

# Welcome to COGS 18:

# Introduction to Python

COGS 18

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## TAs

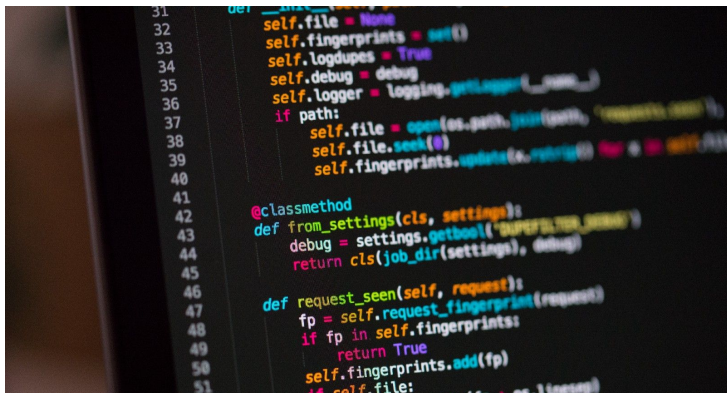
Annie  
Ashlesha  
Mudit  
Paul

## IAs

AP  
Geoff  
Griffin  
Fidella  
Jitarth  
Melody

Let's chat: Teaching &  
Learning Programming

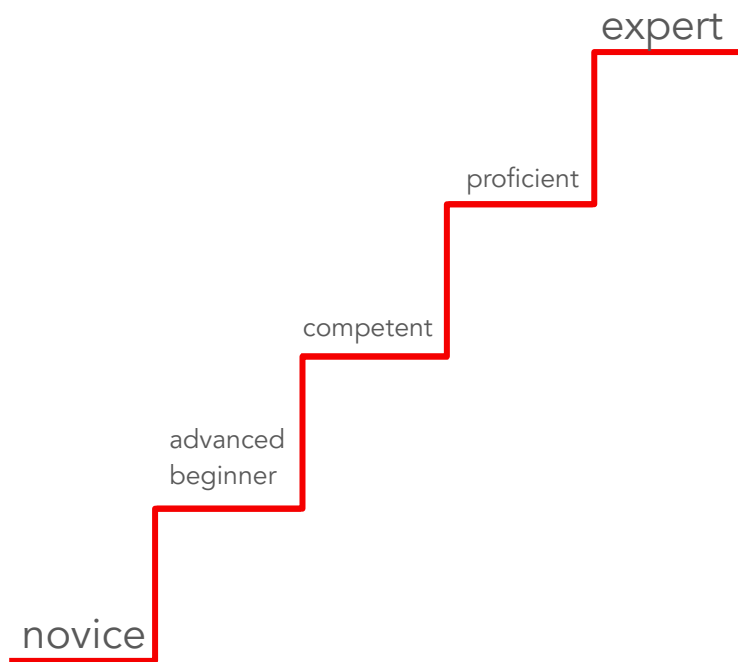
Intro Programming courses  
are often **thought of as**  
**difficult** and are courses with  
the **highest dropout rates**



....yet, the only thing that is slightly  
predictive of success in an intro  
programming course is...*how successful*  
*the student thinks they will be*

Things that do NOT predict success:

- gender
- age
- personality
- math ability



My goal is to have you all be able to **program at an introductory level**

It's generally accepted that it takes people **10 years to move from novice to expert programmer**. But, there are lots of steps in between! We're working to move you further away from novice (& in the direction of expert) than you are right now.

