DATA SCIENCE

CSC 405/605

THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

VERSION CONTROL

GIT

What is Git?

- Distributed Version / Revision Control System
- Large projects – Multiple members/coders
- Software development
- Decentralized, Fast, Flexible

Git Servers

- GitHub (https://education.github.com/pack)
  - *We are going to be using GitHub – Get an account*
- BitBucket (https://www.atlassian.com/software/views/bitbucket-academic-license.jsp)
- ….

Git Tools

- Command line git (Learn this)
- Tower - https://www.git-tower.com/mac
- Github (Windows, Mac) - https://desktop.github.com/
- Gitbox, SourceTree

GIT SETUP

Windows

- https://gitforwindows.org/

Mac

- http://git-scm.com/download/mac

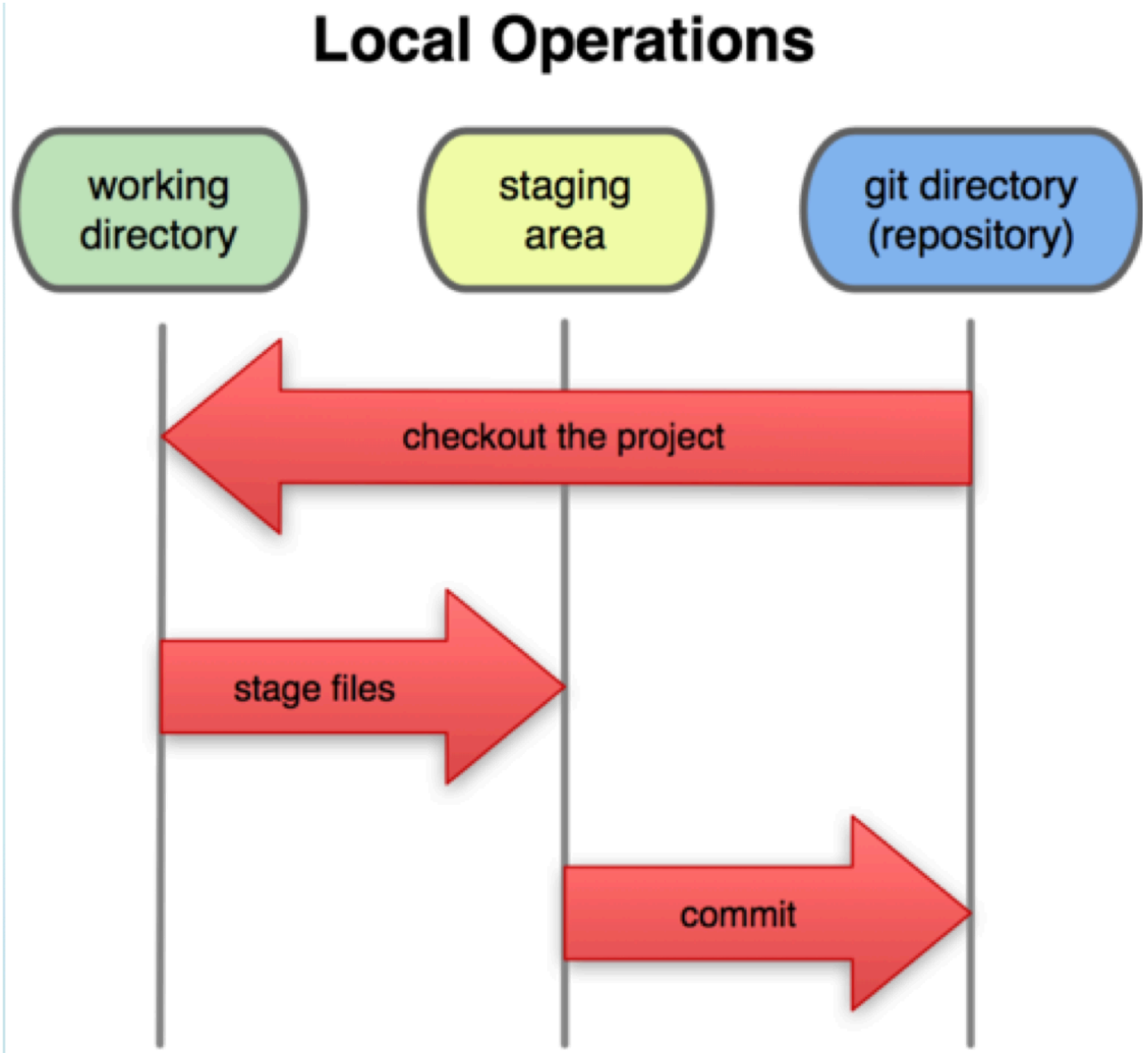
Linux

- http://git-scm.com/book/en/v2/Getting-Started-Installing-Git

Guide

- http://rogerdudler.github.io/git-guide/
- http://slides.com/moji3000/git_presentation/fullscreen#/

GIT SETUP


Local Operations
working directory
staging area
git directory (repository)
checkout the project
stage files
commit

GIT SETUP

Git Config

- Add your user name and email

```
Somyas-MBP:test_proj Som$ git config --global user.name "Somya Mohanty"
Somyas-MBP:test_proj Som$ git config --global user.email "mohanty.somya@gmail.com"
```

```
