Version Control: Backups and Improving Workflow

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Learning Machine Learning

Outline

- Version Control
  - Methods and Tools
- Git
  - Products and Tools
  - Process
  - Collaboration

- Slides and Video will be shared with Margaret

Version Control

- Change tracking in files
- “History” of the changes made to a file
- As you edit the file, Git tracks changes and stores older versions
- Revert back to older versions
- Keep historical record of the changes you’ve made

Programming

- Python
- C/C++
- Java

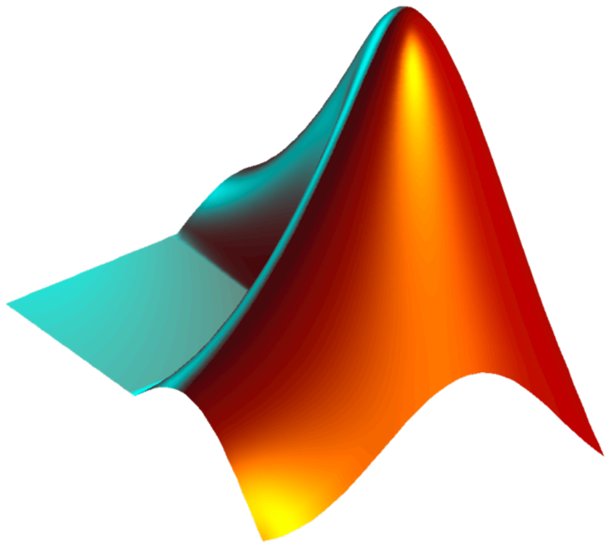
LaTeX

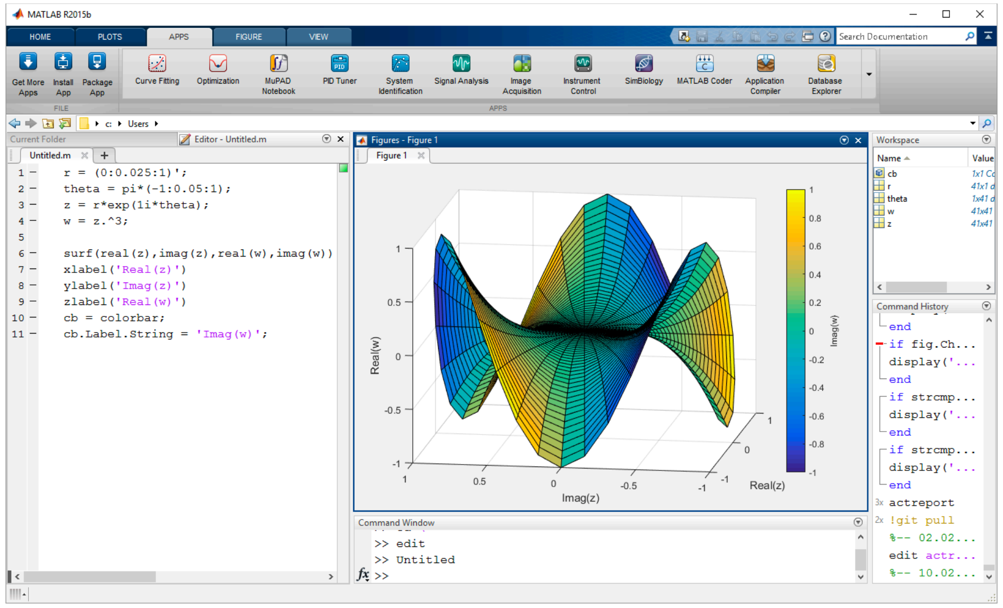
- Version Control for papers
- “*.tex” files
- Figures

- *Overleaf can be linked with a GitHub repository

Matlab

- Version control for “*.m” files
- Version control data****





```
r = (0:0.025:1)';
theta = pi*(-1:0.05:1);
z = r*exp(1i*theta);
w = z.^3;

surf(real(z),imag(z),real(w),imag(w))
xlabel('Real(z)')
ylabel('Imag(z)')
zlabel('Real(w)')
cb = colorbar;
cb.Label.String = 'Imag(w)';
```

Name	Value
cb	1x1 Co
r	41x1 d
theta	1x41 d
w	41x41
z	41x41

```
end
if fig.Ch...
display('...
end
if strcmp...
display('...
end
if strcmp...
display('...
end
3x actreport
2x !git pull
%-- 02.02...
edit actr...
%-- 10.02...
```

```
>> edit
>> Untitled
fx >>
```