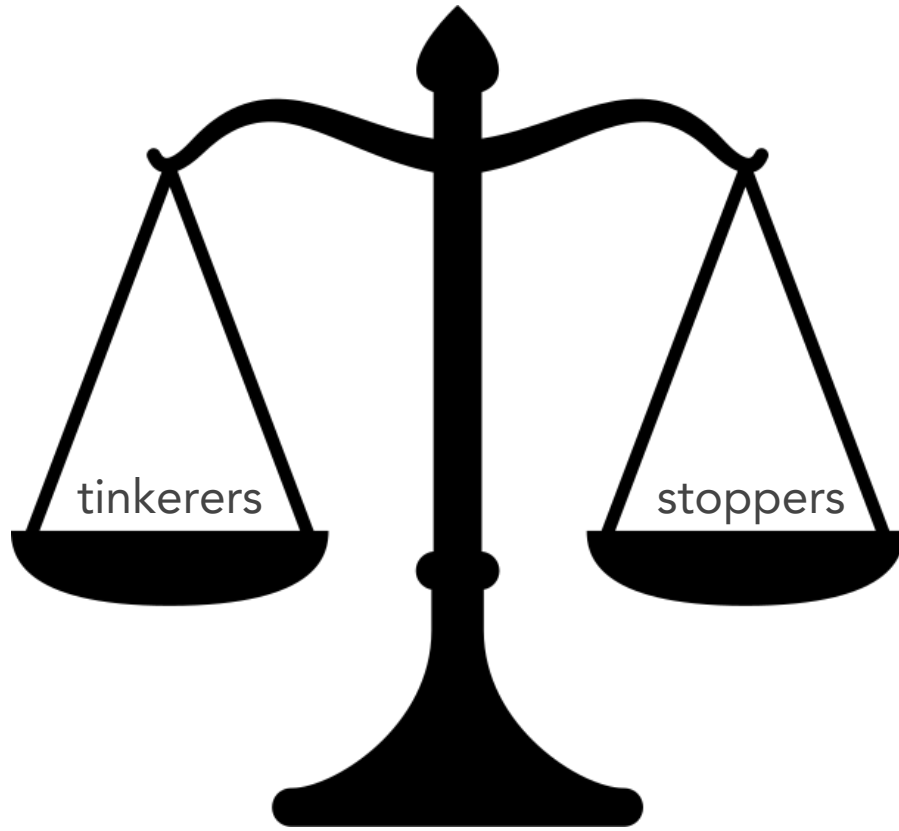


Mixed Messages: We tell people learning to program will be tough and frustrating but that if you're not having fun, you're doing it wrong.



Building Blocks: Too often, we also tell people to “just try things out” without explaining basic concepts. Other courses aren’t taught this way...





**Be a mover:** Make forward progress. Strike a balance between just stopping and tinkering forever.

If you're not moving forward, consider the **2-hour rule**.

If you're trying to figure something out and struggling to move forward at all, consider the 2-hour rule. If you're stuck, **work on the problem for an hour**. If you're still stuck, walk away & **take a 30 min break**. Then, **try again for another 30 minutes** or so. If you're **still completely stuck, stop and contact us** (come to office hours, post on Piazza). If you're not even sure what your question is, include what information that you do have - what you're stuck on, what you've tried, error messages you've received, etc.

# Why Python?

simple(r) syntax


widely-used

Jupyter Notebooks

*"It's not the best language for anything, but  
it's the second best for everything"*

-Brad Voytek





# COGS 18: How this course is going to work

To avoid the common pitfalls of intro programming courses, we're going to take the following approach:

1. First half of course: basic concepts
2. In-class practice
  - a. Zoom polls for comprehension
  - b. time to apply what was just explained
3. Coding Labs
  - a. Notebooks provided
  - b. TAs/IAs/classmates there to help
  - c. Checked for completion, not correctness
4. Assignments
  - a. Completed individually
  - b. Programmatically graded

## COGS 18: How You'll Be Evaluated

	% of Grade	Requirement
Coding Labs	10%	Participate In 5 Code Labs
Assignments	35%	Complete 5 assignments
Exams	40%	2 written take-home exams
Final Project	15%	Submit final project

CodingLabs:  
apply concepts  
discussed in  
lecture using  
coding labs  
(10%). Practice  
makes perfect.

Week 1-7: must attempt 5 for full credit

- Have to make a concerted effort to complete labs
- Coding Labs will be submitted on datahub
- Answers will be sent out the following week
- Can work with others

Weeks 8-10: get help & code review projects

You should attend the section to which you're assigned. You can attend a different section. However, if one section becomes too crowded each week, we'll revisit this policy.

(5) Assignments  
(35%) : Jupyter  
notebooks that are  
completed  
individually &  
graded  
programmatically.

Assignments will always be due on Monday by 11:59 PM.

Assignment	Due Date (11:59 PM)	Week
A1	4/13	Week 3
A2	4/20	Week 4
A3	5/4	Week 6
A4	5/18	Week 8
A5	6/1	Week 10



Assignment Submission @ Datahub: <https://datahub.ucsd.edu>

DATA SCIENCE / MACHINE LEARNING PLATFORM

UC San Diego

Information Technology Services - Educational Technology Services

Help Options ▾



Log In

*Registered Users*  
*"username@ucsd.edu"*

UC San Diego Jupyterhub (Data Science) Platform

In technical  
classes, **Piazza** is  
a particularly  
helpful resource

There are **rules**:

1. No duplicates.
2. Include Assignment & Question in Summary line.
3. Public posts are best.
4. Helping one another is encouraged.
5. No assignment code in public posts.
6. We're not robots.

# University of California, San Diego

[\(change school\)](#)

## Welcome to Piazza!

**Piazza is a free platform** for instructors to efficiently manage class Q&A. Students can post questions and collaborate to edit responses to these questions. Instructors can also answer questions, endorse student answers, and edit or delete any posted content.

Piazza is designed to simulate real class discussion. It aims to get high quality answers to difficult questions, fast!

**The name Piazza** comes from the Italian word for plaza--a common city square where people can come together to share knowledge and ideas. We strive to recreate that communal atmosphere among students and instructors.

**Are you a professor?**[Click here to create & join classes](#)Selected Term: 

Fall 2019

**Class 1:** COGS 18: COGS 18: Introduction to Python [\(edit\)](#)

Instructors: Shannon Ellis · 7 Enrolled

→ **Join as:** ☒ Student *Instructor self-enrollment has been disabled for this class.***Class 2:**  ×**Class 3:**  ×**Class 4:**  ×**Class 5:**  ×[Add Another Class](#)[Join Classes](#)

(2) Exams (40%): Exams are open-book and taken on paper. Each will include a combination of types of questions (multiple choice, fill in the blank, short answer, matching, etc.). There will be a flexible time window when these exams can be taken/submitted.

will be open-book  
and completed  
in-class on 4/24  
and 5/15.