Somyas-MBP:test_proj Som$ git config --list
user.name=Somya Mohanty
user.email=mohanty.somya@gmail.com
filter.media.clean=git-media-clean %f
filter.media.smudge=git-media-smudge %f
filter.lfs.clean=git lfs clean %f
filter.lfs.smudge=git lfs smudge %f
filter.lfs.required=true
core.repositoryformatversion=0
core.filemode=true
core.bare=false
core.logallrefupdates=true
core.ignorecase=true
core.precomposeunicode=true
```

GIT

Git Init

- Create a new repository
  - Create a new directory
  - Open it
  - Execute git init

```
Somyas-MBP:test_proj Som$ git init
Initialized empty Git repository in /Users/Som/test_proj/.git/
```

Git Clone

- Create a working copy from remote server

```
Somyas-MBP:test_proj Som$ git clone https://github.com/idl/Twitter_sentiment
Cloning into 'Twitter_sentiment'...
Username for 'https://github.com': somyamohanty
Password for 'https://somyamohanty@github.com':
remote: Counting objects: 73, done.
remote: Total 73 (delta 0), reused 0 (delta 0), pack-reused 73
Unpacking objects: 100% (73/73), done.
Checking connectivity... done.
Somyas-MBP:test_proj Som$ ls
Twitter_sentiment
```

GIT

Git Status

- Status of the project

```
Somyas-MBP:test_proj Som$ git status
On branch master

Initial commit

nothing to commit (create/copy files and use "git add" to track)
```

