version control : git + GitHub

Marco Morales
marco.morales@columbia.edu

Nana Yaw Essuman
nanayawce@gmail.com

GR5069: Applied Data Science
for Social Scientists

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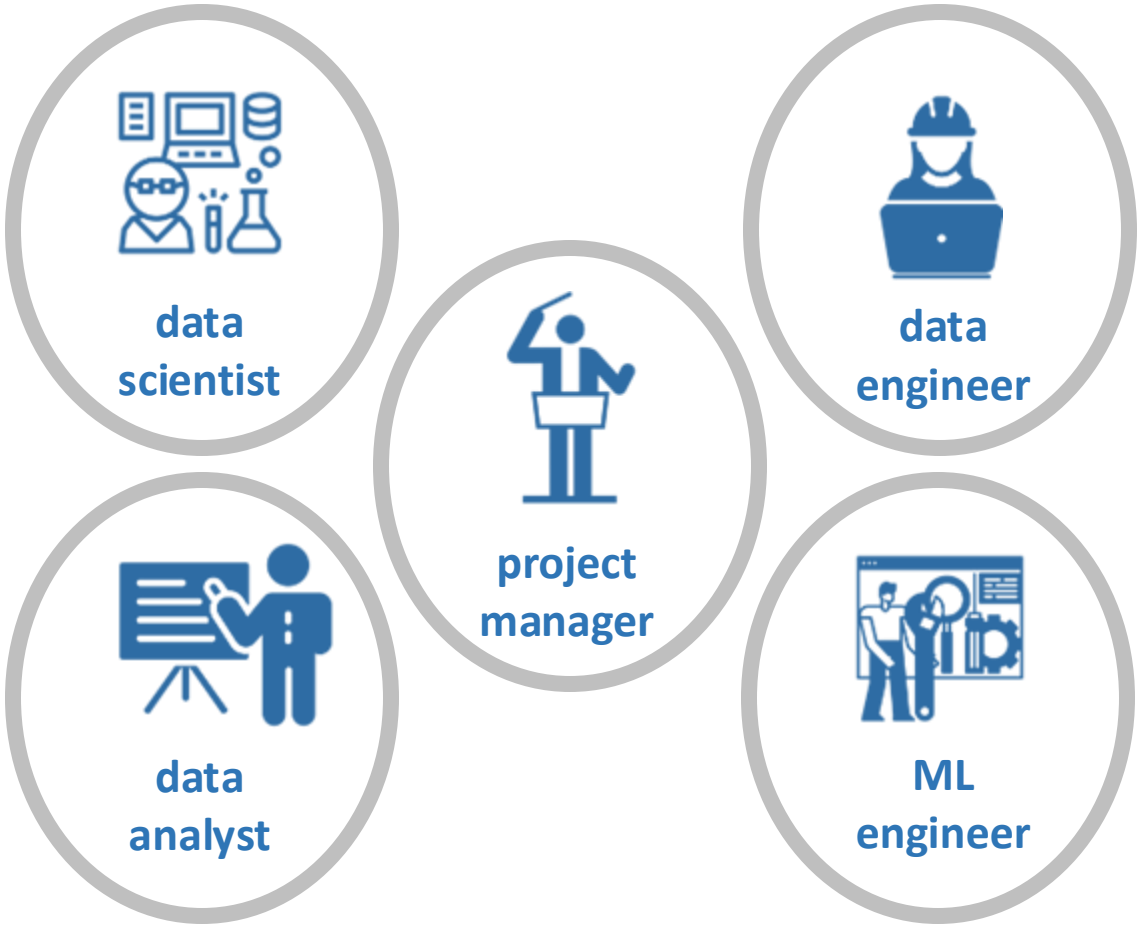
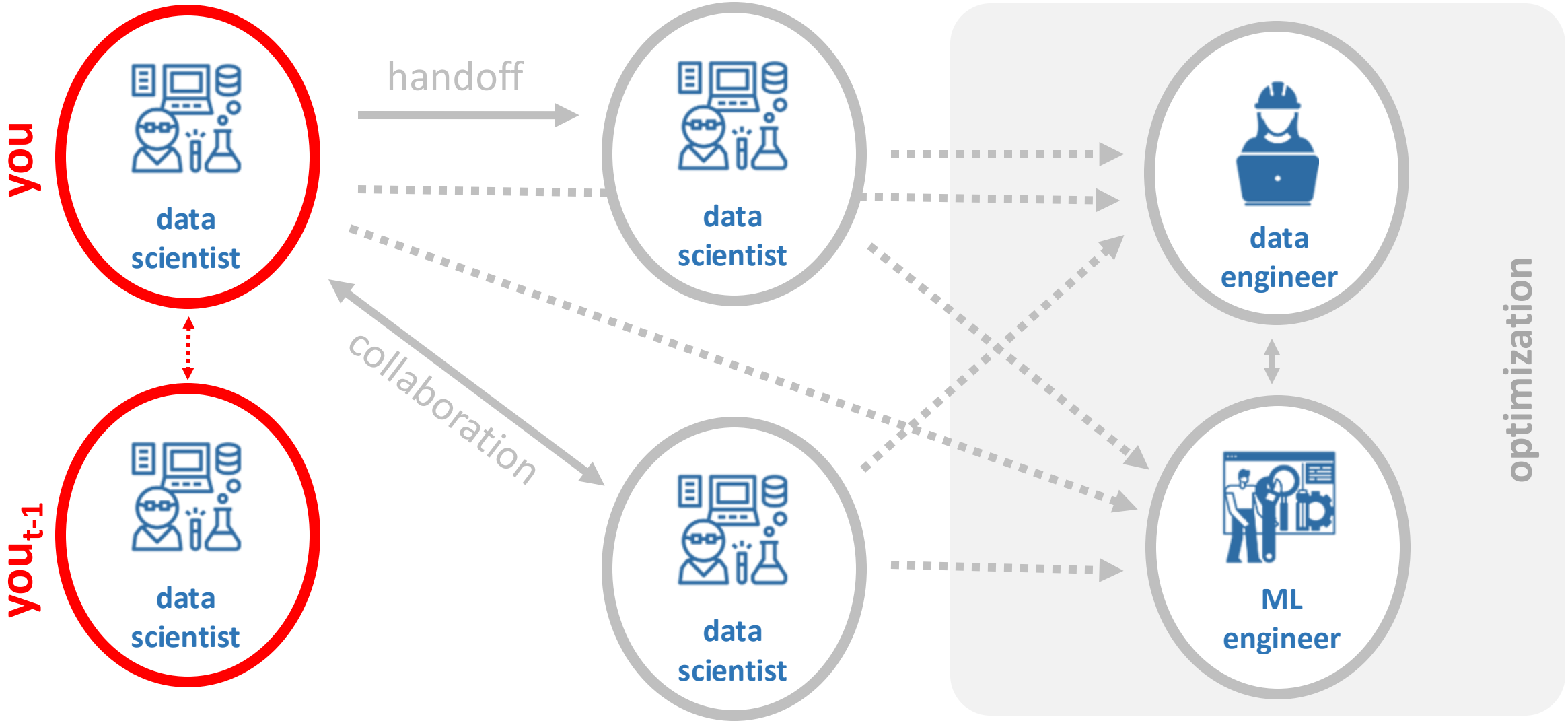
recap: what does a Data Scientist do?