(1) Final Project (15%):  
will be completed  
individually &  
submitted  
electronically on the  
day of the final (6/12)  
by 11:59 PM.

Your final project can build on an assignment from the course to provide it with additional functionality or it can be on a completely new topic of your choosing. However, it **must include original code that you've written** for this project. You do not have to show up anywhere on the day of the actual final.



Your point of contact for COGS 18  
will be the course website:

<https://cogs18.github.io>

Any questions about  
course logistics?

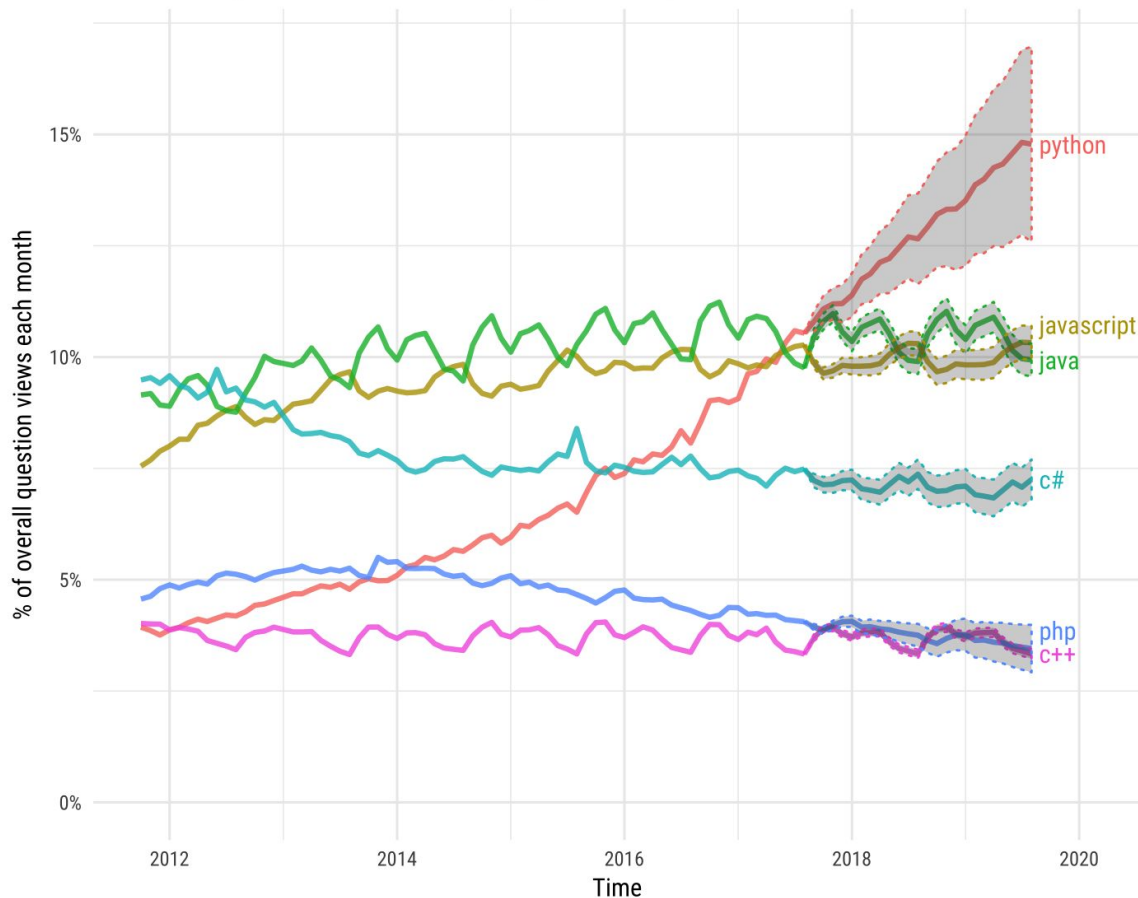
Why even learn to  
program in Python?



Python is only  
gaining in  
popularity as a  
programming  
language

## Projections of future traffic for major programming languages

Future traffic is predicted with an STL model, along with an 80% prediction interval.





The University of St Andrews, founded in 1411, is Scotland's oldest university ([Source](#))



# Introduction

The IT Services department at the University of St Andrews, Scotland, develops and maintains software systems used in a variety of capacities throughout the university.

I had several years of experience working with Perl when I took my first serious look at Python back in 1999. Our team's projects were becoming bigger and more complex, and it was obvious that we needed to bring to them more structure and clarity. I had been looking at Java for some time, but its potential benefits seemed to come at the cost of a steep learning curve, and an overall increase in development time. In contrast, Python appeared to offer the prospect of having both clarity *and* productivity at the same time. And if we ever needed to make use of Java's class libraries there was always Jython, an implementation of Python for the JVM. The increasing number of Python books being published testified to the language's growing popularity, and the number of available libraries was beginning to rival Perl's. This convinced me to give Python a try.

