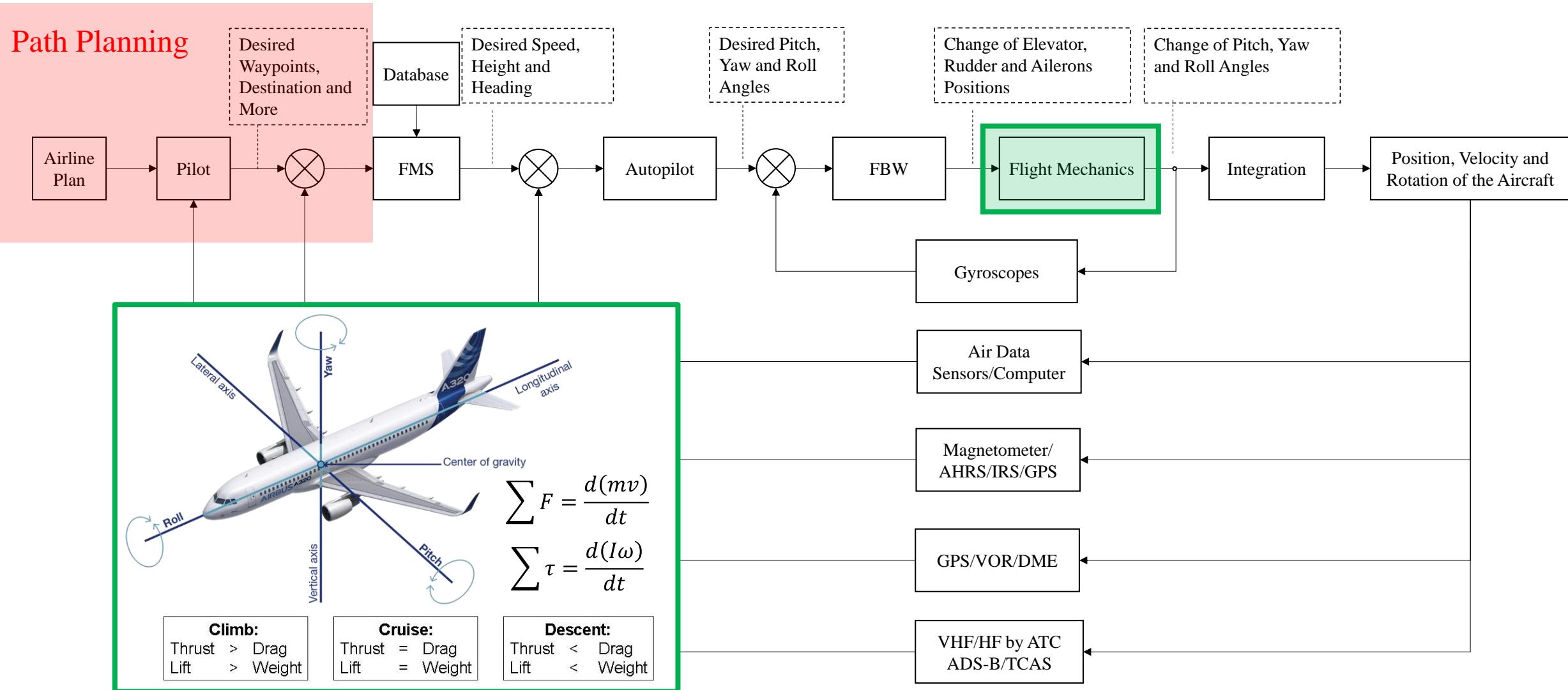
Table 1. A300/A310 cost index

(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?

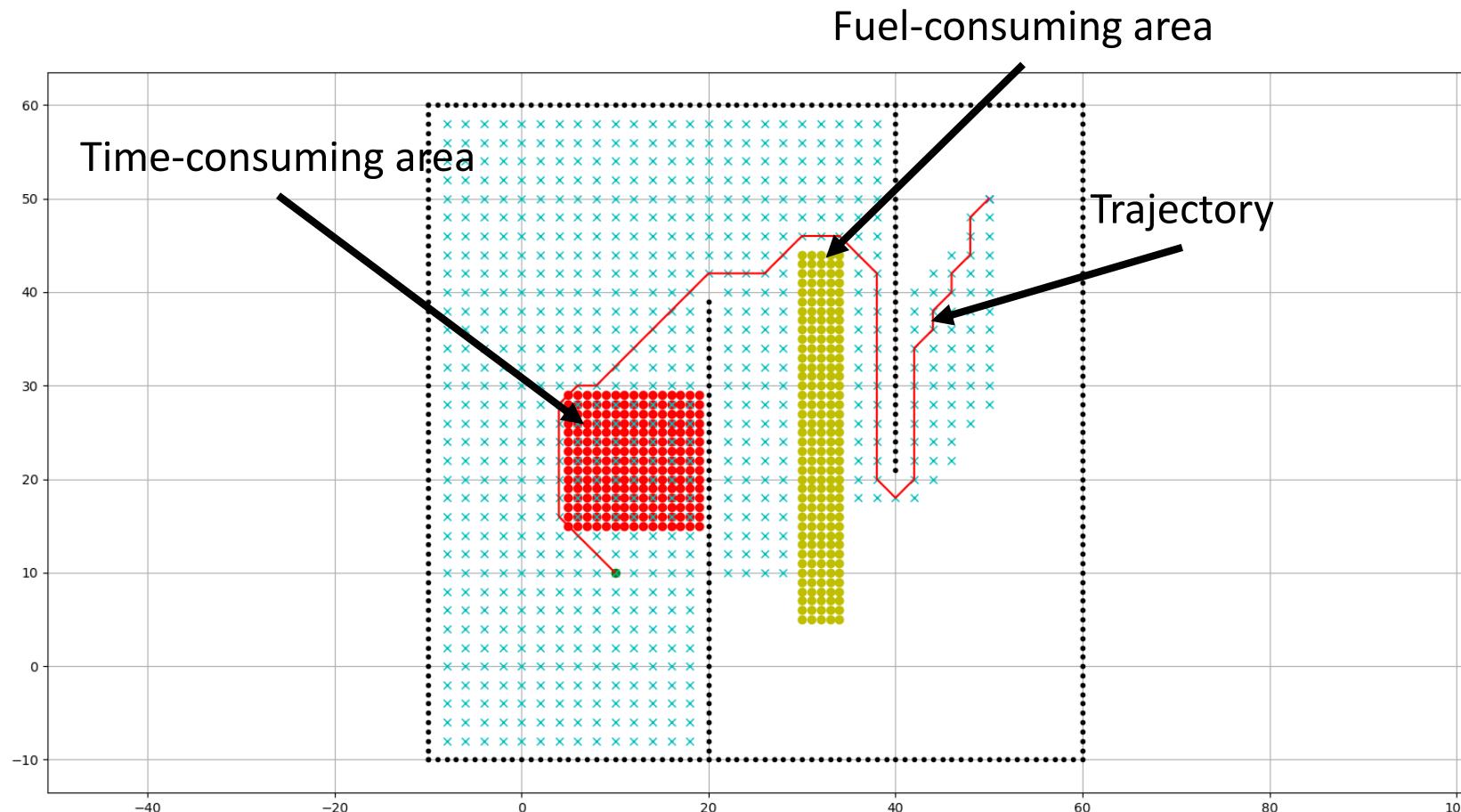
- Mathematics & Physics
- Computer Science
- Aeronautical and Aviation
- The plan should be planned considering the physical limitation (dynamics) of the aircraft

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	ΔF	C_T	ΔT	C_c	ΔF_a	ΔT_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	?	?	?	?	?	?	?
:	:	:	:	:	:	:	:

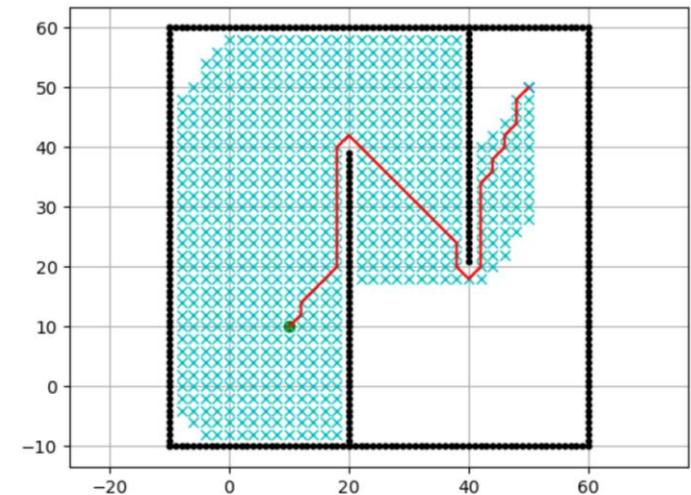
What you are expected to learn?

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

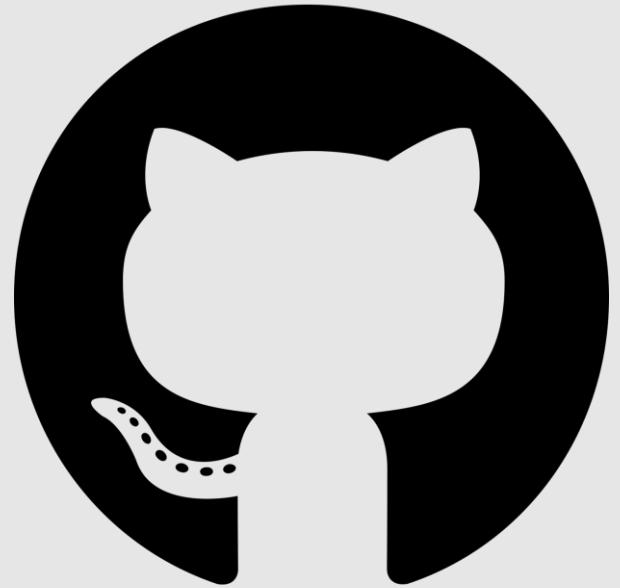
1. Group leader or members to collaborate on an online project,
2. R&D engineers to design and develop path-planning algorithm,
3. Project manager to present the designed code and prepare report.

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?



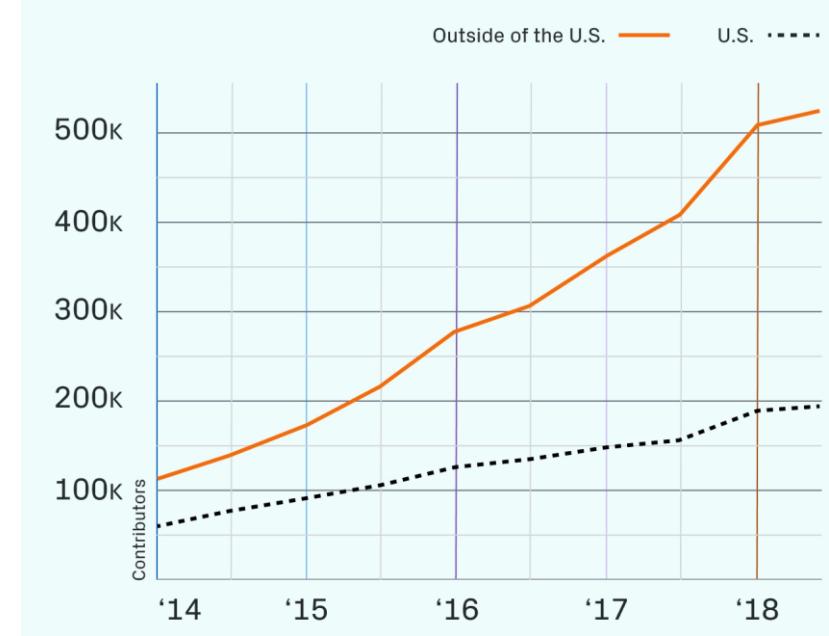
What is Github?