GIT

Git Status

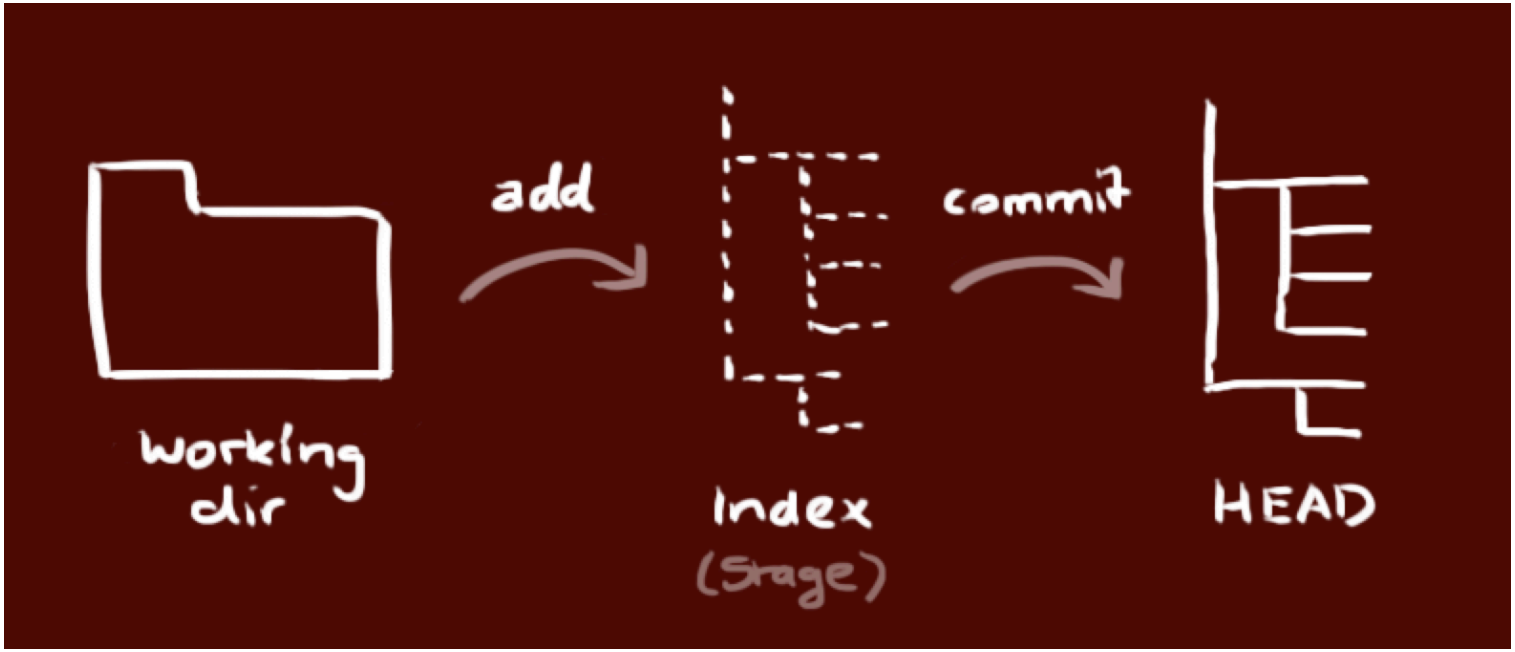
- Uncommitted

```
Somyas-MBP:test_proj Som$ git status
On branch master

Initial commit

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        Twitter_sentiment/

nothing added to commit but untracked files present (use "git add" to track)
```

GIT

Git Workflow

- Working Directory - Actual Files
- Index – Staging Area
- Head – Commit Pointer



GIT

Git Add

- Change a file

```
Somyas-MBP:Twitter_sentiment Som$ git add README.md
Somyas-MBP:Twitter_sentiment Som$ git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        modified:   README.md
```

Git Commit

- Commit the changes made to a file

```
Somyas-MBP:Twitter_sentiment Som$ git commit -m 'testing commit'
[master 68d54c6] testing commit
 1 file changed, 1 insertion(+)
```

GIT

Git Push

- Push head to include the new commit

```
Somyas-MBP:Twitter_sentiment Som$ git push
warning: push.default is unset; its implicit value has changed in
Git 2.0 from 'matching' to 'simple'. To squelch this message
and maintain the traditional behavior, use:

  git config --global push.default matching

To squelch this message and adopt the new behavior now, use:

  git config --global push.default simple

When push.default is set to 'matching', git will push local branches
to the remote branches that already exist with the same name.

Since Git 2.0, Git defaults to the more conservative 'simple'
behavior, which only pushes the current branch to the corresponding
remote branch that 'git pull' uses to update the current branch.

See 'git help config' and search for 'push.default' for further information.
(the 'simple' mode was introduced in Git 1.7.11. Use the similar mode
'current' instead of 'simple' if you sometimes use older versions of Git)

Counting objects: 3, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 292 bytes | 0 bytes/s, done.
Total 3 (delta 2), reused 0 (delta 0)
To https://github.com/idl/Twitter_sentiment
   49a31cb..68d54c6  master -> master
```

GIT

Git Show

```
Somyas-MBP:Twitter_sentiment Som$ git show
commit 68d54c60620befb11235ded6d462d6c09cbfde2b
Author: Somya Mohanty <mohanty.somya@gmail.com>
Date:   Fri Jul 17 12:42:57 2015 -0500

    testing commit

diff --git a/README.md b/README.md
index 028a6d0..8239c85 100755
--- a/README.md
+++ b/README.md
@@ -3,4 +3,5 @@ Twitter Sentiment

 Sentiment Analysis of Twitter Messages

+Test
```

```
Somyas-MBP:Twitter_sentiment Som$ git status
On branch master
Your branch is up-to-date with 'origin/master'.
nothing to commit, working directory clean
```

GIT

Commits on Jul 17, 2015

testing commit

somyamohanty authored 44 seconds ago

68d54c6

testing commit

master

Browse files

somyamohanty authored a minute ago

1 parent 49a31cb commit 68d54c60620befb11235ded6d462d6c09cbfde2b

Showing 1 changed file with **1 addition** and **0 deletions**.