Instagram vs **reality**

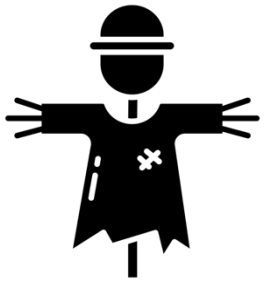
recap: collaboration to develop Data Products



workflow collaboration in Data Science



recap: iteration to build Data Products



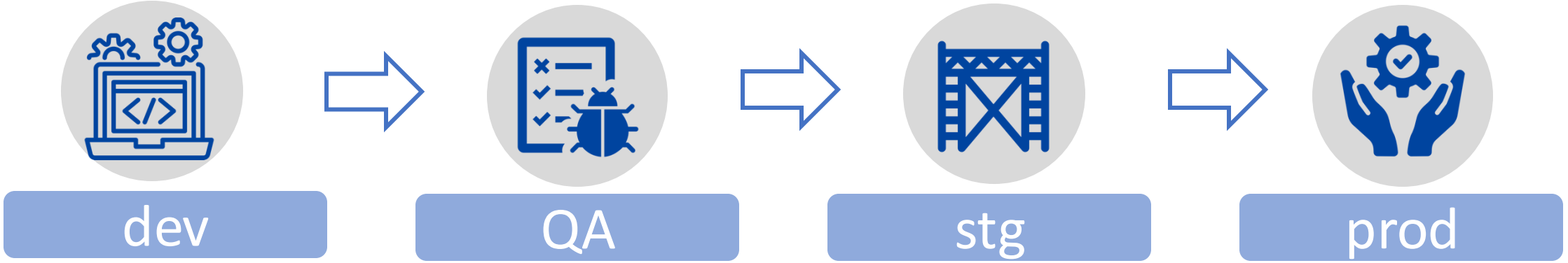
start small
(MVP)

fail fast

scale up

iterate

working environments to build Data Products



development

quality assurance / testing

staging

production

operational concepts in Data Science

portability

anyone should be able to **pick up where you left off** from any machine

replicability

anyone should be able to arrive at your **same results**

scalability

your prototype should also work for **larger data sets** and/or be on the path of **automation**

operational concepts in Data Science

	portability	replicability	scalability
what	• flexible references • structured and documented code • replicate original environment	• documentation: data, software, hardware, environments • commented code • no manual processes	• high quality code • flexible functions • modularized code
why	• seamless handoff • frictionless transitions across environments	• seamless examination, review or validation • cordial troubleshooting • harmonious optimization	• simplified review and validation • reduce time optimizing, automating and deploying

why do we start here?

all **Data Products** involve code, and

code is the backbone of all Data Products

why version control?

1. keeps **“snapshots”** of your code over time
2. expedites the process to **debug** code (yours and your team’s)
3. regulates **team collaboration** (everyone can see who changed what! + “air traffic control”)
4. supports the **lifecycle of a Data Product**
5. enables **reproducibility**, **portability**, and **scalability**