<https://www.python.org/about/success/st-andrews/>





# In 1999, Python becomes mainstay of IT systems

Use Case: Matching students with a class

- Select preferences each semester
- Validate who is in which course
- Handles concurrent users well

Why Python:

- Reduced amount of programming needed
- Quickly learned by staff





INDUSTRIAL  
LIGHT & MAGIC

VISUAL EFFECTS

ART DEPARTMENT

SERVICES

ILMxLAB

COMPANY

BLOG

## Background

Industrial Light & Magic (ILM) was started in 1975 by filmmaker George Lucas, in order to create the special effects for the original Star Wars film. Since then, ILM has grown into a visual effects powerhouse that has contributed not just to the entire Star Wars series, but also to films as diverse as Forrest Gump, Jurassic Park, Who Framed Roger Rabbit, Raiders of the Lost Ark, and Terminator 2. ILM has won numerous Academy Awards for Best Visual Effects, not to mention a string of Clio awards for its work on television advertisements.


# In 1996, Python unifies ILM

- Used Python to code (and re-code) the programs that controlled the production pipeline
  - Ease-of use
  - Quickly learnable
  - Replace Unix shell scripting
- What Python accomplished
  - Streamlined production
  - Provided the needed flexibility
  - Reduced hardware costs
  - Stay on top of the competition
- Since 1996, no better system found





*Entering a new era in  
vascular and cardiac  
regeneration research*

Read more 



Annual Report 2018

What science can do



Sustainability Report 2018

Leading with health

*We believe in what science can do*



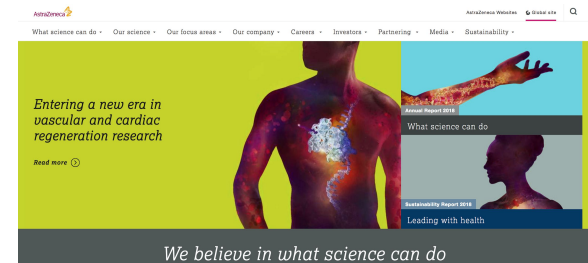
# Introduction

AstraZeneca is one of the world's leading pharmaceutical companies. With over 54,000 employees worldwide, it provides innovative, effective medicines designed to fight cancer, provide pain control, heal infection, and fight diseases of the cardiovascular, central nervous, gastrointestinal, and respiratory systems.

To save time and money on laboratory work, experimental chemists use computational models to narrow the field of good drug candidates, while also verifying that the candidates to be tested are not simple variations of each other's basic chemical structure.

# At AstraZeneca, Python enabled collaboration

- Drug Discovery is key
- Computational chemists weren't the only ones who could do analysis
  - web-based interface called H2X, initially written in Perl
    - Experimentalists could make predictions on their own
  - In 2001, further developed in Python: PyDrone
    - 3 months of development time + 3 months of QA + 3 weeks of documentation time to produce about 5,600 lines of finished Python code.
    - Chosen for its ease-of-use & interpretability
    - Can solve real-world problems
    - Error handling made product more robust



# AIR TRAFFIC MANAGEMENT

Keeping 3 billion passengers safe each year

VOICE COMMUNICATIONS

NETWORKS

REMOTE VIRTUAL TOWER

ATC TOWER

SURVEILLANCE

AIM

AMHS

ATM/UTM INTEGRATION

Keeping 3 billion passengers safe each year

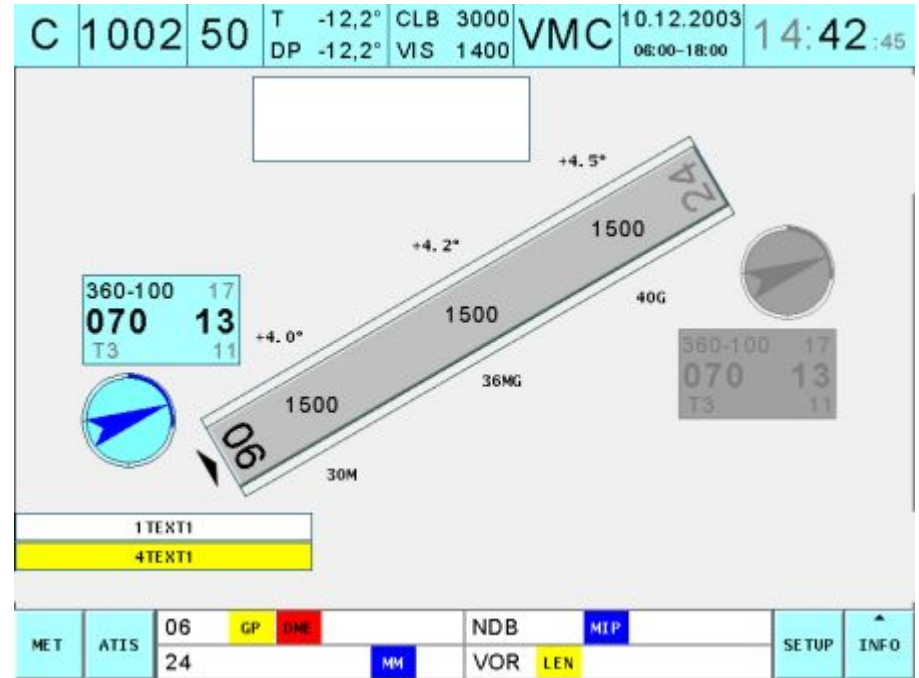
Air Traffic Management (ATM) solutions leverage more than seventy years of ATC experience showcasing true leadership in this market, with deep cross-industry experience to provide functionality in support of the needs of today's Air Navigation Service Providers (ANSP). Embracing digitalisation, virtualisation and innovation, these solutions are an essential enabler to lead today's Air Navigation Service Providers through future evolutions of their infrastructure.