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

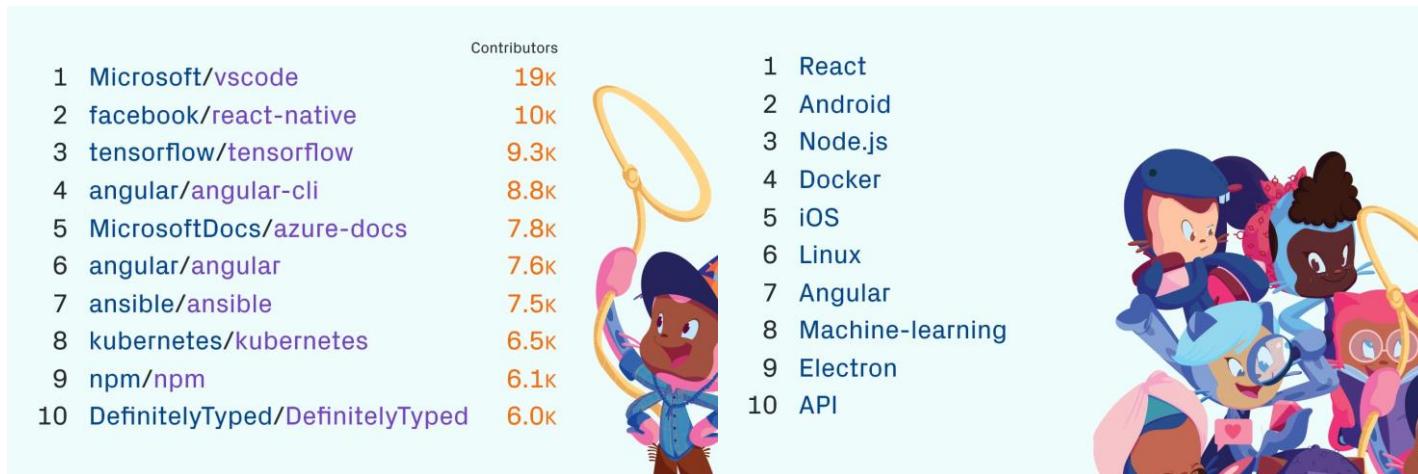
What's on GitHub

- 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

Microsoft
Open source projects and samples from Microsoft

Graphomer
This is the official implementation for "Do Transformers Really Perform Bad for Graph Representation?"

calculator
Windows Calculator: A simple yet powerful calculator that ships with Windows

v8-jsi
React Native V8 JSI adapter

ts-gyb
Generating native code interfaces from TypeScript

fixed-containers
C++ Fixed Containers

mongo-go-driver
Forked from mongo/mongo-go-driver
The Go driver for MongoDB

coreboot
Coreboot sources

linux
Linux sources

ansible puller

Google
Google ❤️ Open Source

<https://opensource.google/> [@GoogleOSS](#) opensource@google.com [Verified](#)

Repositories 2.1k **Packages** **People** 1.2k **Projects**

closure-compiler-npm
Package for managing and documenting closure-compiler for use via npm

it-cert-automation-practice
Google IT Automation with Python Professional Certificate - Practice files

CFU-Playground
Want a faster ML processor? Do it yourself! -- A framework for playing with custom opcodes to accelerate TensorFlow Lite for Microcontrollers (TFLM).

pytype
A static type analyzer for Python code

trax
Trax — Deep Learning with Clear Code and Speed

pigweed

BIG GitHub Pages

Boeing

Overview Repositories 5 Packages People Projects

Popular repositories

modular_navigation	modular_cartographer
● C++ ⭐ 6 📈 6	● C++ ⭐ 5 📈 5
cartographer	math6d
● C++ ⭐ 5 📈 3	● Python ⭐ 2 📈 1
image_tran	
● 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	

People

This organization has no public members. You must be a member to see who's a part of this organization.

Top languages

● C++ ● Python

Report abuse

Find a repository... Type Language Sort

Repositories

Find a repository... Type Language Sort

ED247_LIBRARY

Example of ED-247 standard implementation

● C++ ⭐ 13 📈 7

scikit-decide

AI framework for Reinforcement Learning, Automated Planning and Scheduling

● Python ⭐ 14 📈 10

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

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

Landslide Hazard Analysis for Situational Awareness

● 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

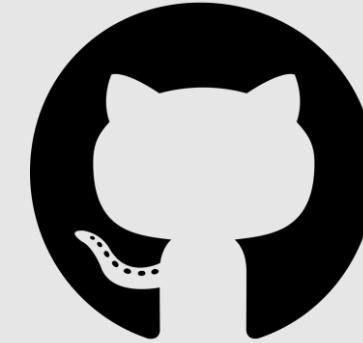
nasa cumulus nasa-cumulus eosdis satellite

People 42

Developer Program Member

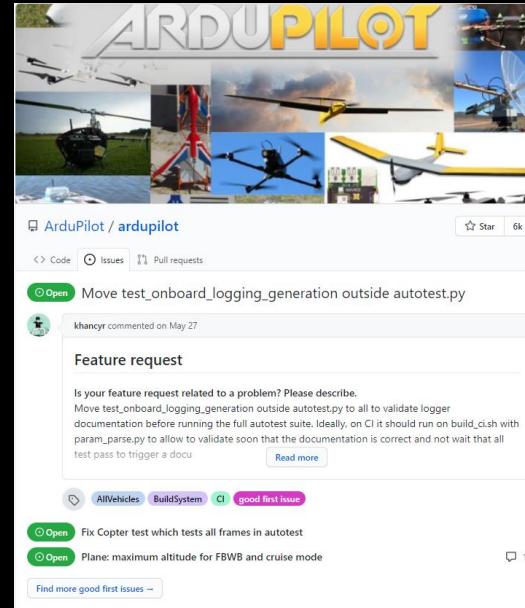
Report abuse

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 section titled 'PX4 Autopilot Software' contains a list of tags: uav, drone, ros, px4, pixhawk, uas, dronecode, autopilot, mavlink, autonomous, drones, dds, hacktoberfest, ugv, mavros, multicopter, qgroundcontrol, fixed-wing, fast-rtps, avoidance. Below the tags, the text 'Updated 19 minutes ago' and 'C++' are shown. The bottom right corner of the screenshot shows a 'Star' icon and '1.9k' stars.

The screenshot shows the mavlink/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. A section titled 'Cross-platform ground control station for drones (Android, iOS, Mac OS, Linux, Windows)' contains a list of tags: qt, uav, drone, px4, pixhawk, uas, mavlink, ardupilot. Below the tags, the text 'Updated 23 hours ago' and 'C++' are shown. The bottom right corner of the screenshot shows a 'Star' icon and '1.9k' stars.

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)

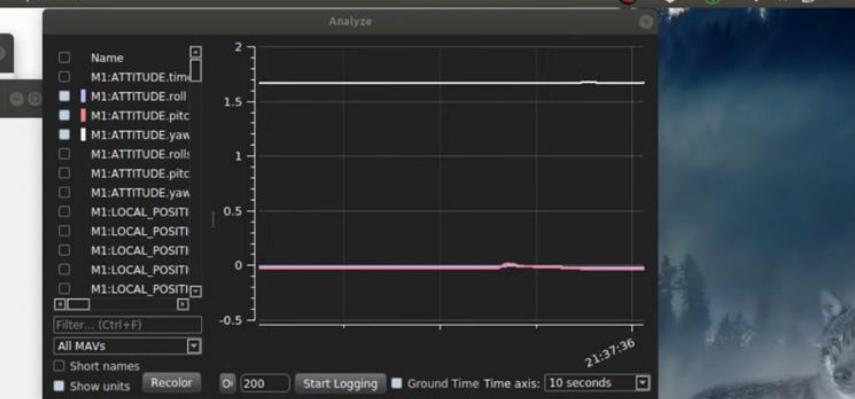
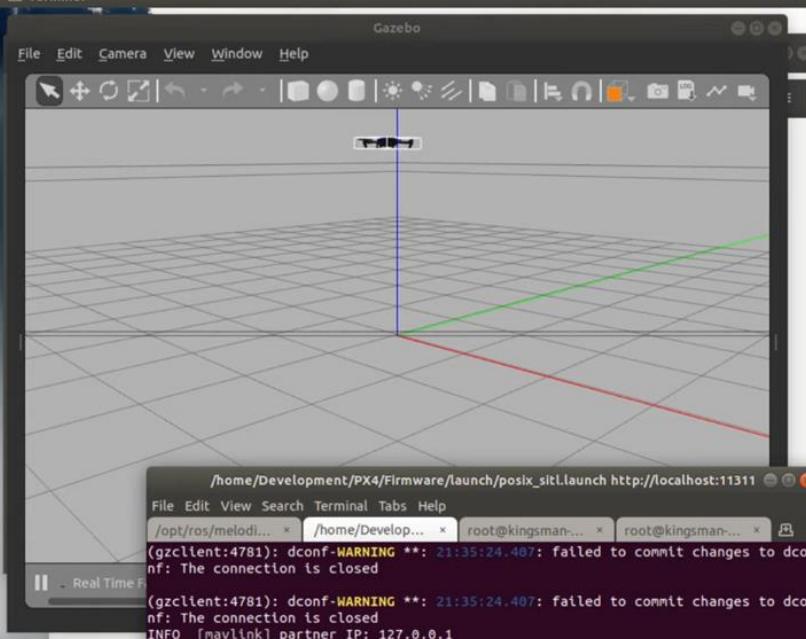


Activities

Terminal

Sun Feb 9, 21:37:36

95%



QGroundControl v3.5.6

File Widgets

Vehicle Setup Summary

Below you will find a summary of the settings for your vehicle. To the left are the setup menus for each component.

Airframe		Sensors	
System ID	1	Compass 0	Ready
Airframe type	Quadrilateral Wide	Gyro	Ready
Vehicle	3DR Iris Quadrilateral	Accelerometer	
Firmware Version	1.11.dev		

INS

Radio		Flight Modes	
Roll	Setup required	Mode switch	
Pitch	Setup required	Flight Mode 1	
Yaw	Setup required	Flight Mode 2	
Throttle	Setup required	Flight Mode 3	
Aux1	Disabled	Flight Mode 4	
Aux2	Disabled	Flight Mode 5	

Firmware Airframe Sensors Radio Flight Modes Power Safety

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, there are buttons for 'dev', '4 branches', '11 tags', 'Go to file', 'Add file', 'Code', and 'About'. The 'About' section indicates it's the RS485 take on LogisticsPipes -- ESTD 2012. Below this, there's a 'Commits' section listing 3,947 commits from various authors, with a focus on kotlin, java, and multiplayer. There are sections for 'Releases' (17), 'Packages' (No packages published), 'Contributors' (49), and 'Languages' (Java 84.4%, Kotlin 15.6%).

The screenshot shows a GitHub search results page for 'Machine Learning'. It displays 339,410 repository results. The sidebar on the left provides navigation links for Repositories (339K), Code (8M), Commits (271K), Issues (173K), Discussions (937), Packages (46), Marketplace (22), Topics (502), Wikis (34K), and Users (56K). The main area lists several repositories: 'josephmisiti/awesome-machine-learning' (A curated list of awesome Machine Learning frameworks, libraries and software.), 'wepe/MachineLearning' (Basic Machine Learning and Deep Learning), 'udacity/machine-learning' (Content for Udacity's Machine Learning curriculum), 'Jack-Cherish/Machine-Learning' (机器学习实践 (Python3) : kNN、决策树、贝叶斯、逻辑回归、SVM、线性回归、树回归、随机森林、朴素贝叶斯、adaboost-algorithm), and 'lawlite19/MachineLearning_Python' (机器学习算法python实现).

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

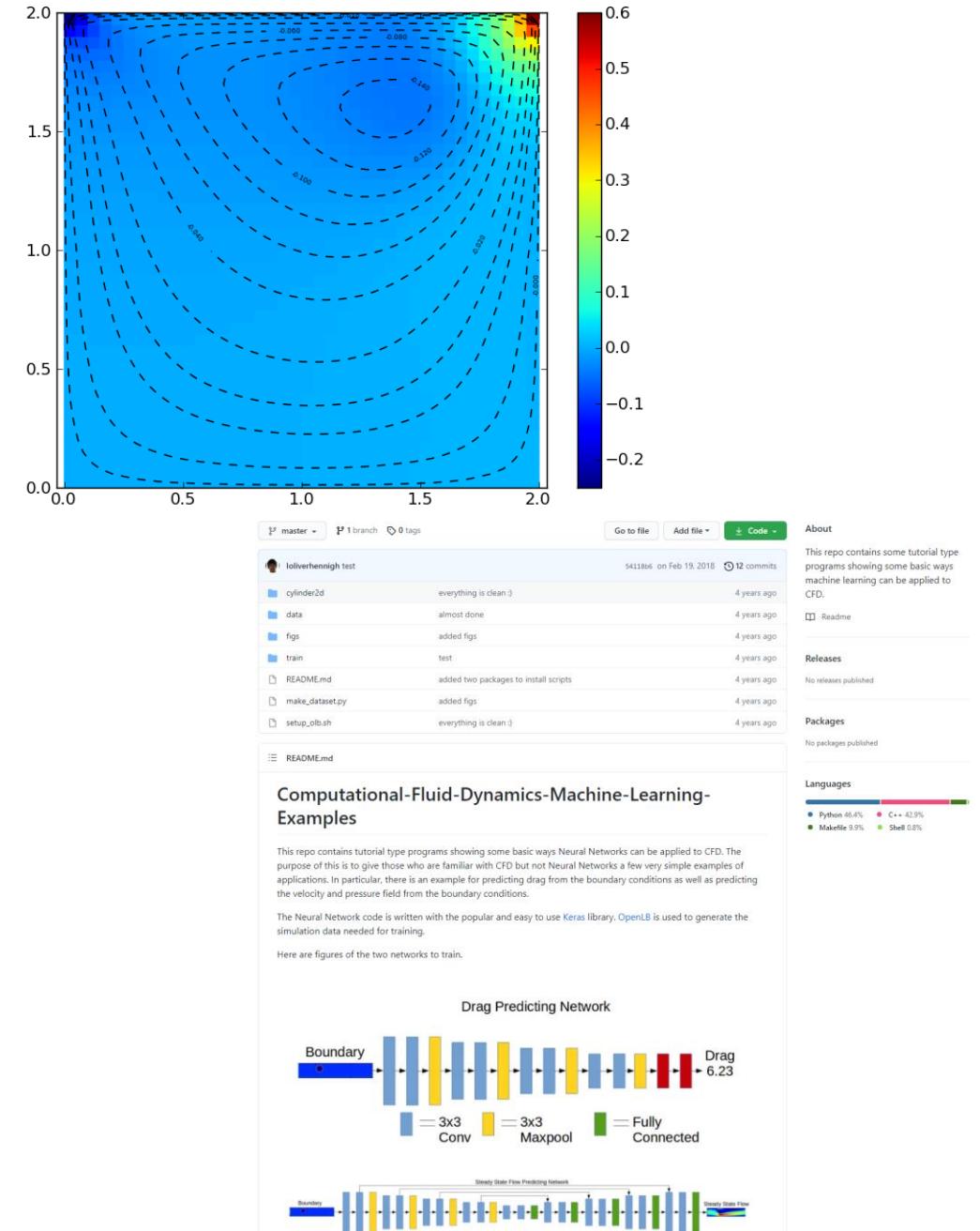
Aircraft design optimization made fast through modern automatic differentiation. Plug-and-play analysis tools for aerodynamics, propulsion, structures, trajectory design, and much, much more.