central to any **activity** that involves **code**

Software Engineering

Data Engineering

Machine Learning Engineering

Data Science

many flavors, but we'll focus on these two

version control software

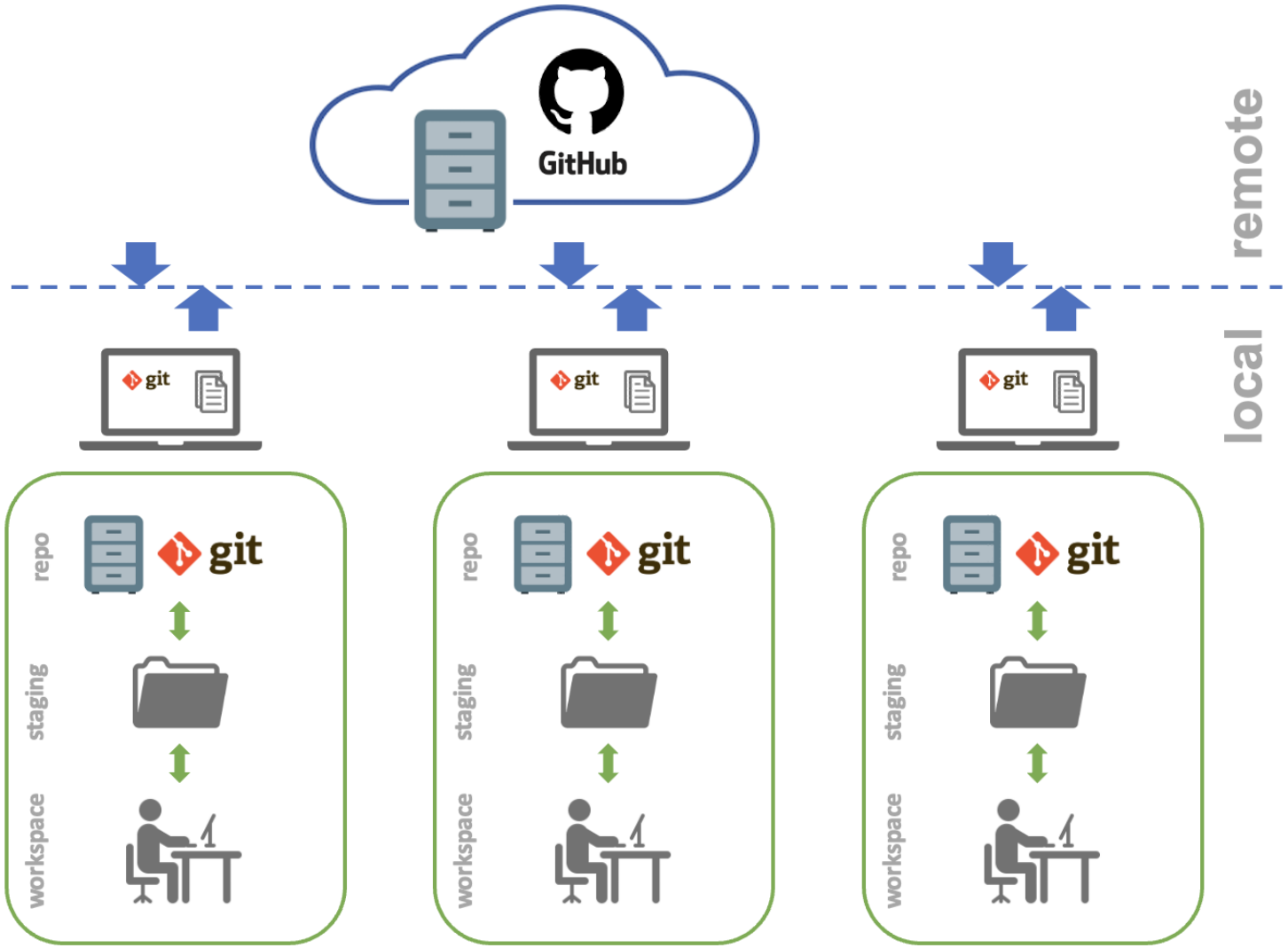
open-source cloud service

two minutes to make sure you've:

1) downloaded/installed git

2) created a GitHub account

an ideal **version control setup**

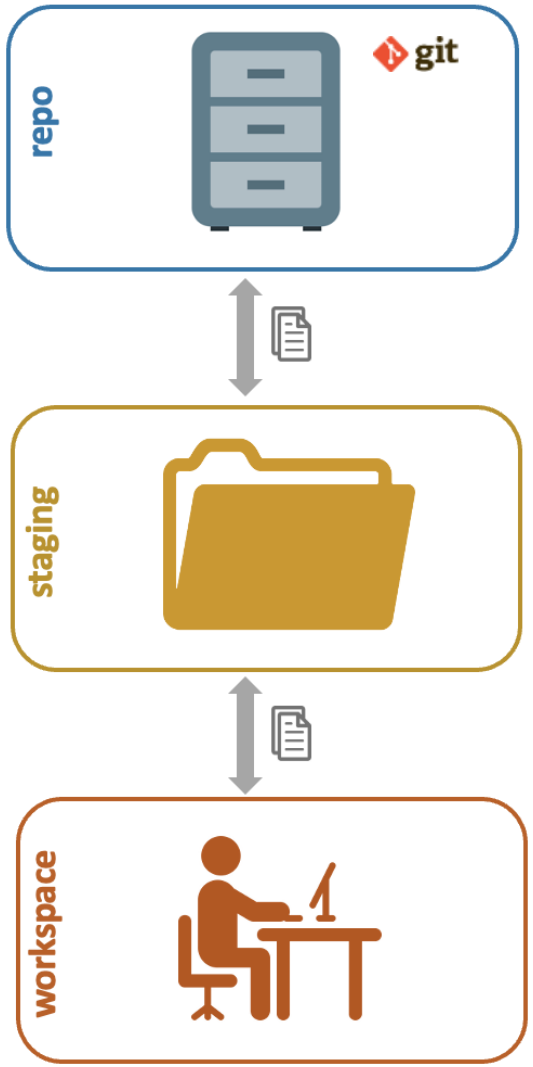


git locally

recap: what was this **git** thing?