Frequentis is one of the world's leading providers for safety-critical solutions in the field of Air Traffic Management and Public Safety & Transport. With over 500 employees world-wide, it provides innovative, user-centered solutions to its customers.

Frequentis has been using Python in its TAPtools<sup>®</sup> product family, which focuses on the *Tower and Airport Tools* segment of Air Traffic Control. These tools are used by air traffic controllers to track weather conditions, control runway lighting, and to monitor and control navigational aid instruments.

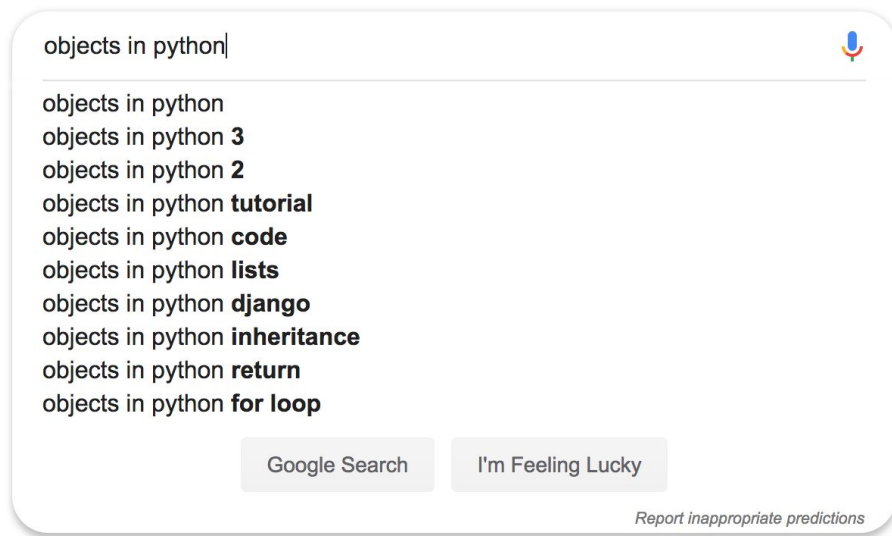
# Python enables tool to work in front of the customer

- Each airport is unique
- TAPtools enables interface unique to airport to be built
  - Rapidly developed in front of the user
    - Minimizes back and forth
- Python advantages
  - Easy to read and maintain
  - Flexible
  - Faster to write (3X faster)



Where to turn for **help**  
**and practice** when  
learning to program?

Including “in python” in your  
Google search can be magic

A mockup of a Google search interface. At the top, a search bar contains the text "objects in python|". To the right of the search bar is a microphone icon. Below the search bar, a list of search suggestions is displayed: "objects in python", "objects in python 3", "objects in python 2", "objects in python **tutorial**", "objects in python **code**", "objects in python **lists**", "objects in python **django**", "objects in python **inheritance**", "objects in python **return**", and "objects in python **for loop**". At the bottom of the suggestions list are two buttons: "Google Search" and "I'm Feeling Lucky". Below these buttons is a link that says "Report inappropriate predictions".

objects in python|

objects in python  
objects in python 3  
objects in python 2  
objects in python **tutorial**  
objects in python **code**  
objects in python **lists**  
objects in python **django**  
objects in python **inheritance**  
objects in python **return**  
objects in python **for loop**

Google Search I'm Feeling Lucky

[Report inappropriate predictions](#)

# StackOverflow probably has the answer to your question



21 ● 3



+20



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Teams  
Q&A for work



Learn More

## Tags

A tag is a keyword or label that categorizes your question with other, similar questions. Using the right tags makes it easier for others to find and answer your question.

Popular

Name

New

**python** × 1137913

a multi-paradigm, dynamically typed, multipurpose programming language, designed to be quick (to learn, to use, and to

1085 asked today, 6241 this week

**python-3.x** × 151128

For questions about Python programming that are specific to version 3+ of the language. Use the more generic [python] tag

273 asked today, 1641 this week

**python-2.7** × 89413

the last major version in the 2.x series. Do not use this tag simply to convey the version of Python you're using, unless the question

40 asked today, 219 this week

**python-requests** × 9229

a full-featured Python HTTP library with an easy-to-use, logical API.

8 asked today, 81 this week

**wxpython** × 6191

a Python wrapper for the cross-platform C++ GUI API wxWidgets.

20 asked this week, 52 this month

**ipython** × 6036

a feature-rich interactive shell for Python, and provides a kernel for frontends such as IPython Notebook and Jupyter Notebook.

15 asked this week, 65 this month

**python-imaging-library** × 4495

The Python Imaging Library (PIL) provides the Python language with a de-facto standard foundation for image work. PIL's

23 asked this week, 113 this month

**python-3.6** × 3882

Version of the Python programming language released in December 2016. For issues specific to Python 3.6. Use more

10 asked today, 43 this week

**python-3.5** × 3260

The version of the Python programming language released on September 13, 2015. For issues that are specific to Python 3.5.