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

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. The master branch has 49 commits from richard-elvira. Recent commits include "V0.4: Beta version, 21 April 2021" for Examples, Thirdparty, Vocabulary, evaluation, include, src, .gitignore, CMakeLists.txt, Changelog.md, Dependencies.md, LICENSE, README.md, build.sh, and build_ros.sh. The repository has 165 issues, 27 pull requests, and 1k forks.
- tomojitakasu / RTKLIB**: This page shows the repository's code history. The master branch has 69 commits from tomojitakasu. Recent commits include "rtklib 2.4.2 p13" for app, bin, brd, data, doc, lib, and src. The repository has 303 issues, 39 pull requests, and 290 forks.
- HKUST-Aerial-Robotics / VINS-Mono**: This page shows the repository's code history. The master branch has 76 commits from shaozu. Recent commits include "fix ar_demo image interface" for ar_demo, "another warning" for benchmark_publisher, "add Eigen3 cmake" for camera_model, "Merge branch 'master' of github.com:HKUST-Aerial-Robotics/VINS-Mono" for config, "update docker" for docker, "add realSense config: avoid imu disorder; fix relocalization visualiza..." for feature_tracker, "add docker" for pose_graph, "modify readme" for support_files, "user-friendly updates" for vins_estimator, and "user-friendly updates" for .gitignore, LICENSE, and README.md. The repository has 231 issues, 4 pull requests, and 217 forks.

Aviation

Powered By GitHub

aviation

Here are 368 public repositories matching this topic...

Language: All Sort: Best match



Generalized Aviation™

[generalized-intelligence / GAAS](#) Star 1.6k

Code Issues Pull requests

GAAS is an open-source program designed for fully autonomous VTOL(a.k.a flying cars) and drones. GAAS stands for Generalized Autonomy Aviation System.

aviation uav drone flight-controller flight lidar autonomous drones autonomous-quadcopter autonomous-driving autonomous-vehicles vtol flying-car evtol hd-map e-vtol

Updated on Oct 25, 2021 C++

[cyoung / stratus](#) Star 842

Code Issues Pull requests

Aviation weather and traffic receiver based on RTL-SDR.

aviation weather traffic rtl-sdr stratus

Updated 6 days ago C

[szpaider / RTLSDR-Airband](#) Star 469

Variety of resources

All free on GitHub

aircraft

Here are 287 public repositories matching this topic...

Language: All ▾ Sort: Best match ▾

wiedehopf / [tar1090](#) ★ Star 582

Provides an improved webinterface for use with ADS-B decoders readsb / dump1090-fa

sdr rtl-sdr webinterface aircraft ads-b adsb rtl-sdr 1090 readsb 1090mhz

Updated 3 days ago JavaScript

JSBSim-Team / [jsbsim](#) ★ Star 504

Open XML validation 16

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

robin-shaun / [XTDrone](#) ★ Star 418

Code Issues Pull requests

UAV Simulation Platform based on PX4, ROS and Gazebo

px4 ros px4 gazebo aircraft self-driving



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

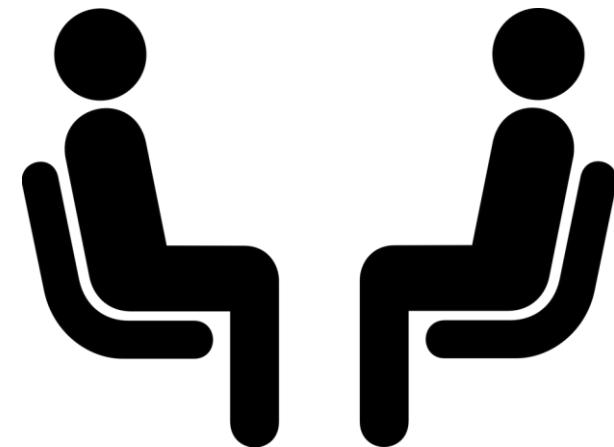


For Your Career

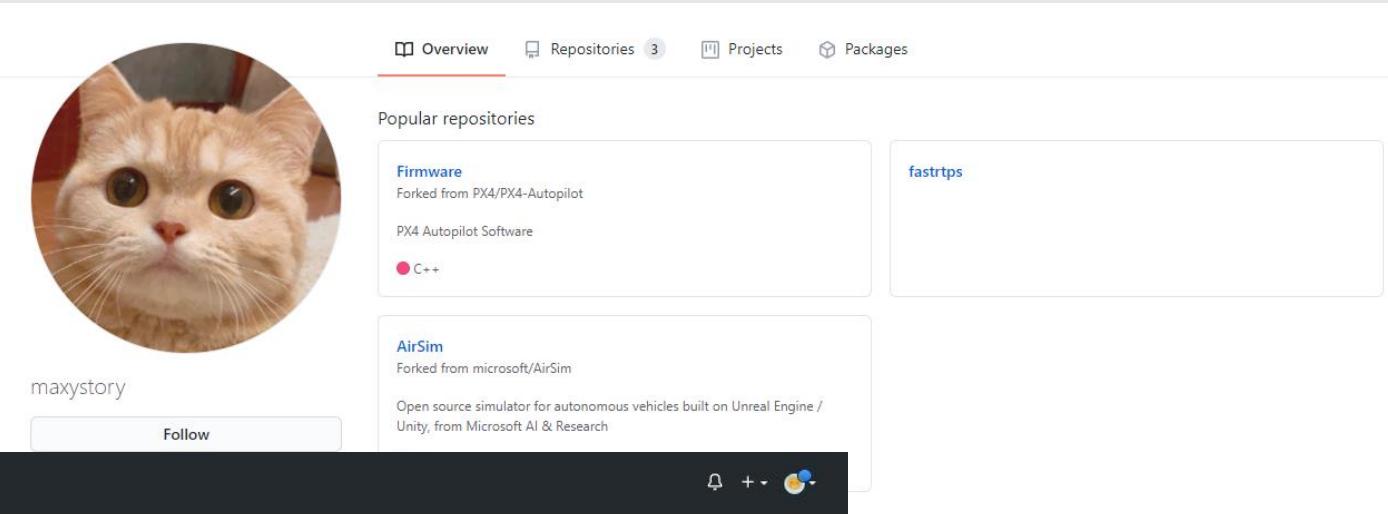


GitHub Facilitated Job Hunting

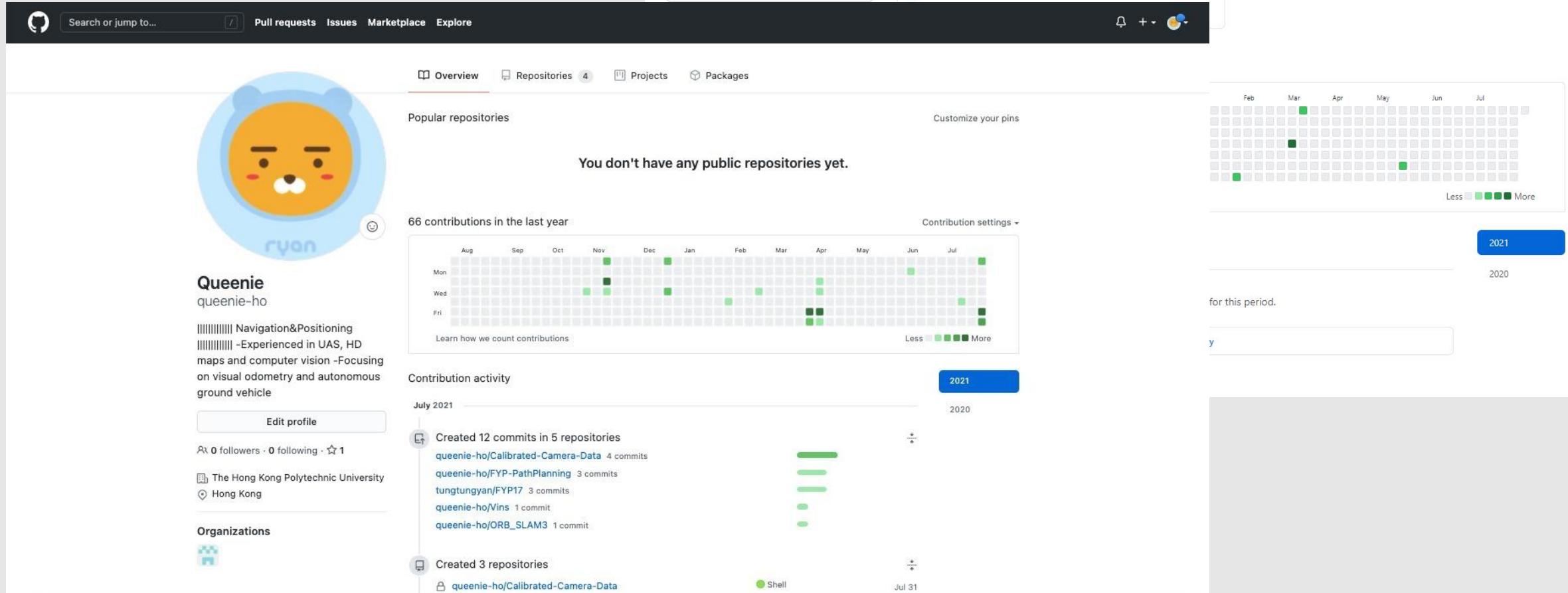
- A online digital profile for students
 - Indicating interests
 - Show past work
 - Roadmap of students' development career
- Let people know that you are looking for a job
- During job hunting
 - Better first impression
 - Better understanding
 - Appears more enthusiastic



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 link to 'Edit profile'. 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, with 66 contributions marked by green squares. The timeline shows contributions from August 2020 to July 2021, with a focus on the months of November, December, and January. The 'Contribution settings' dropdown is open. The 'Contribution activity' section also lists specific contributions: 'Created 12 commits in 5 repositories' (including queenie-ho/Calibrated-Camera-Data, queenie-ho/FYP-PathPlanning, tungtungyan/FYP17, queenie-ho/Vins, and queenie-ho/ORB_SLAM3) and 'Created 3 repositories' (all under the queenie-ho/Calibrated-Camera-Data account). The right side of the profile page features a calendar heatmap for the year 2021, with green squares indicating active periods. A note states 'for this period.' followed by a partially visible date 'y'. The bottom of the page shows sections for 'Organizations' and 'Recent activity'.



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

128 contributions in 2020



2021
2020
2019
2018

Activity overview

Contributed to weisongwen/researchTools.

Code review

Up to Phd Studies

The image shows two GitHub profiles side-by-side for comparison. The left profile is for B.X.W (baaixw) and the right is for Darren Wong. Both profiles feature a circular profile picture, a summary section with pinned repositories, a contributions calendar for the last year, and sections for achievements, organizations, and activity overview.

B.X.W (Left Profile):

- Popular repositories:** remoteSensing2020, ios_logger, vins-application, catkin, CV_GNSS, tutorials.
- Achievements:** 128 contributions in 2020.
- Activity overview:** Contributed to weisongwen/researchTools.

Darren Wong (Right Profile):

- Pinned repositories:** e3372-web-management, protobuf-over-nanomsg-example, weisongwen/UrbanNavDataset.
- Achievements:** 98 contributions in the last year.
- Activity overview:** Contributed to IPNL-POLYU/UrbanNavDataset, IPNL-POLYU/ipnl-sensor-kit, DarrenWong/benchmark_lo, and 5 other repositories.



Seph Soliman

scarlac

[Follow](#)

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

64 followers · 7 following · 71 contributions

[Tesla](#)
[San Francisco](#)
<https://www.seph.dk>

Achievements



Organizations


[Block or Report](#)

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
- lолpause**
MacOS utility app to pause League of Legends GUI Flash client while game is active to lower CPU consumption
Objective-C ⭐ 1

44 contributions in 2021





Jonathan Hall
flimzy

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

[Follow](#)

...