****- Size limit, can’t be used as a database

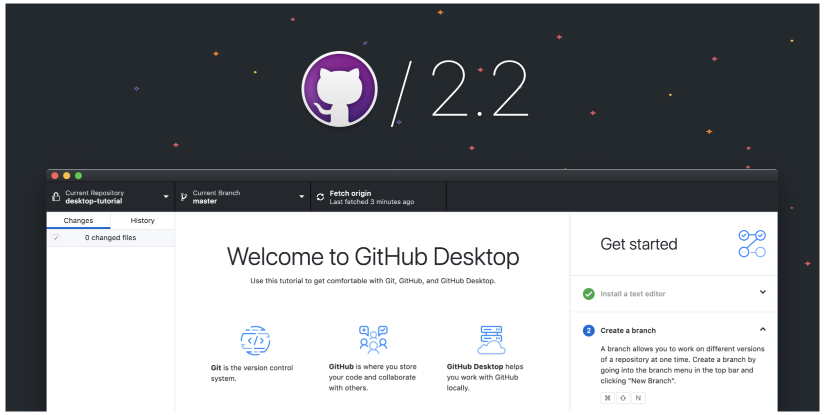
Git

- Software that implements version control
  - Tracks changes in files
  - Implements functions that simplify collaboration
  - Provides mechanisms for splitting development and reincorporating splits

Tools

- GitHub - Unlimited private repositories (projects) for academics
  - Desktop Application - Graphical User Interface (GUI)

- Sign up for a Github account (https://github.com)
- Download Github Desktop (https://desktop.github.com/)



Welcome to GitHub Desktop

Use this tutorial to get comfortable with Git, GitHub, and GitHub Desktop.

Git is the version control system.

GitHub is where you store your code and collaborate with others.

GitHub Desktop helps you work with GitHub locally.

2 Create a branch

A branch allows you to work on different versions of a repository at one time. Create a branch by going into the branch menu in the top bar and clicking "New Branch".

Git Workflow - Basics

- Initialize Repository/Project
- Publish Repository to Github

-- (Start of Repeat)

- Do Some Work
- Commit Your Work
- Push Your Work

-- (End of Repeat)

Git Workflow - Basics

- **Initialize Repository/Project**
- Publish Repository to Github

-- (Start of Repeat)

- Do Some Work
- Commit Your Work
- Push Your Work

-- (End of Repeat)

Git Workflow - Basics

- Initialize Repository/Project
- **<u>Publish Repository to Github</u>**

-- (Start of Repeat)

- Do Some Work
- Commit Your Work
- Push Your Work

-- (End of Repeat)

Git Workflow - Basics

- Initialize Repository/Project
- Publish Repository to Github

-- (Start of Repeat)

- **<u>Do Some Work</u>**
- Commit Your Work
- Push Your Work

-- (End of Repeat)

Git Workflow - Basics

- Initialize Repository/Project
- Publish Repository to Github

--- (Start of Repeat)

- Do Some Work
- **<u>Commit Your Work</u>**
- Push Your Work

--- (End of Repeat)

Git Workflow - Basics

- Initialize Repository/Project
- Publish Repository to Github

-- (Start of Repeat)

- Do Some Work
- Commit Your Work
- <u>**Push Your Work**</u>

-- (End of Repeat)

Git Workflow - Basics

- Initialize Repository/Project
- Publish Repository to Github

-- (Start of Repeat)

- **Do Some Work**
- **Commit Your Work**
- **Push Your Work**

-- (End of Repeat)

Git Workflow - Working with Collaborators

- Initialize Repository/Project
- Publish Repository to Github

--- (Start of Repeat)

- Do Some Work
- Commit Your Work
- Push Your Work

--- (End of Repeat)

Git Workflow - Working with Collaborators

- Initialize Repository/Project
- Publish Repository to Github

--- (Start of Repeat)

- **<u>Fetch+Pull Other's Work</u>**
- Do Some Work
- Commit Your Work
- Push Your Work

--- (End of Repeat)

Advanced Topics/Techniques

“I Broke It”

- Your super productive 4am coding session went great
- You wake up the next morning to test the project
    - **<u>Nothing works</u>**

- Git Revert to pull project back to a previously “good” commit

- *Git Checkout to go back and test an old commit*

Collaboration – “Branching” the Project

- Jim has a genius idea for a feature for your project

- You want to incorporate this feature, but you’re not sure if Jim’s “genius idea” will break the main project
    - Alternatively, don’t want to clutter the main project with untested features

- Have Jim “BRANCH” the repository and he can work on his changes there instead of the main branch (master branch)

Collaboration – Working the Branch

- Users must “checkout” the branch before they can make changes
- **Return to basic workflow presented in previous slides**

Collaboration – “Merging” the Branch

- Jim’s genius feature is complete and needs to be incorporated to the main project

- Create a “PULL REQUEST” and “MERGE” these changes to the main project

Keeping Secrets and Data Out

- Most projects require some data that’s not code
- For ML, this data may be HUGE
- Git ignore files can be used to exclude certain files from being tracked and uploaded to GitHub

Command-Line Interface vs. GUI

- All actions possible in GitHub Desktop can be performed in a Terminal/Command Line
  - For Linux users, you <u>must</u> use the CLI (Command-Line Interface)

- **<u>Same exact workflow that was presented in previous slides</u>**

Conclusions

- Version Control can be used as a backup for project code and documents
- Used to revert changes back to working conditions
- Changes and files can be tracked and edited by many people in a group and kept in one central location
- Not limited to just traditional “programming” files
  - Matlab, LaTeX, etc.