9 asked this week, 34 this month

**python-import** × 3150

For questions about importing modules in Python

18 asked this week, 58 this month

**python-3.4** × 2594

The version of the Python programming language released on March 16, 2014. For issues that are specific to Python 3.4. Use

6 asked this month, 126 this year

**python-sphinx** × 2365

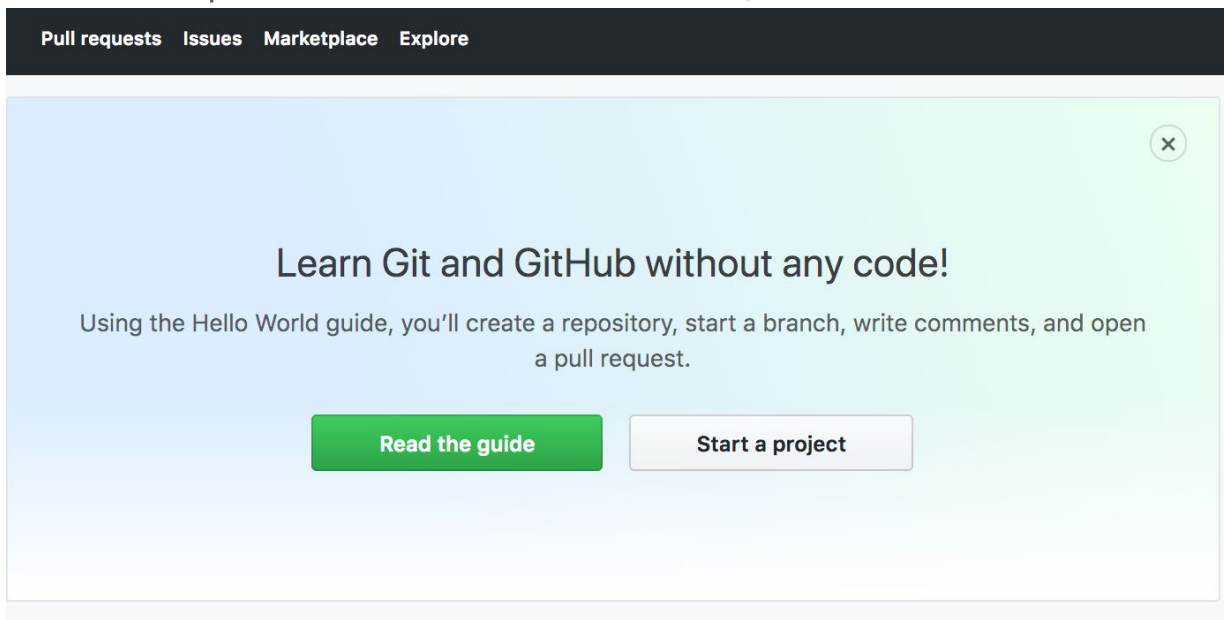
a tool that makes it easy to create intelligent and beautiful documentation. Sphinx is especially suitable for Python

9 asked this week, 34 this month



# GitHub: programmers' social media platform

Code is shared on GitHub. In the beginning, it may be intimidating, but I encourage you to familiarize yourself with the platform and share code you write on GitHub.