139 followers · 32 following · 45 contributions

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

Highlights

* Arctic Code Vault Contributor

Organizations




Jonathan Hall

flimzy

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

[Follow](#)

139 followers · 32 following · 45 contributions

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

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



Contribution activity

2020



Jonathan Hall

flimzy

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

[Follow](#)

139 followers · 32 following · 45 contributions

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

Highlights

* Arctic Code Vault Contributor

Organizations

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



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

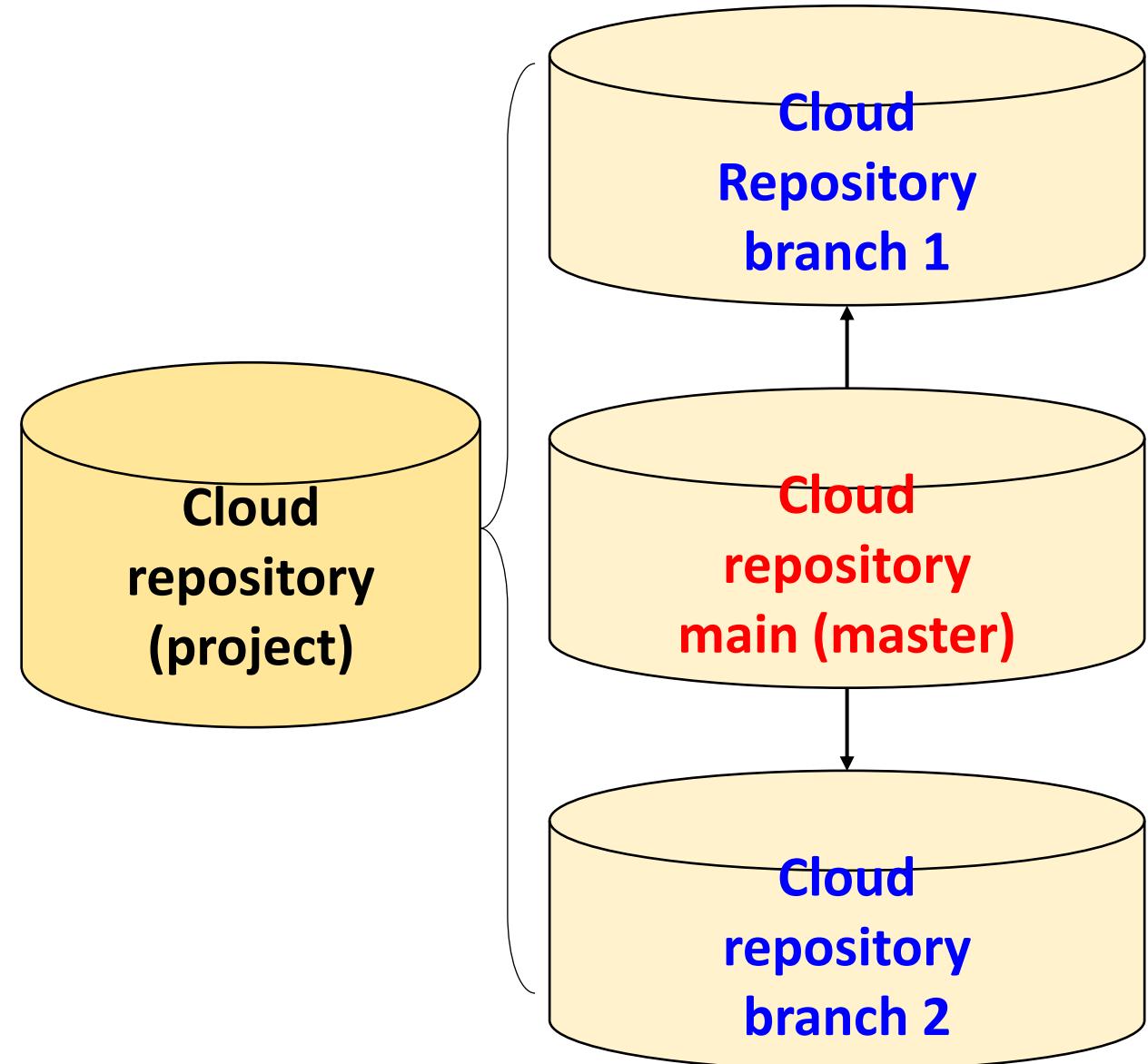
New Version

Add (Stage)

Commit: *To create a snapshot of the repository*

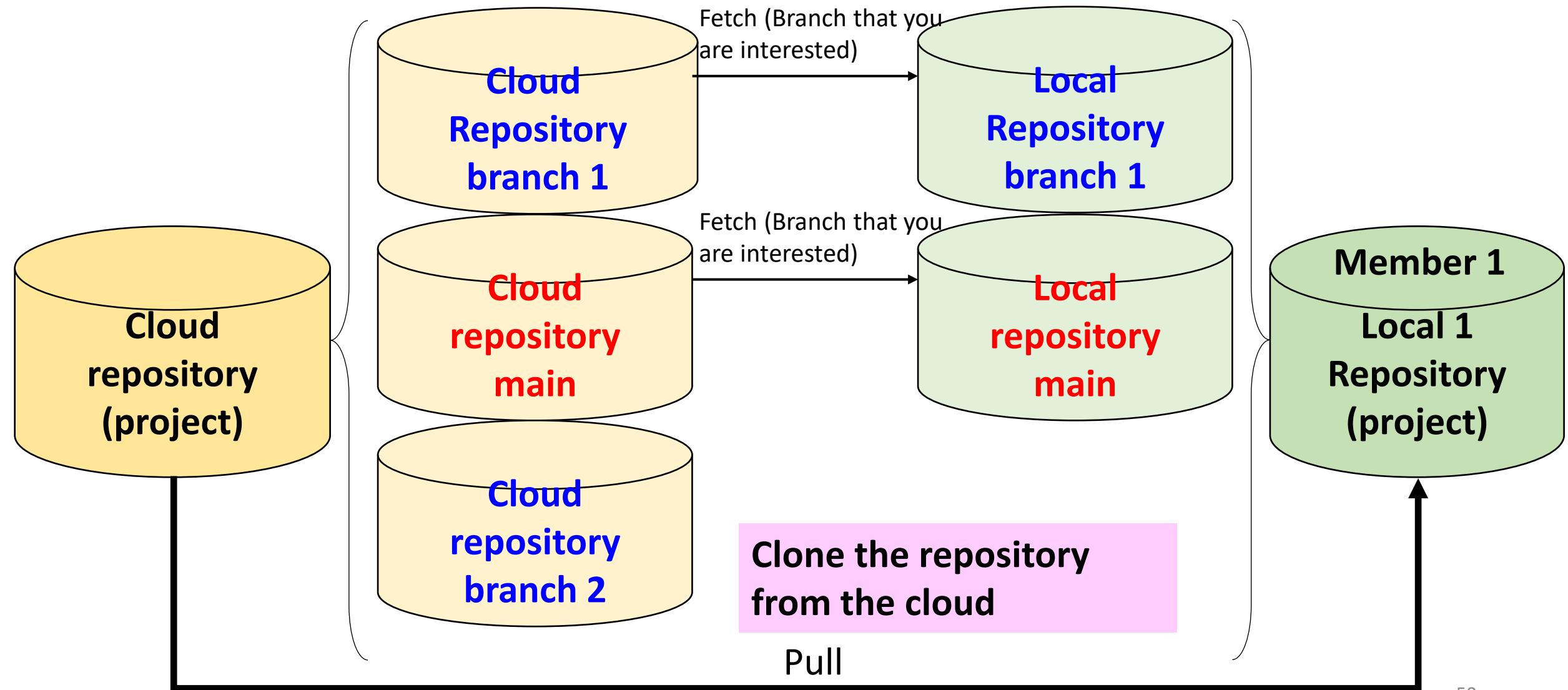
Add (Stage): *To add files or segments in the next commit*

Collaborative coding online – Generate Branch (Member)

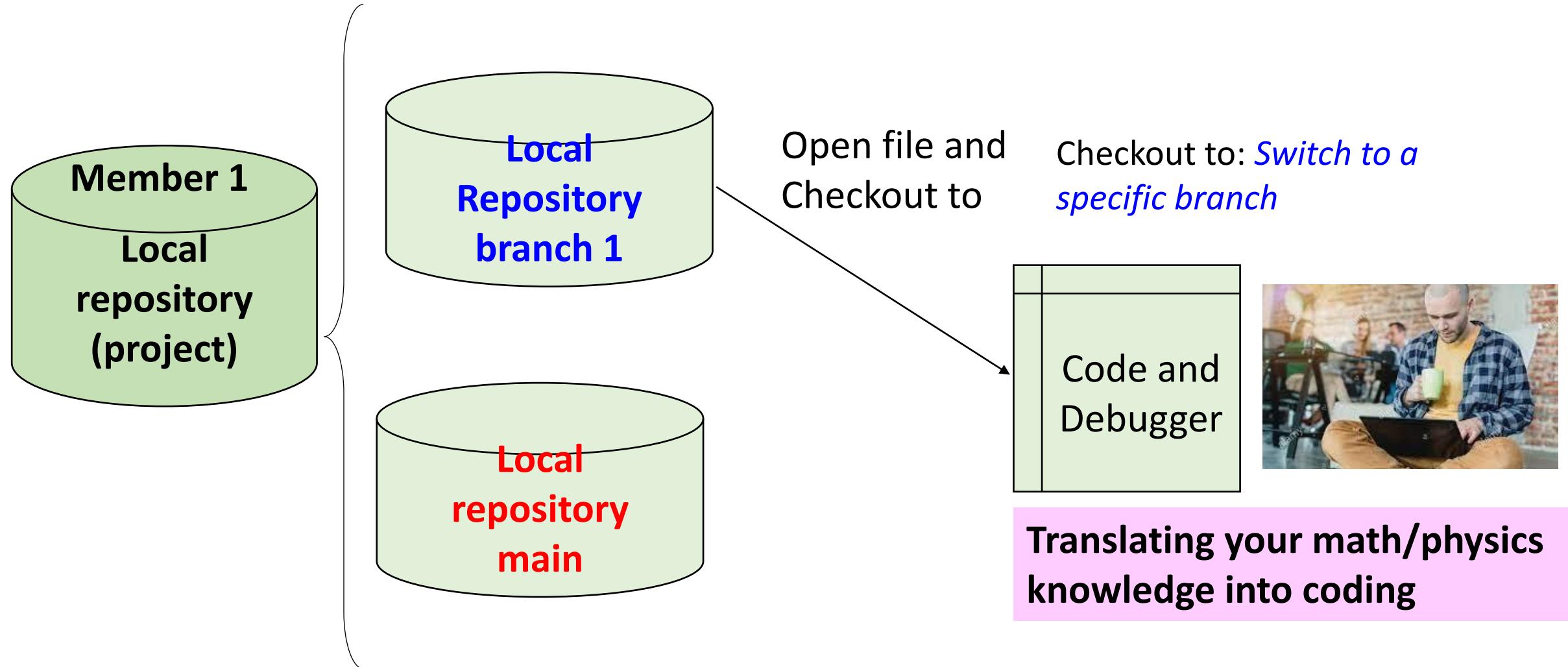


To generate a branch for different member that participant the project, creating a contained area of your repository to develop features, fix bugs and more.

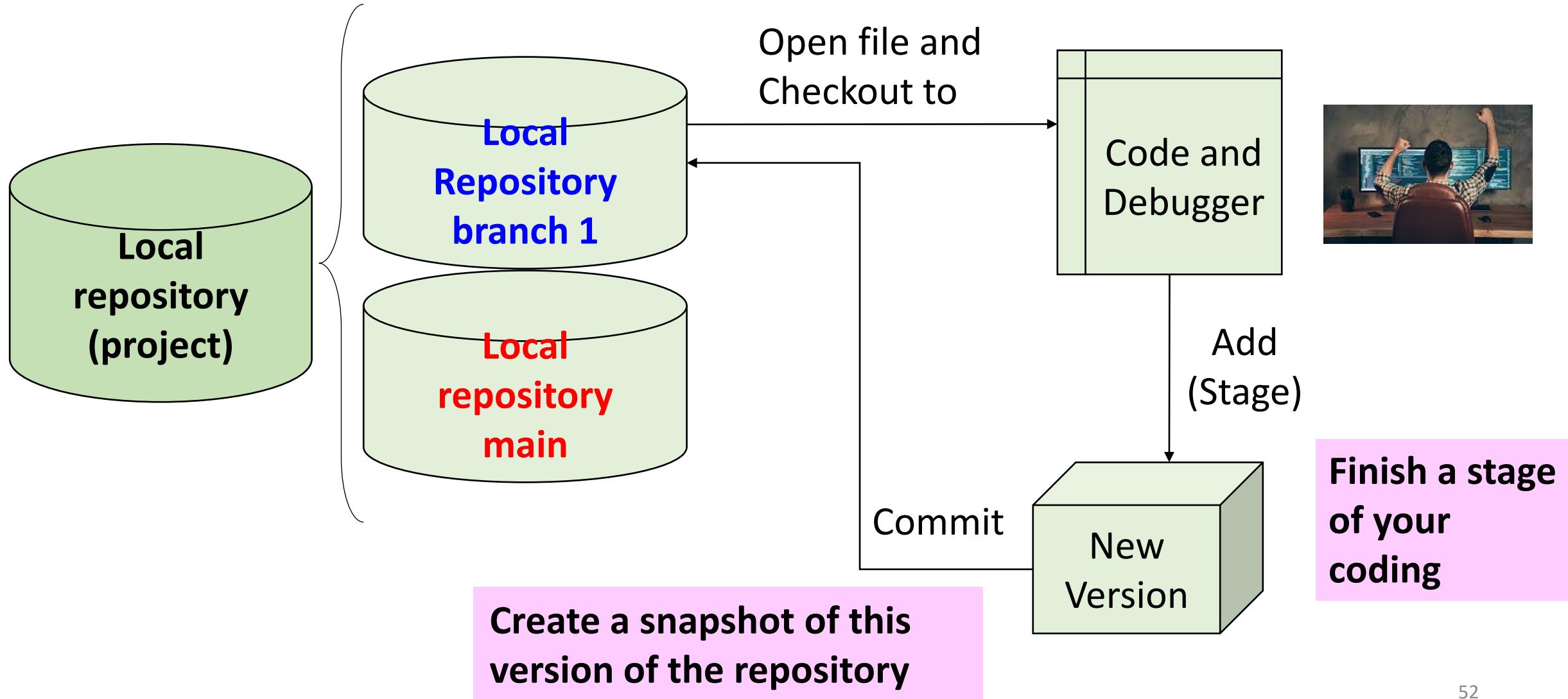
Collaborative coding online – Fetch/Pull Branch from Cloud