Unified Split

1 README.md

View

```
@@ -3,4 +3,5 @@ Twitter Sentiment
3  3
4  4   Sentiment Analysis of Twitter Messages
5  5
   6  +Test
6  7
```

GIT

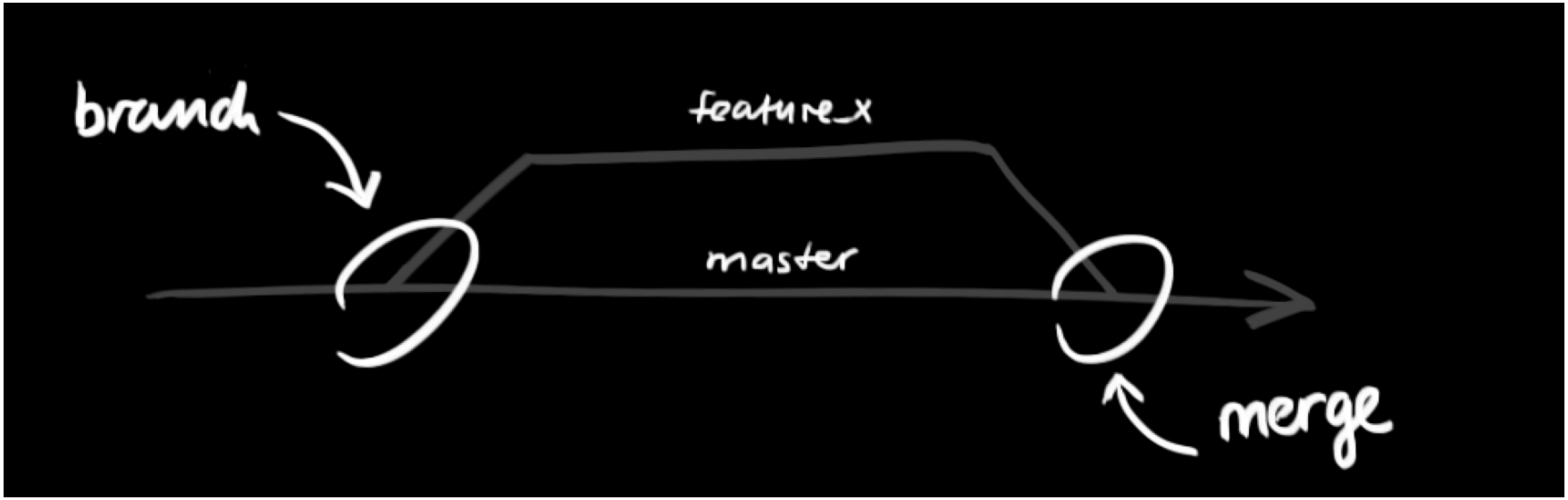
Git Pull

- Get new updates

```
Somyas-MBP:Twitter_sentiment Som$ git pull
remote: Counting objects: 3, done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), done.
From https://github.com/idl/Twitter_sentiment
   68d54c6..97ef6a1  master     -> origin/master
Updating 68d54c6..97ef6a1
Fast-forward
 README.md | 1 +
 1 file changed, 1 insertion(+)
Somyas-MBP:Twitter_sentiment Som$ git show
commit 97ef6a176552a818eb5b9437f523f02d350c5e6f
Author: Somya Mohanty <mohanty.somya@gmail.com>
Date:   Fri Jul 17 13:16:12 2015 -0500

    Testing again

diff --git a/README.md b/README.md
index 8239c85..c6ac490 100755
--- a/README.md
+++ b/README.md
@@ -5,3 +5,4 @@ Sentiment Analysis of Twitter Messages

 Test

+Test agin
```