There are also  
**COGS18-specific  
avenues** when  
looking for help

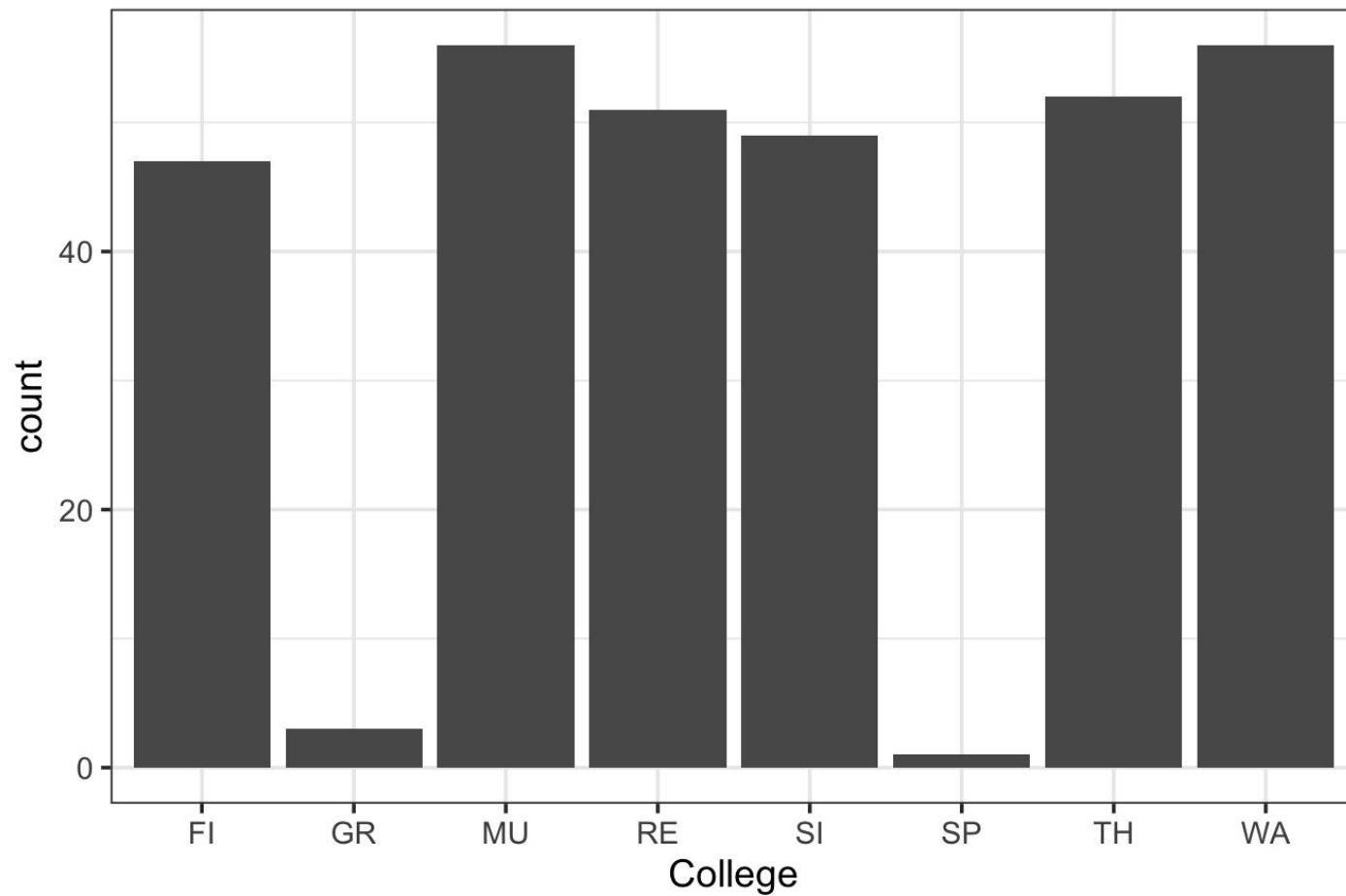
Questions in **CodingLabs**, coming to  
**office hours**, talking to your **classmates**,  
or reaching out for help on **Piazza** are  
all options for you. You're encouraged  
to help one another on Piazza!



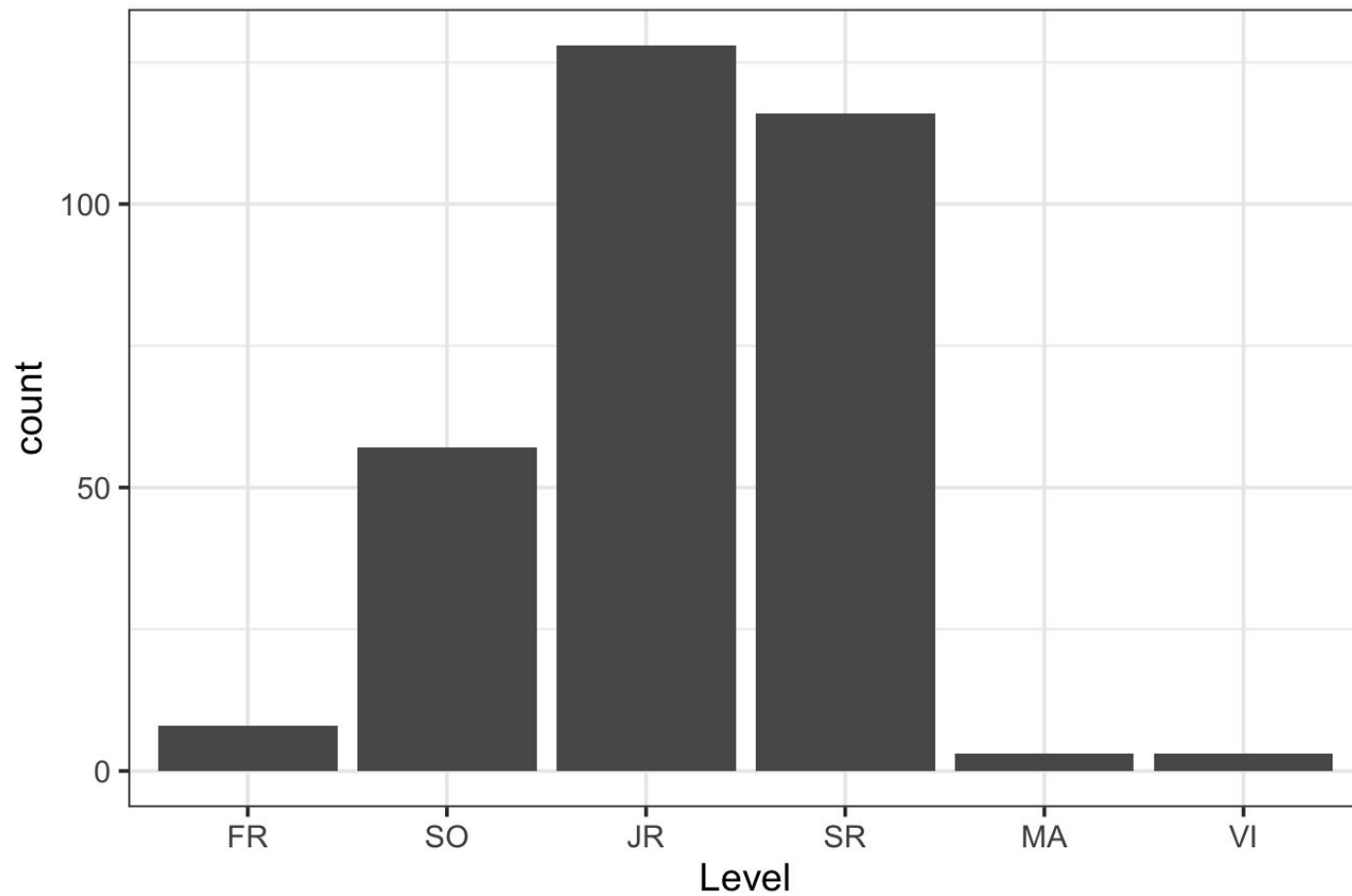
Today I used a PDF slideshow,  
but every other day of class,  
**lecture notes** will be presented  
in a **Jupyter notebook**