- git is a **version control software**
  - installed “locally” on your computer (or virtual machine or computing platform)
  - keeps snapshots of your (coding) work
- helps with
  - “time travel” (insert your favorite “Back to the future” gif here)
  - keep collaboration organized when multiple people are working on the same project
- a vehicle to be nice to your fellow collaborators (and to the you of the future)

git: a mental model



git, meet your new user!

- set your **username** and **email address**

```
$ git config --global user.name "John Doe"
$ git config --global user.email johndoe@example.com
```

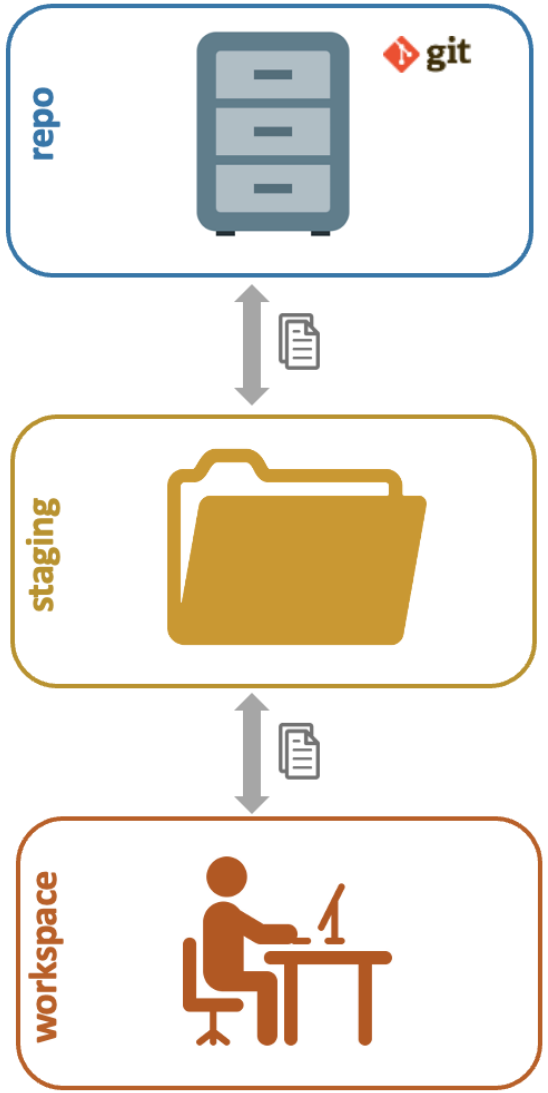
- **verify** that information was successfully entered

```
$ git config –-list
```

- this information gets baked in your commits

ProTip: other useful information (e.g. proxy settings) also goes on git config

now, turn your folder structure into a git repo



now, turn your folder structure into a git repo

- go to the **root** of your project and initialize the repo

```
$ git init
```

- there are **files you never want tracked** by git (e.g. log files, access keys), even by mistake

- that's the purpose of a .gitignore file

now, turn your folder structure into a git repo

- from the root of your local repository, create a .gitignore file

```
$ touch .gitignore
$ echo > .gitignore
```

(Mac)
(Windows)