Collaborative coding online – Edit the code in the local computer



Collaborative coding online – Edit the code in the local computer

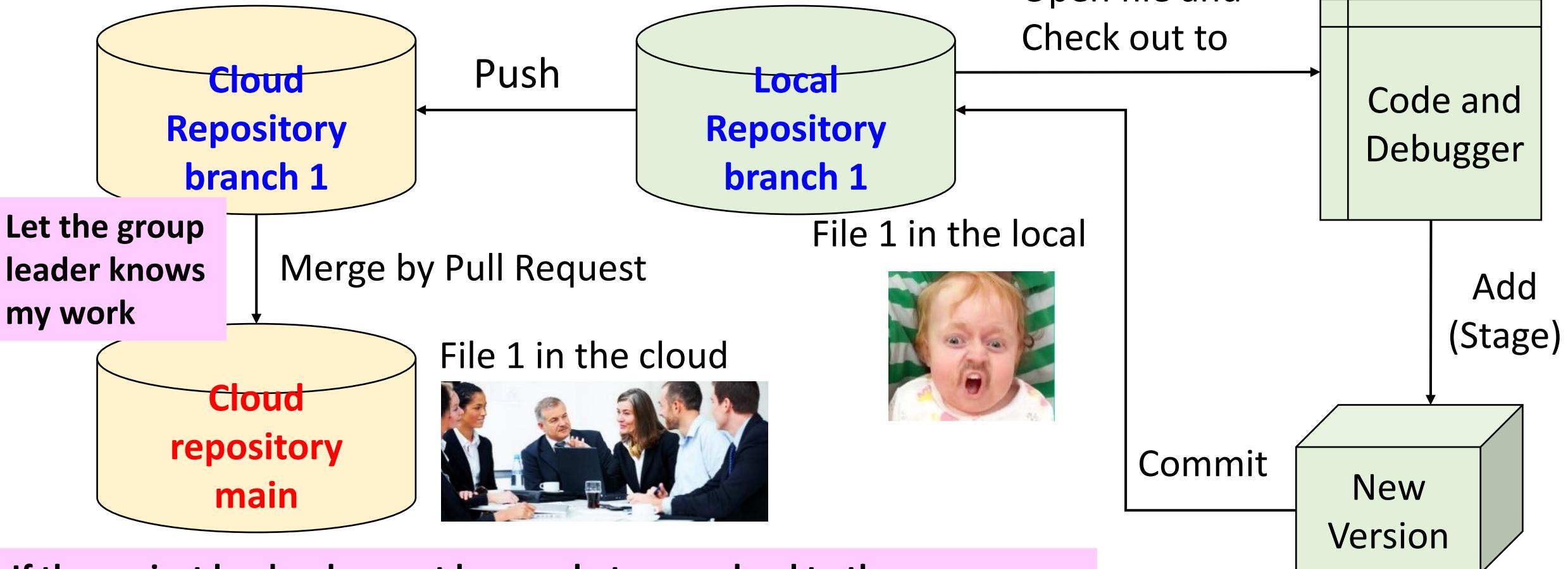


Concept of collaborative coding online

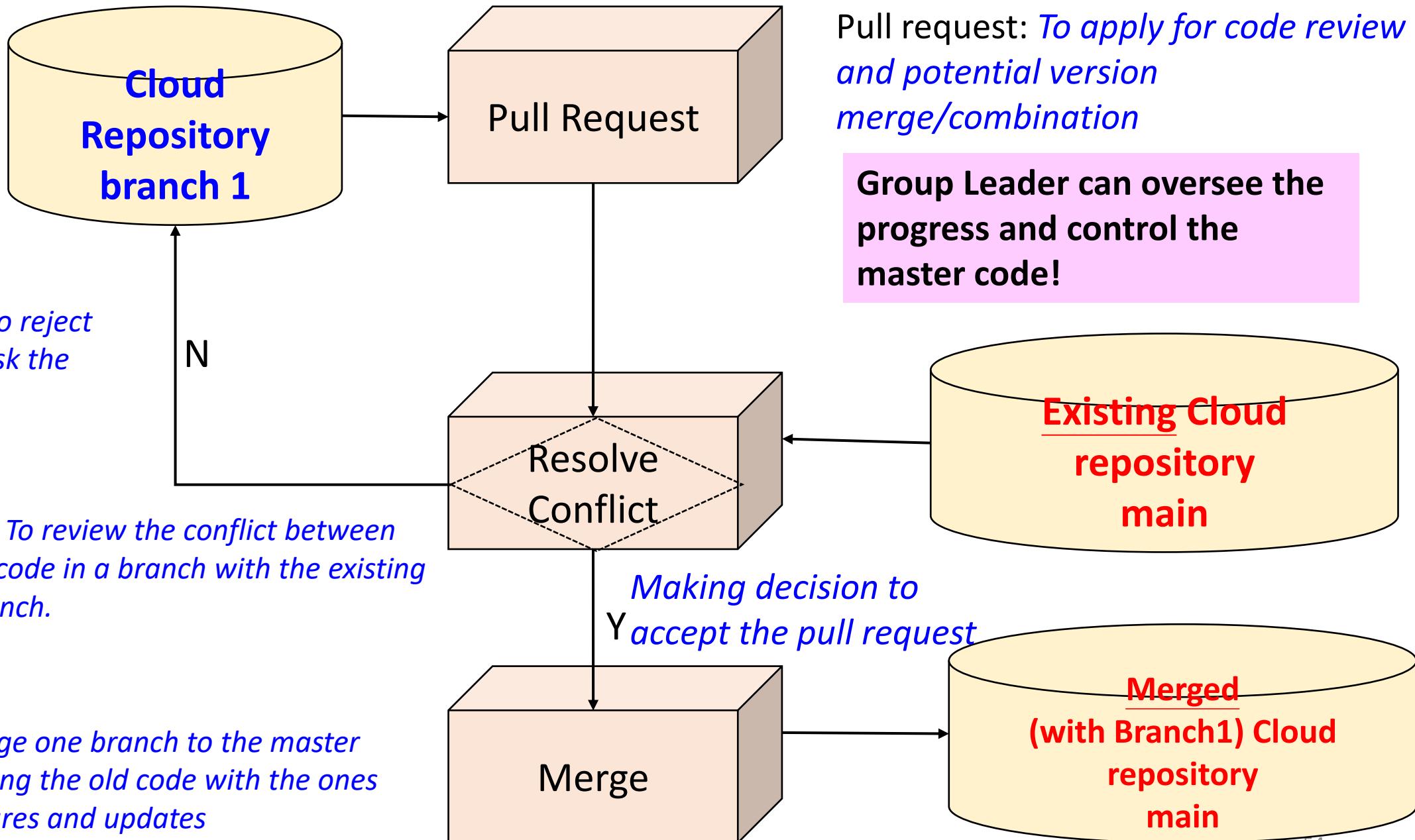
Web based

Video: [VSC-Git Branches](#)

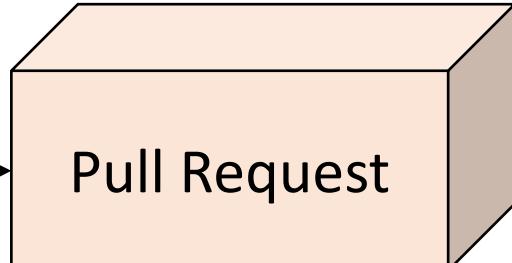
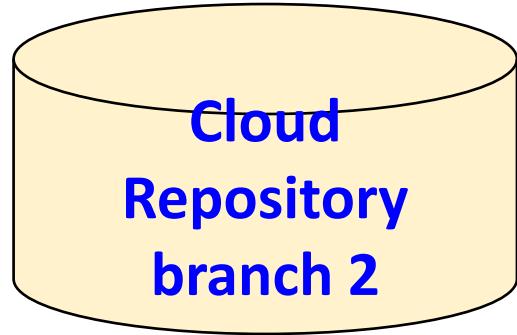
Ready to update to the cloud branch!



Web based



Web based

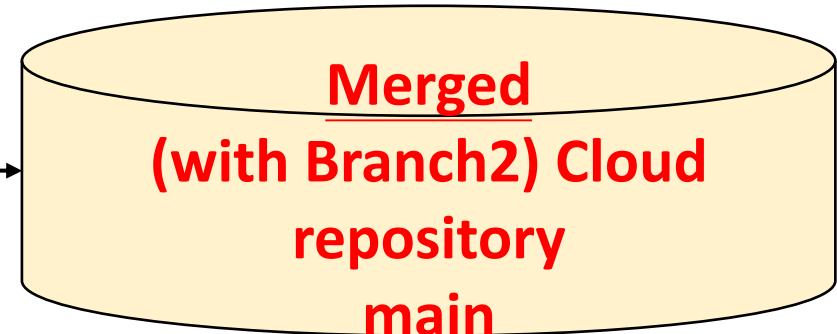
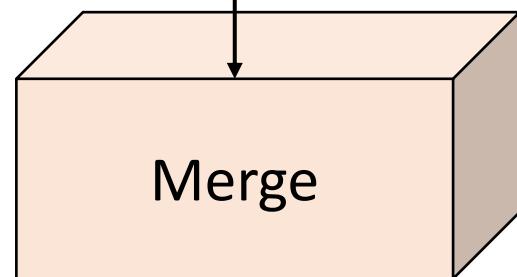
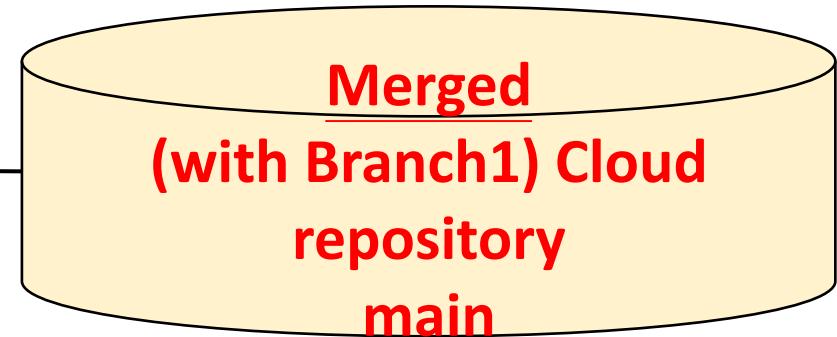
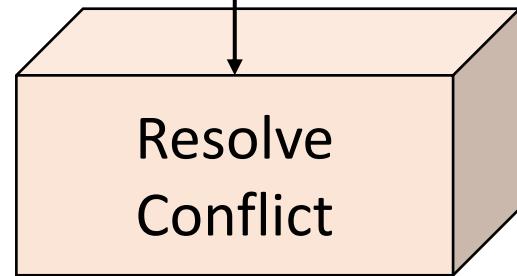


Group Leader can oversee the progress and control the master code!

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

[More conflict!](#)

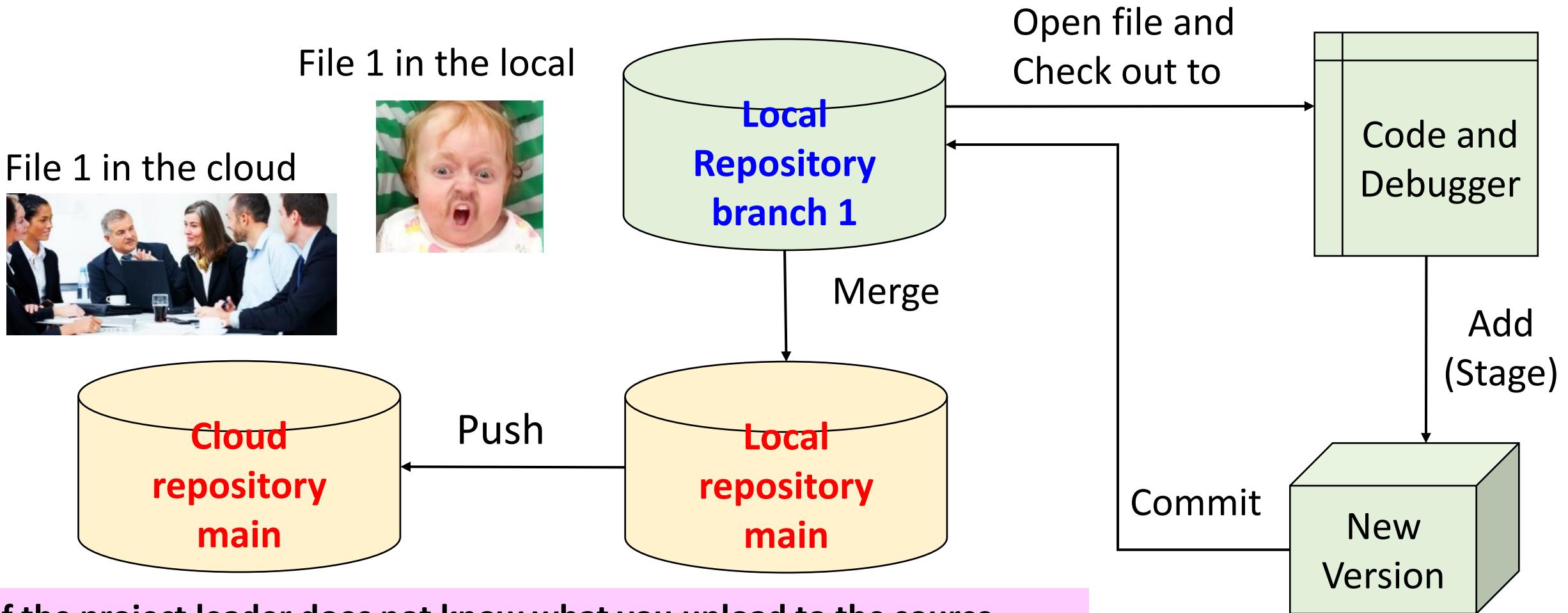
After reviewing, making decision to change or reject the pull request.



