

Principles of Computer Science II

Algorithms for Bioinformatics

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Lecture 2



Development Tools

Programming Tool

A programming tool or software development tool is a computer program that software developers use to create, debug, maintain, or otherwise support other programs and applications.

- ▶ Source Code Editor
- ▶ Debugger or Profiler
- ▶ Bug Tracking System
- ▶ Documentation Generators
- ▶ Revision Control
- ▶ Performance Analysis
- ▶ Collaborative Programming
- ▶ Cloud-based IDEs



Integrated Development Environment (IDE)

A programming tool or software development tool is a computer program that software developers use to create, debug, maintain, or otherwise support other programs and applications. The IDE is meant to make programming a more productive process.

- ▶ Organize project files
- ▶ Searching
- ▶ Source Code Editor
- ▶ Debugger
- ▶ Tasks & Annotations related to code
- ▶ Documentation Generators
- ▶ Revision Control
- ▶ Code Analysis



Jupyter Notebook



- ▶ Interactively developing and presenting data science projects.
- ▶ A single document integrates: code and its output, visualizations, narrative text, mathematical equations, and other rich media.



Installation & Execution

Installation:

- ▶ For Windows - make sure you first install Anaconda, then use `pip`.
- ▶ For Mac / Linux use directly `pip`:

```
pip3 install jupyter
```

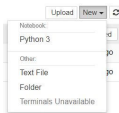
Execution:

- ▶ For Windows - via Anaconda.
- ▶ For Mac / Linux from the command line:

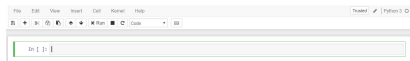
```
jupyter notebook
```

- ▶ The jupyter interface is available at <http://localhost:8888/tree>

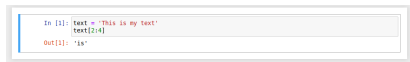
jupyter



The Notebook Interface



- ▶ A Cell can be either **Code** or **Markdown**
- ▶ Use the **Run** button or CTRL+ENTER to execute the Code or present the Markdown.



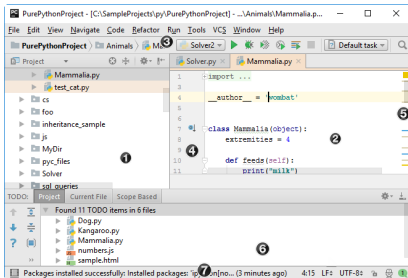
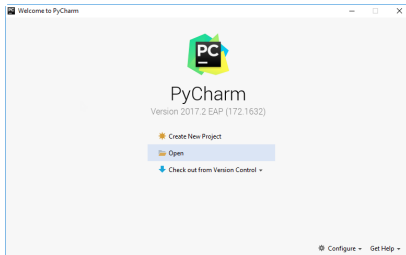
- ▶ Check out that `In []:` has changed to `In [1]:`
- ▶ When python is processing the code we get `In [*]:`

Navigating the Notebook with the Keyboard

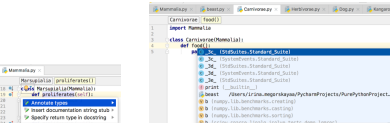
- ▶ There is always a Cell **Active**.
- ▶ You can **Stop Editing** by using the **ESC** key.
- ▶ You can **Start Editing** by using the **ENTER** key.
- ▶ When **NOT** in Editing mode:
 - ▶ We can go up/down the cells using the **Up** and **Down** keys.
 - ▶ To change the Cell type to Markdown use the **M** key.
 - ▶ To change the Cell type to Code use the **Y** key.
 - ▶ To insert a new Cell above the current Cell use the **A** key.
 - ▶ To insert a new Cell below the current Cell use the **B** key.
 - ▶ To delete a Cell use the **D** key **twice**.
 - ▶ To UNDO a delete command use the **Z** key.

pyCharm: Python IDE for Professional Developers

- ▶ Keyboard-centric approach
- ▶ Smart assistance
- ▶ Code quality tools
- ▶ Cross technology development
- ▶ Navigation and Refactoring
- ▶ Database support
- ▶ Scientific tools



Code with smart assistance



- ▶ Intention Action – indicated with a bulb **ALT+Enter**
 - ▶ Suggestions based on the action that you do that intend to save time.
 - ▶ Remark that the code needs to be correct for this feature to work.
- ▶ Code completion
 - ▶ Auto-complete function/variable names.