- add files, file types and folders you want git to ignore

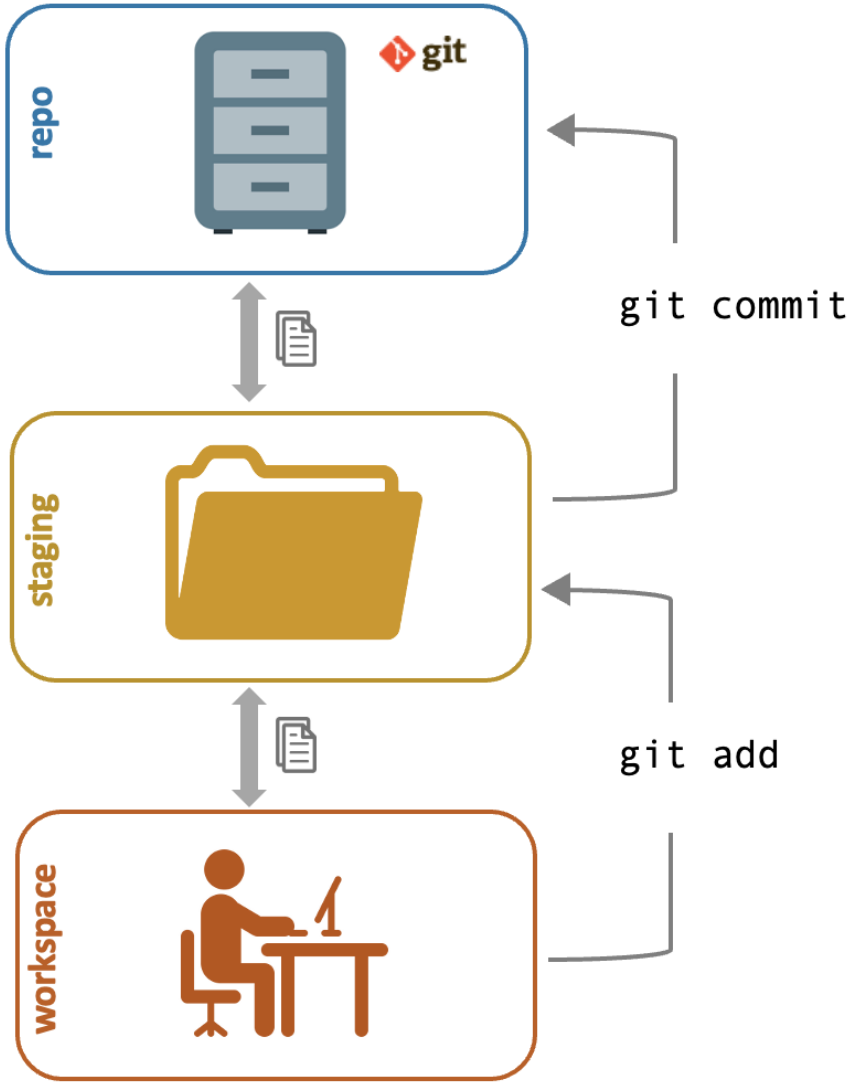
what do you add to a **.gitignore** file?

```
# OS generated files #
*.DS_Store

# Jupyter Notebook
.ipynb_checkpoints
```

```
# RStudio files
*.Rproj.user/

# all data folders
data/
```

ProTip: further info/templates: https://github.com/github/gitignore

your basic git workflow



your basic git workflow

- indicate a file to be tracked by git

```
$ git add samplefile.R
```

- verify what’s being tracked

```
$ git status
```

- commit your tracked files (with an informative message)

```
$ git commit -m "Commit initial files"
```

a few confusing things about git

- a file will be committed **exactly** as it was when you git add-ed it
- if you change the file after you git add it and want to commit the new changes, you need to git add again before the git commit
- use git status to assess what's being staged and committed

git workflow **ProTips**

- NEVER use `git add .`
- use `git status` often as validation
- only `add` and `commit` source files
  - omit files you can reproduce using source files
- `commit` **small chunks of logically grouped changes**
  - you may want to undo a change, and only that change
- `commit` with **informative** (imperative mood) **messages**
  - [*this commit will*] Rename income variable

quick detour: what is a branch in git?

a **divergence** from the main line of development

that **isolates** development work
without affecting other branches

---

a branch can **merge** into another branch

repos always have a **default branch**

git workflow **ProTips**

- current best practice is to use main for your default branch; used to be master
- by default, git will create a main branch after your first commit
- easy tor rename your branch to main

```
$ git branch -M main
```

- for a permanent solution (in git >= 2.28)

```
$ git config --global init.defaultBranch main
```

push globally
(to GitHub)

recap: what was this **GitHub** thing?