Concept of collaborative coding online

VS code based

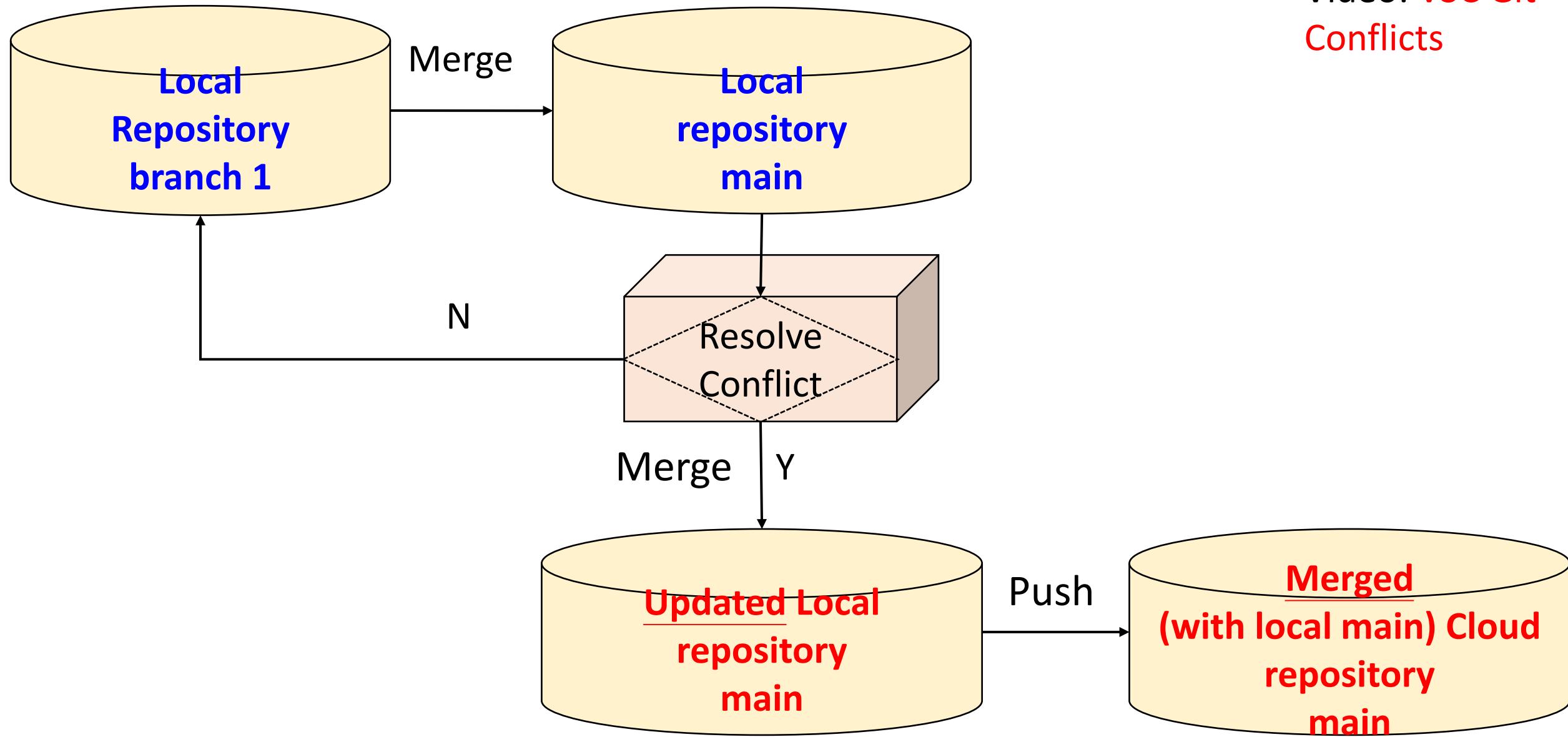
Video: [VSC Git Conflicts](#)



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](#)



Software Installation and setup Guide

Install Python in Windows 10

Step 1: Download Python 3.6.4

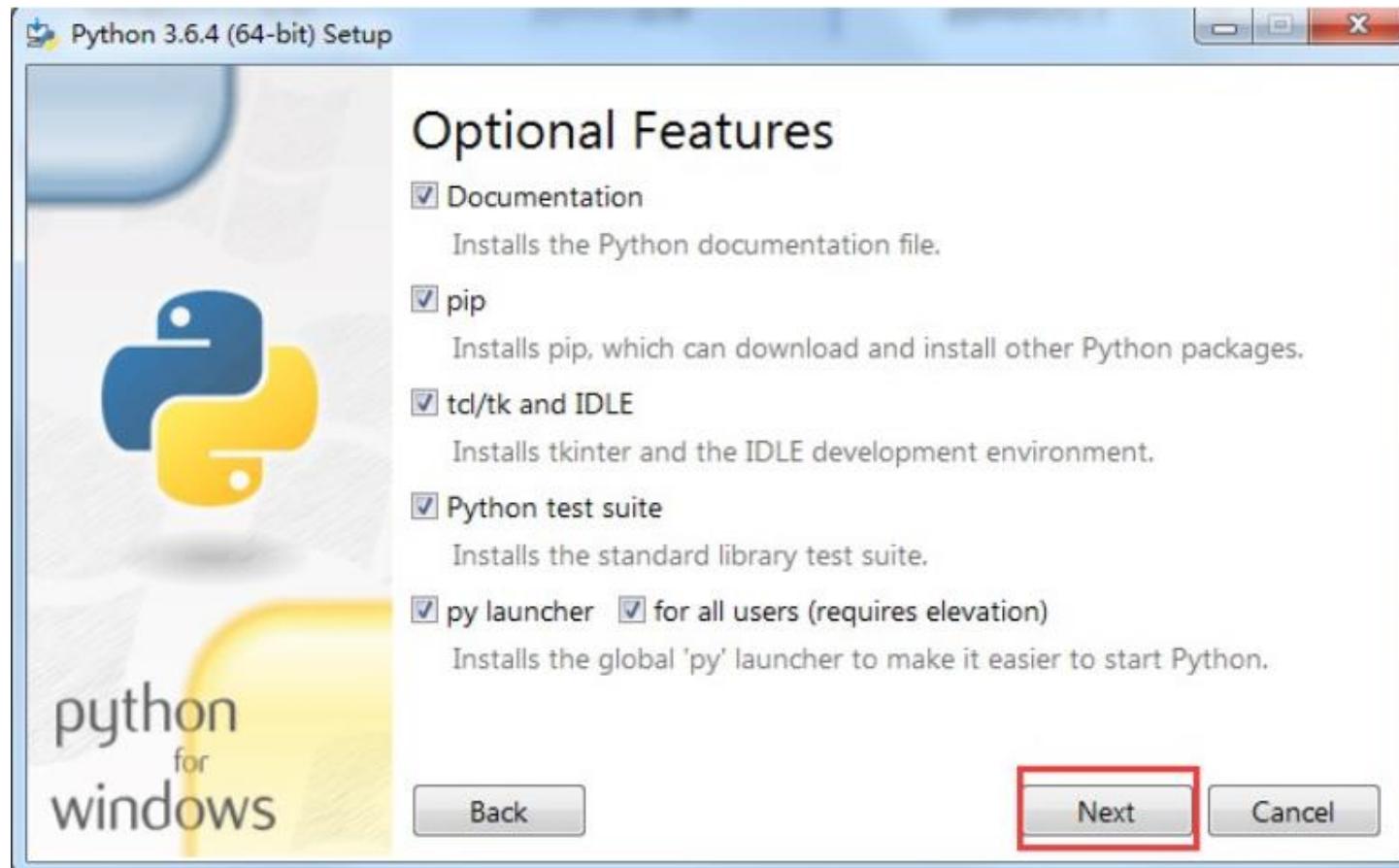
<https://www.python.org/ftp/python/3.6.4/python-3.6.4-amd64.exe>

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.