Live Templates

```
Mammalia.py x
Mammalia
1 import Carnivorae
2 import Herbivorae
3
4 class Mammalia(object):
5     extremities = 4
6
7
8
9
10
11
12
13
14
15
```

Surround With

- if
- while
- try / except
- try / finally
- <editor-fold...> Comments
- region...endregion Comments

pass

```
Mammalia.py x
Mammalia
3
4 class Mammalia(object):
5     if True:
6         extremities = 4
```

- ▶ Live Template **ALT+J** produce entire code constructs.
- ▶ A library of ready-to-use templates.

Search for Usages

Find Usages of Mammalia in All Places

Mammalia(object)

Found usages 2 usages

- Usage in superclass list 2 usages
- PurePythonProject 2 usages
 - Animals 2 usages
 - Mammalia.py 2 usages
 - Marsupialia 1 usage

19 class Marsupialia(Mammalia):

- ▶ As the project grows, or when you work with someone else's code.
- ▶ To find where a particular symbol is used, **ALT+F7**
 - ▶ All files are searched.

Project navigation – Find by name

Enter file name: Include non-project files (⇧⌘O)

Q *b|

beast.py (PurePythonProject/Animals)

Herbivorae.py (PurePythonProject/Animals)

- ▶ Search only Classes by name, **CTRL+N**
- ▶ Search only based on filenames, **CTRL+Shift+N**
- ▶ Search Variable, **CTRL+Shift+ALT+N**
- ▶ Search Declaration, **CTRL+B**
- ▶ Search Class/Function, **CTRL+U**

Find Action – CTRL+Shift+A

Enter action or option name:

Q file

File

File... (⇧⌘O) Goto by Name Actions

File Encoding File

File Open Actions

File Structure (⌘F12) Goto by Reference Actions

Actions on Pairs of Files

Configure Current File Analysis... (⌘⇧⌘H) Code

Find Usages in File (⌘F7) Find

Highlight Usages in File (⇧⌘F7) Find

HTML File

JavaScript File

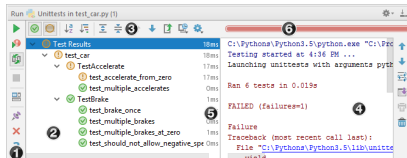
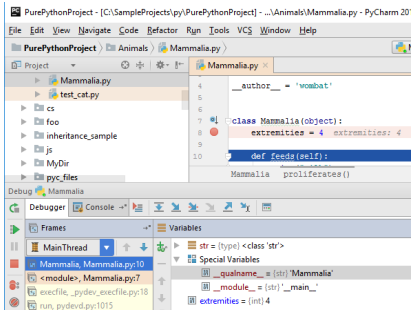
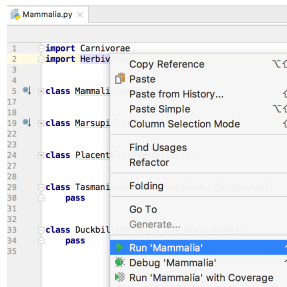
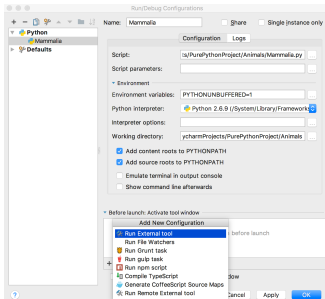
Open Log file Help

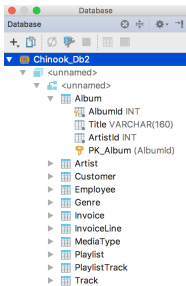
Recent Files (⌘E) View Recent Actions Group