GIT

Git Branch



GIT

Git Branch

```
Somyas-MBP:Twitter_sentiment Som$ git checkout -b 'feature_x'
Switched to a new branch 'feature_x'
```

```
Somyas-MBP:Twitter_sentiment Som$ git branch
* feature_x
  master
```

Git push branch

```
Somyas-MBP:Twitter_sentiment Som$ git push origin 'feature_x'
Total 0 (delta 0), reused 0 (delta 0)
To https://github.com/idl/Twitter_sentiment
 * [new branch]      feature_x -> feature_x
```

GIT

Git Checkout

```
Somyas-MBP:Twitter_sentiment Som$ git checkout master
Switched to branch 'master'
Your branch is up-to-date with 'origin/master'.
```

Git merge branch

```
Somyas-MBP:Twitter_sentiment Som$ git merge feature_x
Updating 97ef6a1..77bbeea
Fast-forward
 README.md | 2 ++
 1 file changed, 2 insertions(+)
Somyas-MBP:Twitter_sentiment Som$ git show
commit 77bbeea597407a2f9e3093ce0cd02b7695aaea8b
Author: Somya Mohanty <mohanty.somya@gmail.com>
Date:   Fri Jul 17 13:27:10 2015 -0500

    testing merging

diff --git a/README.md b/README.md
index c6ac490..9f81ac5 100755
--- a/README.md
+++ b/README.md
@@ -6,3 +6,5 @@ Sentiment Analysis of Twitter Messages
 Test

 Test agin
+
+Testing merging branch
```

GIT

Git directory structure for class project

- **./src –** Source code / IPython Notebooks
  - **./util** – Library files
- **./data –** Sample Data (Public Data Only)
- **./doc** - Project Documentation
- **./Readme.MD** – Project Introduction
- **./requirement.txt –** Libraries/Tools/Module use

PACKAGE MANAGEMENT

PIP PYTHON

What is Pip?

- **Package manager to install python libraries**
  - pip install <some-package-name>
- **How to install pip?**
  - Linux (ubuntu)
    - sudo apt-get install python-pip
  - Mac
    - sudo easy_install pip
  - Windows
    - https://github.com/BurntSushi/nfldb/wiki/Python-&-pip-Windows-installation
  - Download get-pip.py from https://bootstrap.pypa.io/get-pip.py
  - Pip install
    - python get-pip.py --no-index --find-links=/local/copies
    - python get-pip.py –user
- **Upgrade pip**
  - pip install -U pip

VIRTUAL ENVIRONMENT

What is Virtual Environment?

- **Dependencies relevant to project**
  - Local to projects
  - Easy to do pip-freeze and get the requirements
- **Solves "Project X depends on version 1.x but, Project Y needs 4.x"**
- **Helps in re-producible projects**
- **Steps**
  - Install virtualenv and virtualenvwrapper (makes it much easier to work with virtualenv)
    - Linux or Mac
      - pip install virtualenv
      - pip install virtualenvwrapper
    - Windows
      - pip install virtualenvwrapper-win

VIRTUAL ENVIRONMENT

- **Steps**
  - Set your home environment
    - export WORKON_HOME=~/Envs
    - source /usr/local/bin/virtualenvwrapper.sh
  - Create a project directory
    - mkdir assignment_1
    - cd assignment_1
  - Create virtual environments
    - mkvirtualenv assignment_1
    - workon assignment_1
  - List all environments
    - lsvirtualenv
  - List all packages
    - lssitepackages

- **http://docs.python-guide.org/en/latest/dev/virtualenvs/**

VIRTUAL ENVIRONMENT

- **Get the requirements of project**
  - Inside the project directory
    - pip freeze
    - pip freeze > requirements.txt

LOCAL SETUP

- **Install build dependencies**
  - Ubuntu
    - sudo apt-get install python-numpy python-scipy python-matplotlib ipython ipython-notebook python-pandas python-sympy python-nose
    - sudo apt-get install libfreetype6-dev libpng-dev
    - pip install pandas, numpy, scipy, matplotlib
  - Mac
    - Use pip to install pandas, numpy, scipy, matplotlib
- **Install gcc**
  - Ubuntu
    - sudo apt-get install gcc
  - Mac
    - brew install gcc
- **Install g++**
  - Ubuntu
    - sudo apt-get install g++

PYTHON

PYTHON

Why?