- **GitHub** is a **cloud service** that hosts git repositories
  - lives in the cloud
  - understands the git dialect!
  - can speak with multiple git users simultaneously
- helps with
  - persisting repository storage (your dog cannot eat your repo!)
  - synchronizing work
  - minimizing risk of people stepping on each other's toes (while working on the same project)
  - seamless transition between environments (dev > qa> staging > prod)

first, create a GitHub repo

Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? Import a repository.

Required fields are marked with an asterisk (*).

Repository template

No template

Start your repository with a template repository's contents.

Owner *

marco-morales

Repository name *

mytestrepo

mytestrepo is available.

Great repository names are short and memorable. Need inspiration? How about friendly-memory ?

Description (optional)

Public
Anyone on the internet can see this repository. You choose who can commit.

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

Initialize this repository with:

Add a README file
This is where you can write a long description for your project. Learn more about READMEs.

Add .gitignore

.gitignore template: None

Choose which files not to track from a list of templates. Learn more about ignoring files.

Choose a license

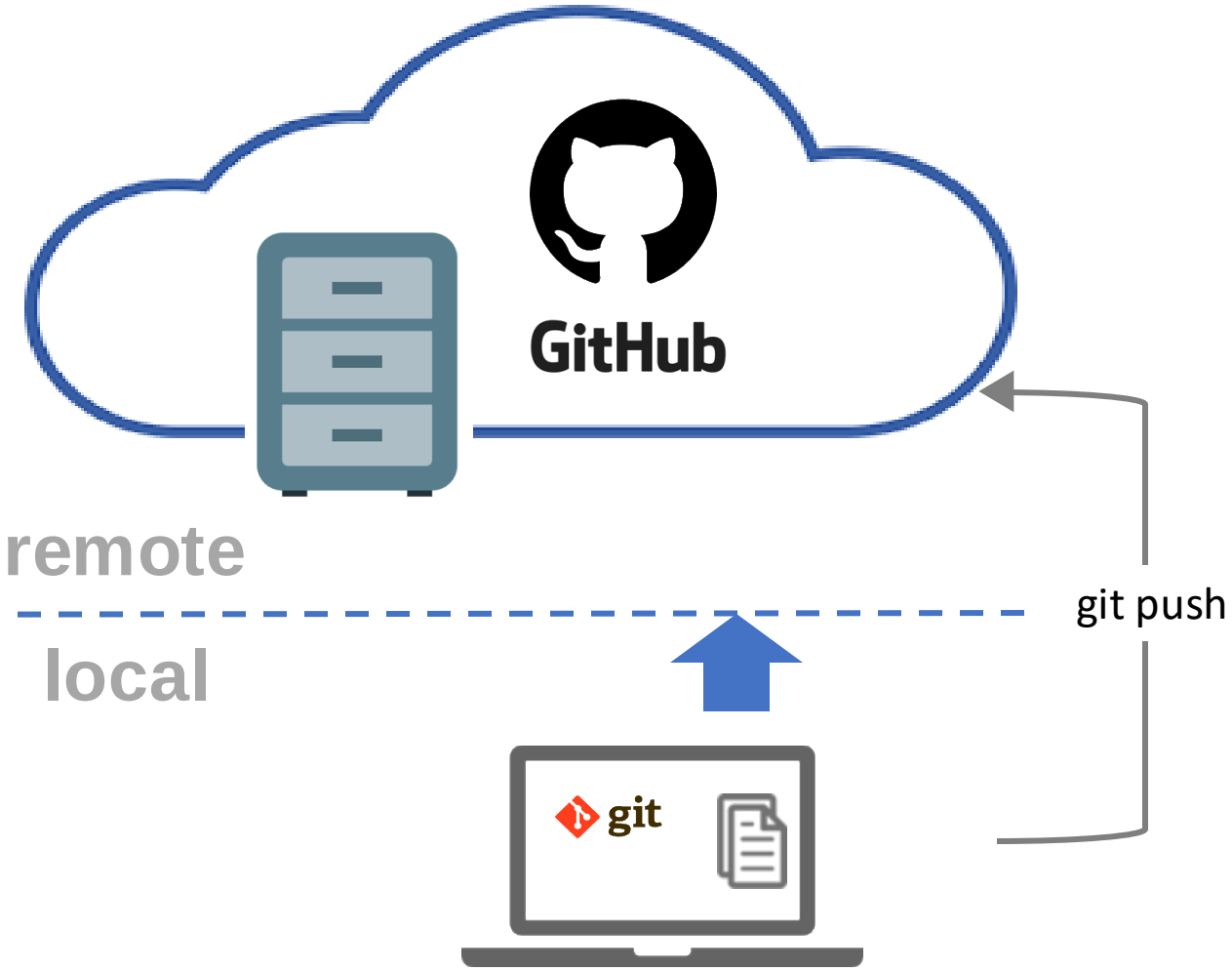
License: None

A license tells others what they can and can't do with your code. Learn more about licenses.

You are creating a public repository in your personal account.

Create repository

then, push to that GitHub repo



then, push to that GitHub repo

- tell git the location of the remote GitHub repo you just created (typically nicknamed “origin”)

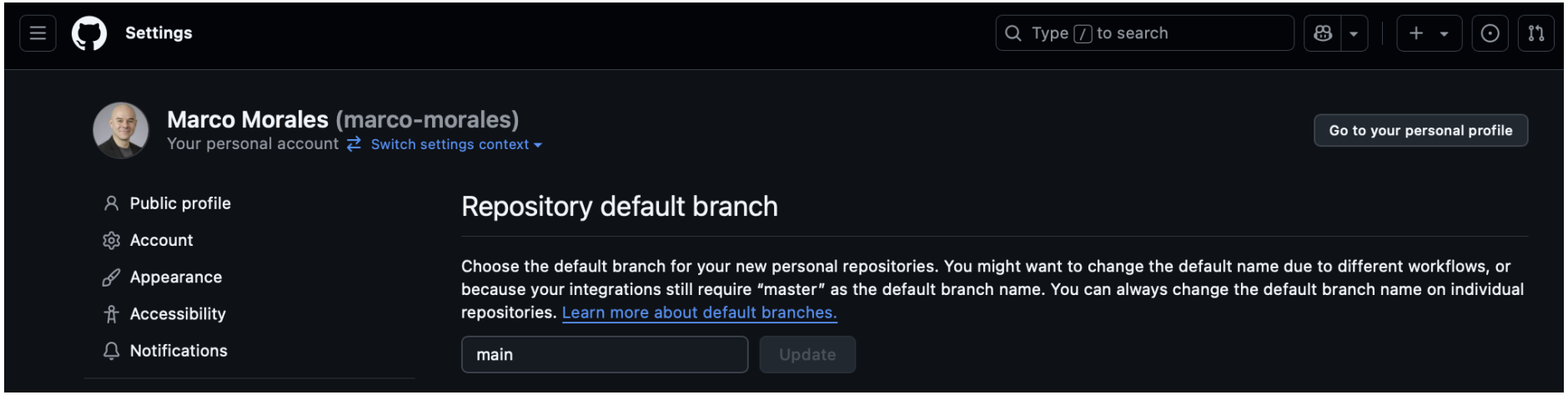
```
$ git remote add origin https://github.com/marco-morales/testrepo.git
```

- send committed files to your GitHub (“origin”) repo from your local git branch (“main”)

```
$ git push -u origin main
```

GitHub workflow ProTips

- current best practice is to use main for your default branch; used to be master
- by default, GitHub will create a master branch after you first create a repo if you do not change defaults
- easy to change permanently in your GitHub settings



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