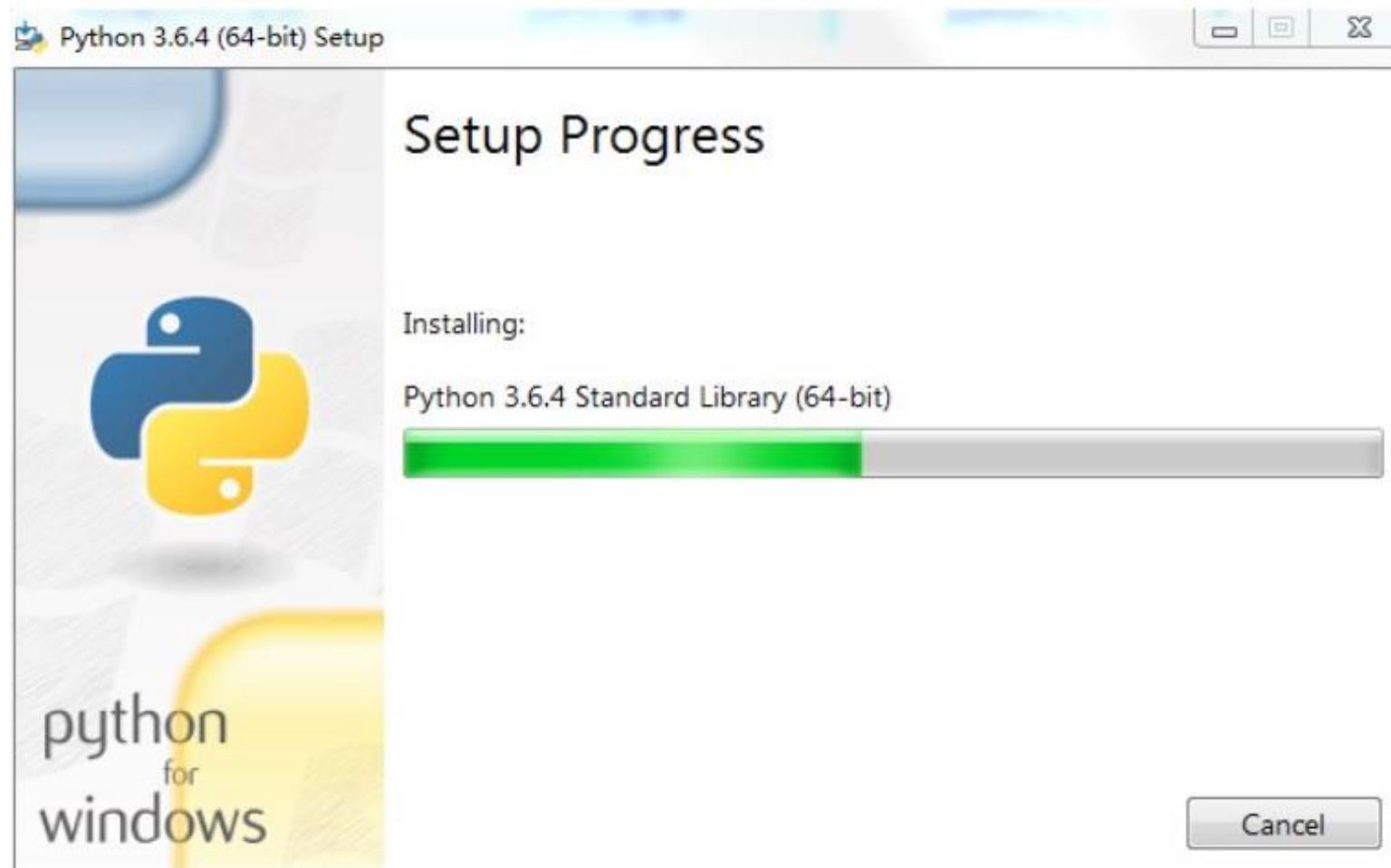
Install Python in Windows 10



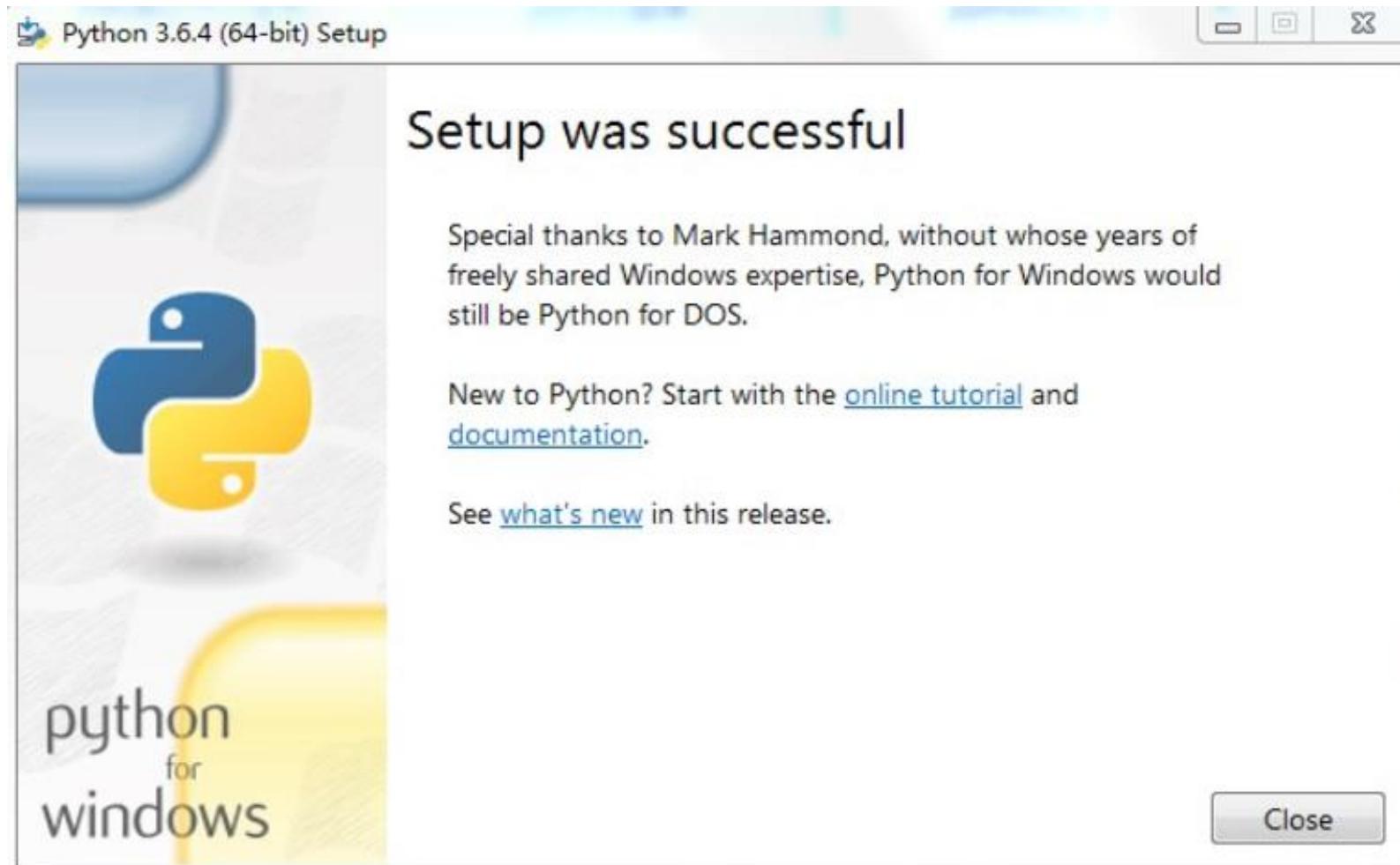
Install Python in Windows 10



Install Python in Windows 10



Install Python in Windows 10

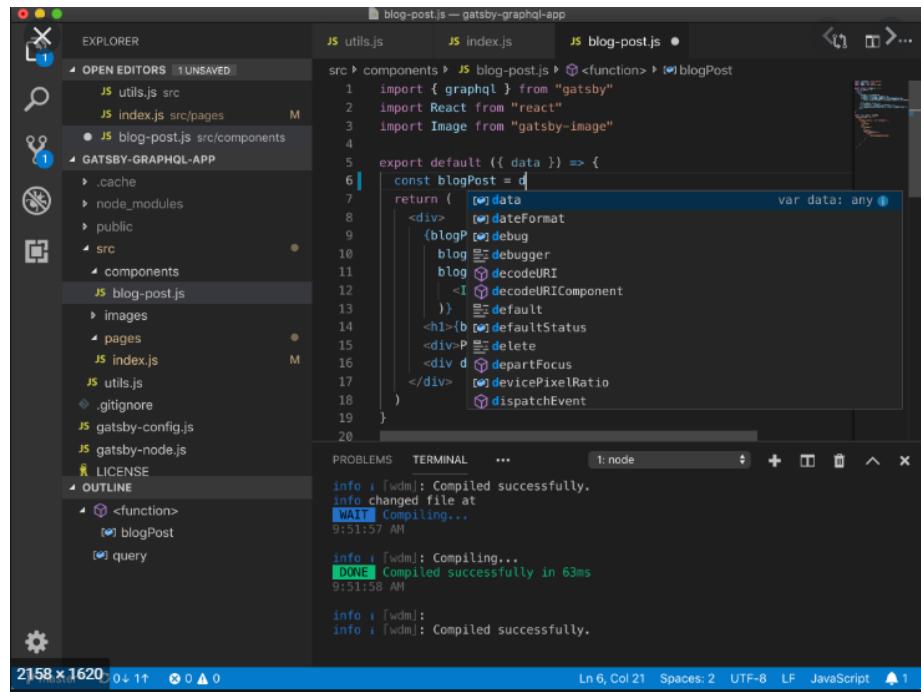


Install VS code in Windows 10

Step 1: Download the latest VS code

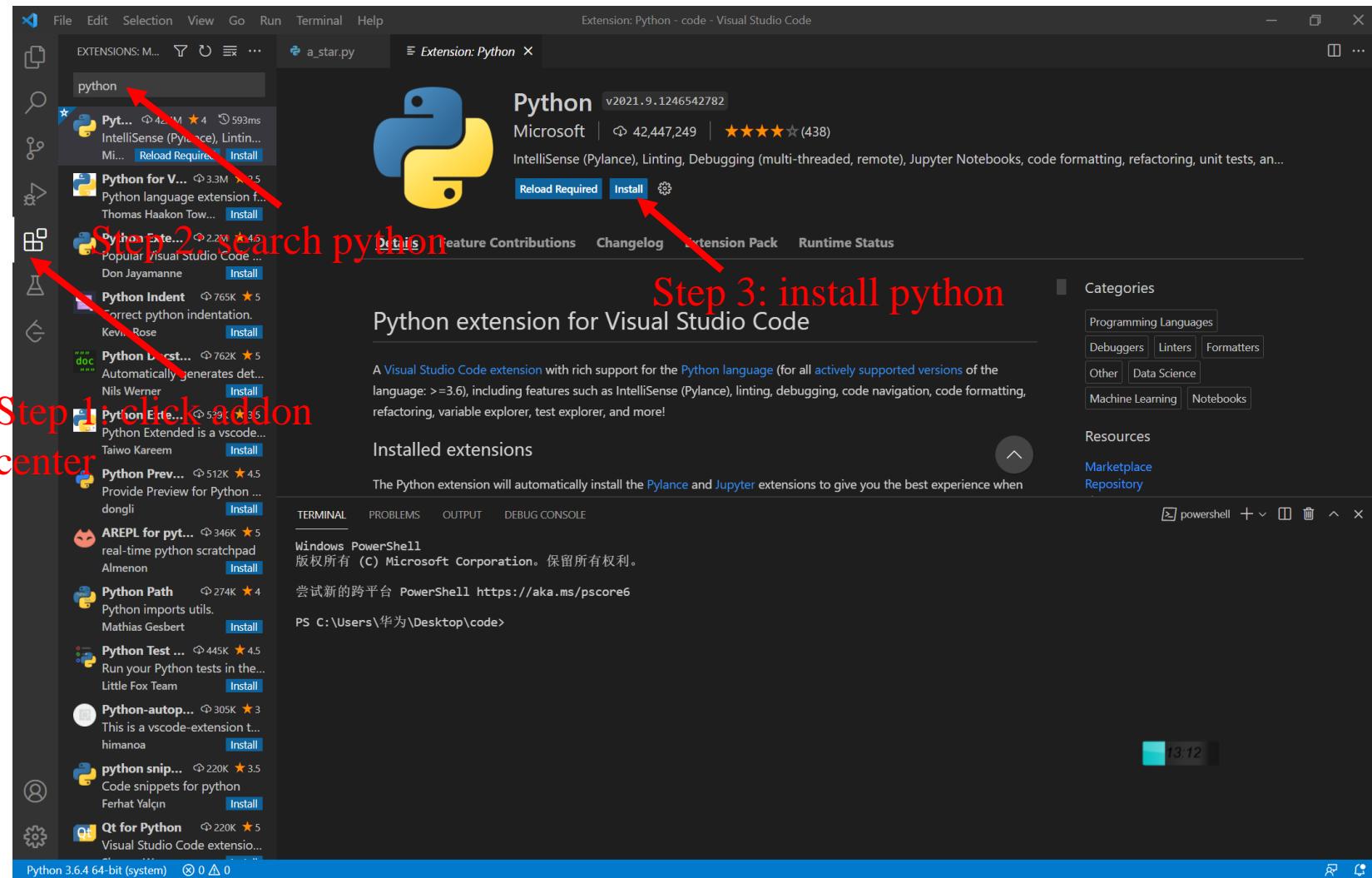
<https://code.visualstudio.com/download>

Step 2: Install latest VS code in Windows 10

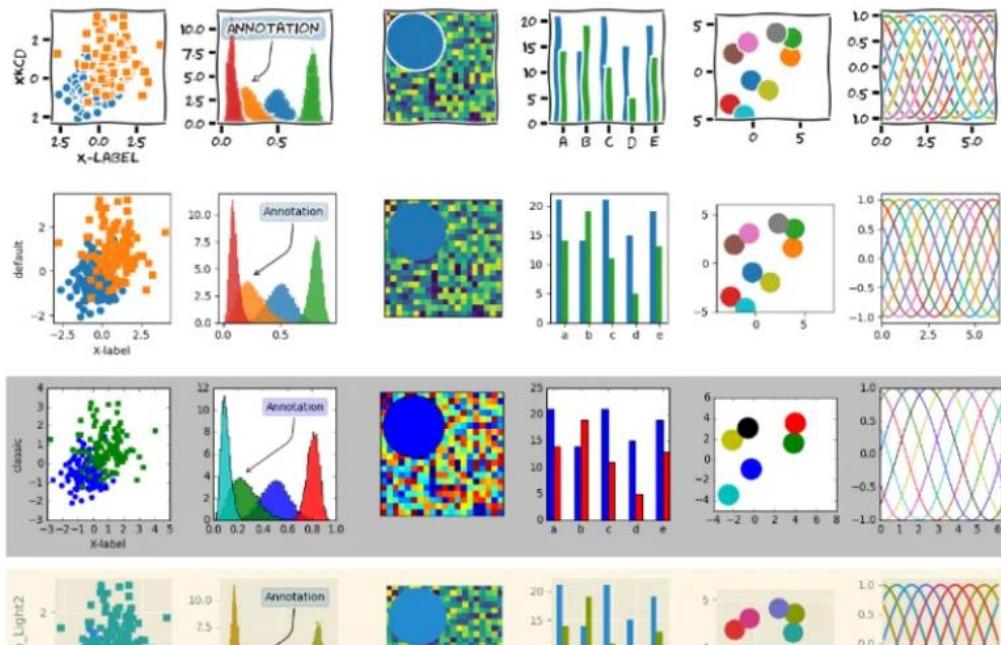


Visual Studio Code is a free source-code editor made by Microsoft for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git.