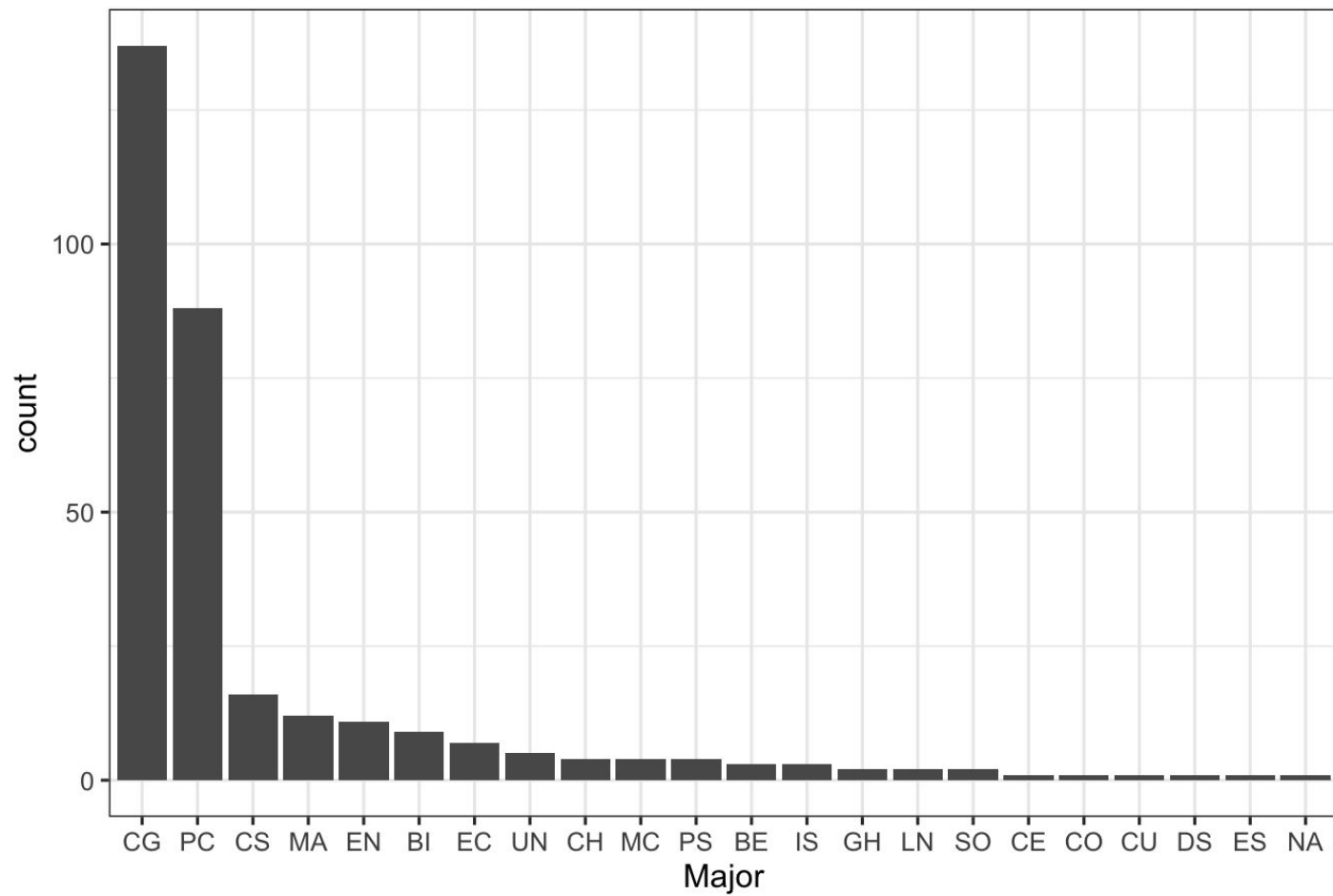
## COGS 18



## COGS 18



## COGS 18





I'm excited to have you all in  
COGS 18 this quarter & I'd love  
to learn more about you:

[http://bit.ly/cogs18\\_survey\\_sp20](http://bit.ly/cogs18_survey_sp20)