File Associations

File Path (⌘⇧F12) Goto by Reference Actions

Press ^T or ^L to navigate through the history





- ▶ Code Hosting Platform
 - ▶ Version Control, Bug Tracking & Todo list, Wiki, Collaboration, ...
- ▶ Public + Private Projects
- ▶ Cloud-based or Private Storage
- ▶ Alternatives:
 - ▶ BitBucket, SourceForge, Team Foundation Server, SVN, CVS

First steps on Github

- ▶ Repository-oriented Family of Services
 - ▶ Repository: group of files relevant to a specific project.
 - ▶ Not necessarily related to coding.
- ▶ Each member of the project needs a separate account.
- ▶ Repositories are owned by an account.
 - ▶ Organizations are also allowed to own repositories.
- ▶ Repositories are created via the Website.
- ▶ Repositories can be browsed/modified via the Web or via broad range of client applications.

Creating a new Repository

Owner: hubot | Repository name: hello-world

Great repository names are short and memorable. Need inspiration? How about [petulant-shame](#).

Description (optional)
Just another repository

Public
Anyone can see this repository. You choose who can commit.

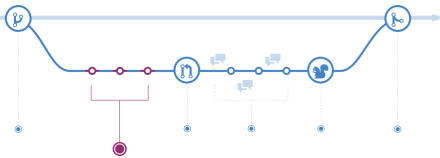
Private
You choose who can see and commit to this repository.

Initialize this repository with a README
This will allow you to git clone the repository immediately. Skip this step if you have already run git init locally.

Add .gitignore: None | Add a license: None

Create repository

Make and commit changes



- ▶ Whenever you add, edit, delete.
- ▶ Keeps track of progress.
- ▶ Easy to roll-back to previous states.

```
1 | # hello-world
2 | Hi Hubot!
3 | Hubot here, I like Node.js and Coffeescript (that's what I'm made of).
4 | I've had tacos on the moon and find them far superior to Earth tacos.
5 |
```

Commit changes

Finish README

Add mention moon tacos

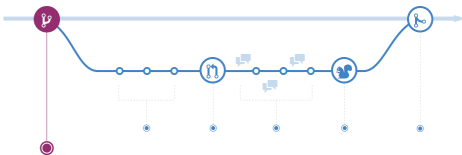
Commit directly to the `main` branch

Create a new branch for this commit and start a pull request. [Learn more about pull requests.](#)

Real power of Github: Branching

- ▶ The most over-stressed functionality.
- ▶ Branching: work on different versions of a repository at one time.
- ▶ By default each repository has 1 branch: **master**
- ▶ When create a new branch off the master:
 - ▶ Make a copy of all contents.
 - ▶ Changes on new repository are separated.
 - ▶ Can pull changes from master at any point.
 - ▶ Can push changes to master at any point.

Branching



- ▶ Starting from the **MASTER** branch.
- ▶ We create the **FEATURE** branch.
- ▶ The new branch progresses independently.
- ▶ Eventually, it **MERGES** into **MASTER**.

Just another repository — Edit

1 commit

2 branches



branch: **readme-edits**

hello-world /

This branch is 0 commits ahead and 0 commits behind master

Fetching latest commit...



- ▶ Communicating changes to the other members of the team is done via **PULL REQUESTS**.
- ▶ Pull Requests are the heart of collaboration on GitHub.
- ▶ As soon as you make a commit:
 - ▶ open a pull request,
 - ▶ start a discussion!

Merge Pull Requests

- ▶ The final step of bringing changes together.
- ▶ Merging 2 brunches.
- ▶ After confirming the merge, other branches can be deleted.



This branch has no conflicts with the base branch

Merging can be performed automatically.

Merge pull request

You can also open this in [GitHub Desktop](#) or view [command line instructions](#).



Pull request successfully merged and closed

You're all set—the [readme-edits](#) branch can be safely deleted.

Delete branch