Install Python **addon** in VS code in Windows 10



Install matplotlib



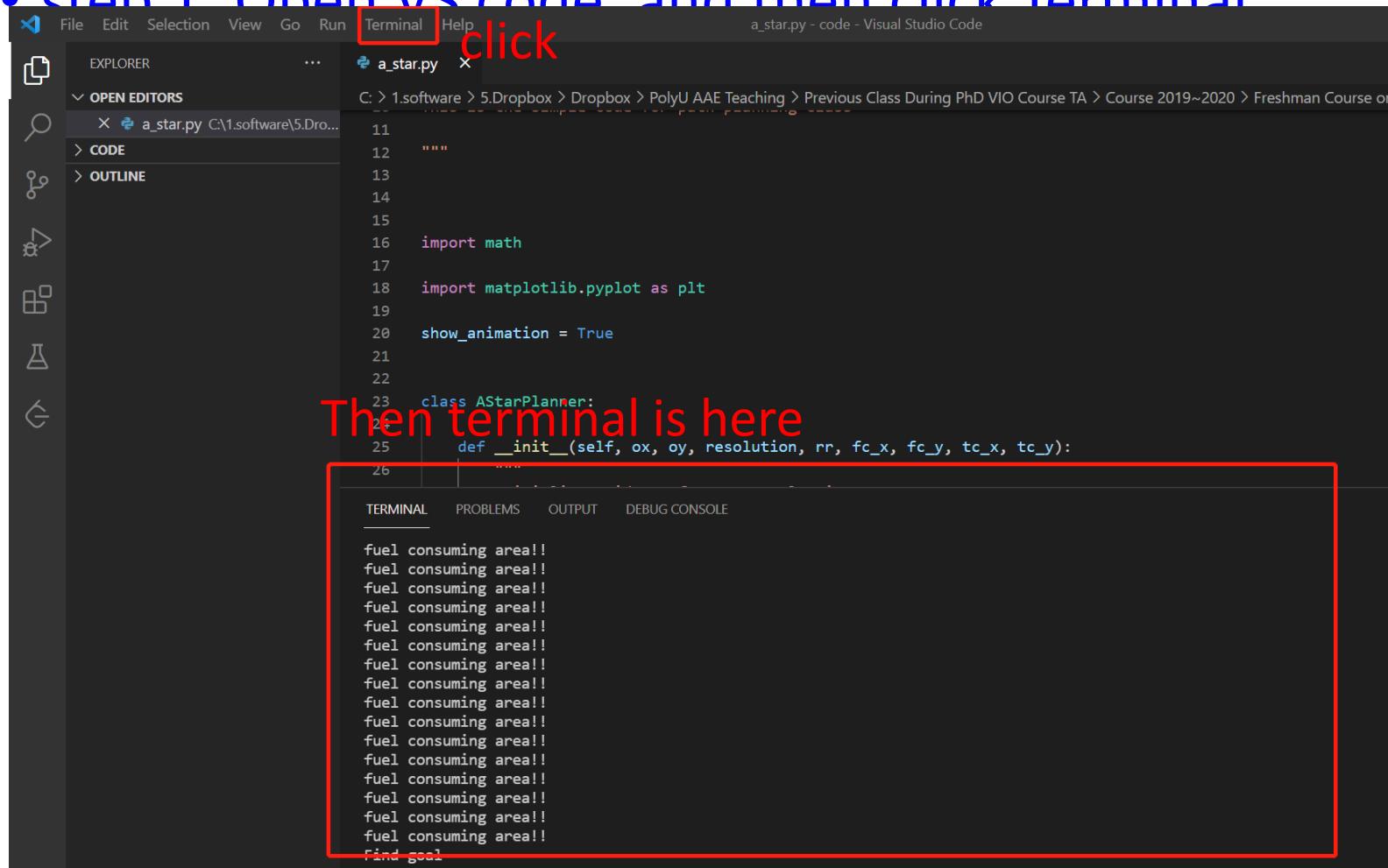
Source:

<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. On the left, the Explorer sidebar shows a file named 'a_star.py'. The code editor displays the following Python script:

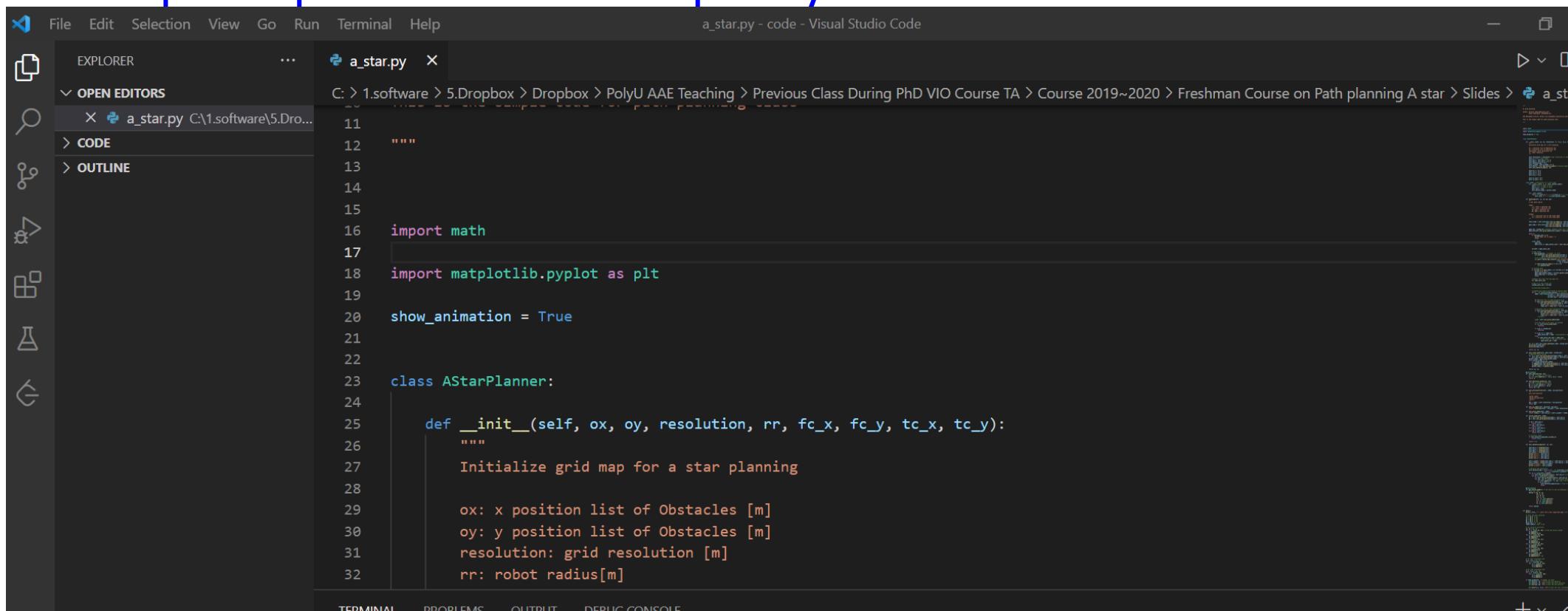
```
11
12 """
13
14
15
16 import math
17
18 import matplotlib.pyplot as plt
19
20 show_animation = True
21
22
23 class AStarPlanner:
24
25     def __init__(self, ox, oy, resolution, rr, fc_x, fc_y, tc_x, tc_y):
26         """
27             Initialize grid map for a star planning
28
29             ox: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

Below the code editor is a terminal window showing a Windows PowerShell prompt. The text "pip install matplotlib==3.0.3" is displayed in red at the bottom of the terminal window.

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

Test matplotlib

- step 3: Open the code sample by VS code



```
a_star.py - code - Visual Studio Code
File Edit Selection View Go Run Terminal Help
EXPLORER OPEN EDITORS CODE OUTLINE
C: > 1.software > 5.Dropbox > Dropbox > PolyU AAE Teaching > Previous Class During PhD VIO Course TA > Course 2019~2020 > Freshman Course on Path planning A star > Slides > a_star.py
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]
```

Test matplotlib

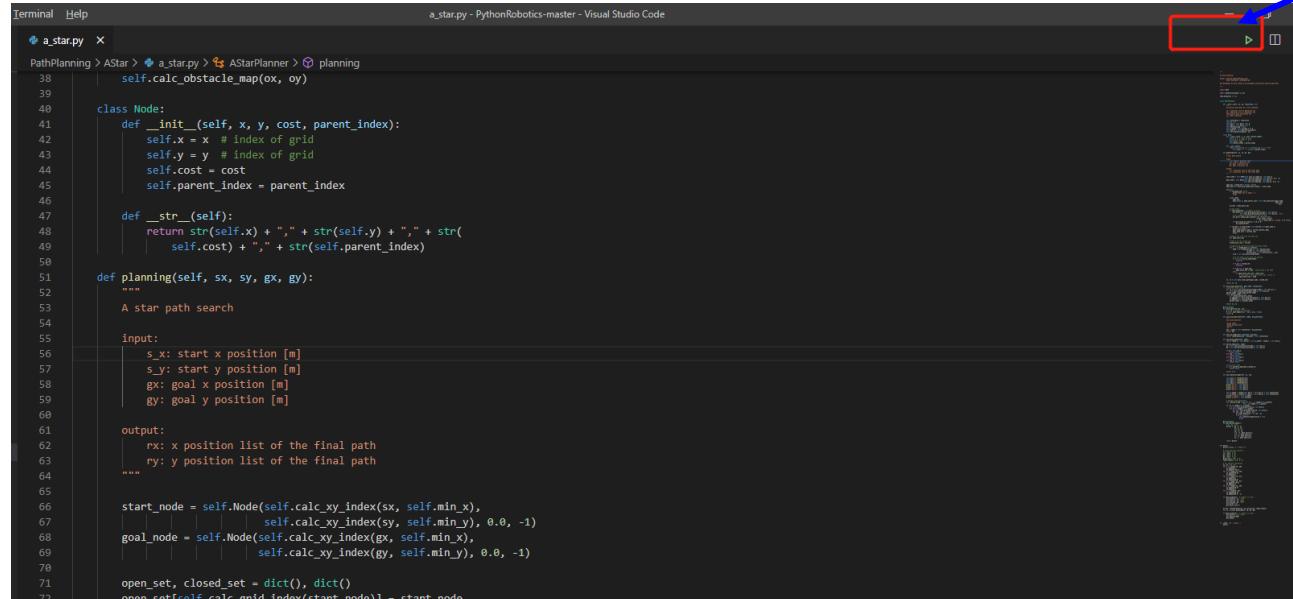
step 4: Run the demo

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

- File Bar:** File, Edit, Selection, View, Go, Run, Terminal, Help.
- Explorer:** Shows 'a_star.py' in the open editors list.
- Code Editor:** Displays the Python code for 'a_star.py'. The code imports math and matplotlib.pyplot, defines a class AStarPlanner, and includes a terminal output section.
- Terminal:** Shows repeated output 'fuel consuming area!!' followed by 'Find goal'.
- Figure View:** Titled 'Figure 1', it displays a 2D grid-based plot. The grid ranges from -10 to 60 on both axes. A red path is plotted, starting near (10, 10), moving right to (20, 20), then down to (40, 20), and finally right again to (50, 50). There are two obstacles: a red rectangle centered at (20, 20) and a yellow vertical rectangle centered at (35, 15). The background is light blue with a grid pattern.
- Output Panel:** Shows three entries: powershell, Python, and powershell.
- Bottom Status Bar:** Shows the time '05:48'.

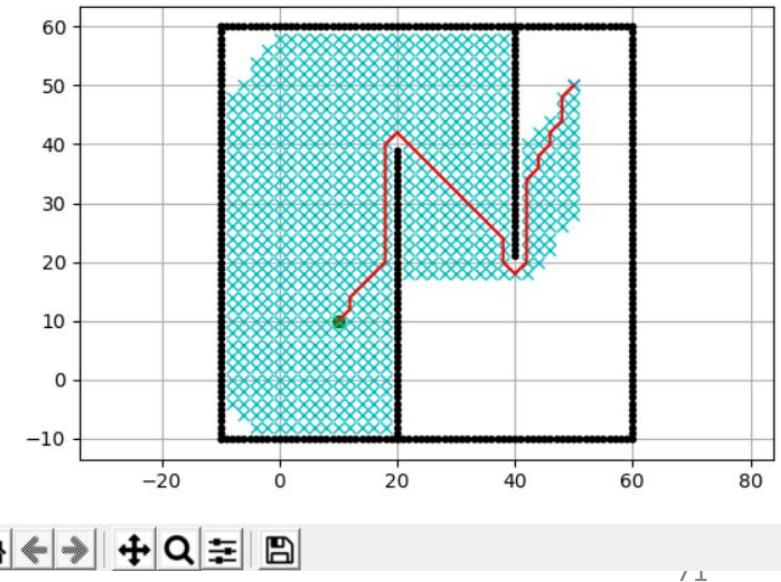
Run A Star in VS code

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 == None or j == None:
84                 continue
85
86             n = self.Node(self.calc_xy_index(i, self.min_x),
87                           self.calc_xy_index(j, self.min_y), cur_node.cost + self.sr,
88                           cur_node.index)
89
90             if i == gx and j == gy:
91                 print("A* found a path")
92                 rx, ry = self.reconstruct_path(n)
93                 break
94
95             if n not in closed_set:
96                 if (i, j) in closed_set:
97                     closed_set.pop((i, j))
98
99                 open_set[n.index] = n
100
101             else:
102                 if closed_set[(i, j)].f > n.f:
103                     closed_set.pop((i, j))
104
105                     open_set[n.index] = n
106
107             if n not in open_set:
108                 open_set[n.index] = n
109
110         closed_set[(cur_node.x, cur_node.y)] = cur_node
111
112         self.show_grid(ox, oy, cur_node)
113
114     return rx, ry
115
116
117 def reconstruct_path(self, cur_node):
118     rx, ry = [], []
119
120     while cur_node.parent_index != -1:
121         rx.append(cur_node.x)
122         ry.append(cur_node.y)
123
124         cur_node = self.nodes[cur_node.parent_index]
125
126     rx.append(self.start_x)
127     ry.append(self.start_y)
128
129     return rx, ry
130
131
132 def show_grid(self, ox, oy, cur_node):
133     if len(ox) == 0 and len(oy) == 0:
134         return
135
136     min_x, min_y, max_x, max_y = self.get_min_max(ox, oy)
137
138     dx, dy = self.calc_xy_distanse(self.start_x, self.start_y, cur_node.x, cur_node.y)
139
140     if cur_node.parent_index == -1:
141         color = "red"
142     else:
143         color = "green"
144
145     plt.plot([self.start_x, cur_node.x], [self.start_y, cur_node.y], color)
146
147     for i in range(min_x, max_x+1):
148         for j in range(min_y, max_y+1):
149             if (i, j) in ox and (i, j) in oy:
150                 plt.plot([i], [j], "black", "x")
151             else:
152                 plt.plot([i], [j], "cyan", ".")
```

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*