- **Wide array of libraries for most of the applications**
  - Numerical (NumPy, Pandas)
  - Scientific (SciPy)
  - Machine Learning (Sci-Kit, PyBrain, Gensim, NLTK)
  - Visualization (MatplotLib, Bokeh)
  - Database ORM (SQLAlchemy, PyMongo)
  - Big Data (PySpark, HadooPy)
- **Easy to learn (in comparison to let say R)**
- **Multi-Processing**
- **Preferred language of choice for Data Scientists**

IPYTHON

IPython provides a rich architecture for interactive computing with:

- Powerful interactive shells (terminal and Qt-based).
- A browser-based notebook with support for code, rich text, mathematical expressions, inline plots and other rich media.
- Support for interactive data visualization and use of GUI toolkits.
- Flexible, embeddable interpreters to load into your own projects.
- Easy to use, high performance tools for parallel computing.

http://ipython.org/index.html

IPYTHON NOTEBOOK

- Runs code in a web-browser
- Stored in a json format
- Allows for code and text (MarkDown)
- Has Debugger
- Has Checkpoint
- Sharing / Co-editing is a lot easier
- Has access to all python libraries (locally imported and system installed)
- All your assignments are going to be in that. ☺

IPYTHON NOTEBOOK

Installation (Ubuntu and Mac)

- pip install ipython[notebook]
- Install all dependencies

Alternative:

- Use Anaconda (Its pretty great for Data Science)
  - https://conda.io/docs/user-guide/getting-started.html
  - Install - https://conda.io/docs/user-guide/install/index.html
- Docker
  - https://docs.docker.com/get-started/#prepare-your-docker-environment
  - Created for class: https://github.com/somyamohanty/datascience_docker
    - All libraries are pre-installed

Windows Users:

- http://technivore.org/posts/2016/02/27/windows-jupyter-three-ways.html

IPYTHON NOTEBOOK

Run

- Locally
  - ipython notebook
- Remote Server
  - ipython notebook --no-browser --port=8888
- Starts at home directory
- http://localhost:8888/tree
- .ipynb

Ipython and Python Basics

CURRENT LOCAL SETUP

- **Current requirements (Installed IPython, NumPy, SciPy, Pandas)**
  - backports.ssl-match-hostname==3.4.0.2
  - certifi==2015.4.28
  - decorator==4.0.2
  - funcsigs==0.4
  - functools32==3.2.3.post2
  - ipykernel==4.0.3
  - ipython==4.0.0
  - ipython-genutils==0.1.0
  - Jinja2==2.8
  - jsonschema==2.5.1
  - jupyter-client==4.0.0
  - jupyter-core==4.0.4
  - MarkupSafe==0.23
  - matplotlib==1.4.3
  - mistune==0.7
  - mock==1.3.0
  - nbconvert==4.0.0
  - nbformat==4.0.0
  - nose==1.3.7
  - notebook==4.0.2
  - numpy==1.9.2
  - pandas==0.16.2
  - path.py==7.6.1
  - pbr==1.6.0
  - pexpect==3.3
  - pickleshare==0.5
  - ptyprocess==0.5
  - Pygments==2.0.2
  - pyparsing==2.0.3
  - python-dateutil==2.4.2
  - pytz==2015.4
  - pyzmq==14.7.0
  - scipy==0.16.0
  - simplegeneric==0.8.1
  - six==1.9.0
  - terminado==0.5
  - tornado==4.2.1
  - traitlets==4.0.0
  - wheel==0.24.0

RESOURCES

CLOUD RESOURCES

- **Microsoft Azure – UNCG**
  - https://kangaroo.uncg.edu
  - Login with Spartan ID
    - It will show security exception, just confirm it and proceed.
    - It takes a few minutes to startup
- **Google CoLab**
  - https://colab.research.google.com/notebooks/welcome.ipynb
  - Links to google drive for data
- **Both have limitations on the computational resources**
  - Using your own laptop/desktop gives you more control.