Building an executable with

PyInstaller

#!/bin/env python
import os
import sys

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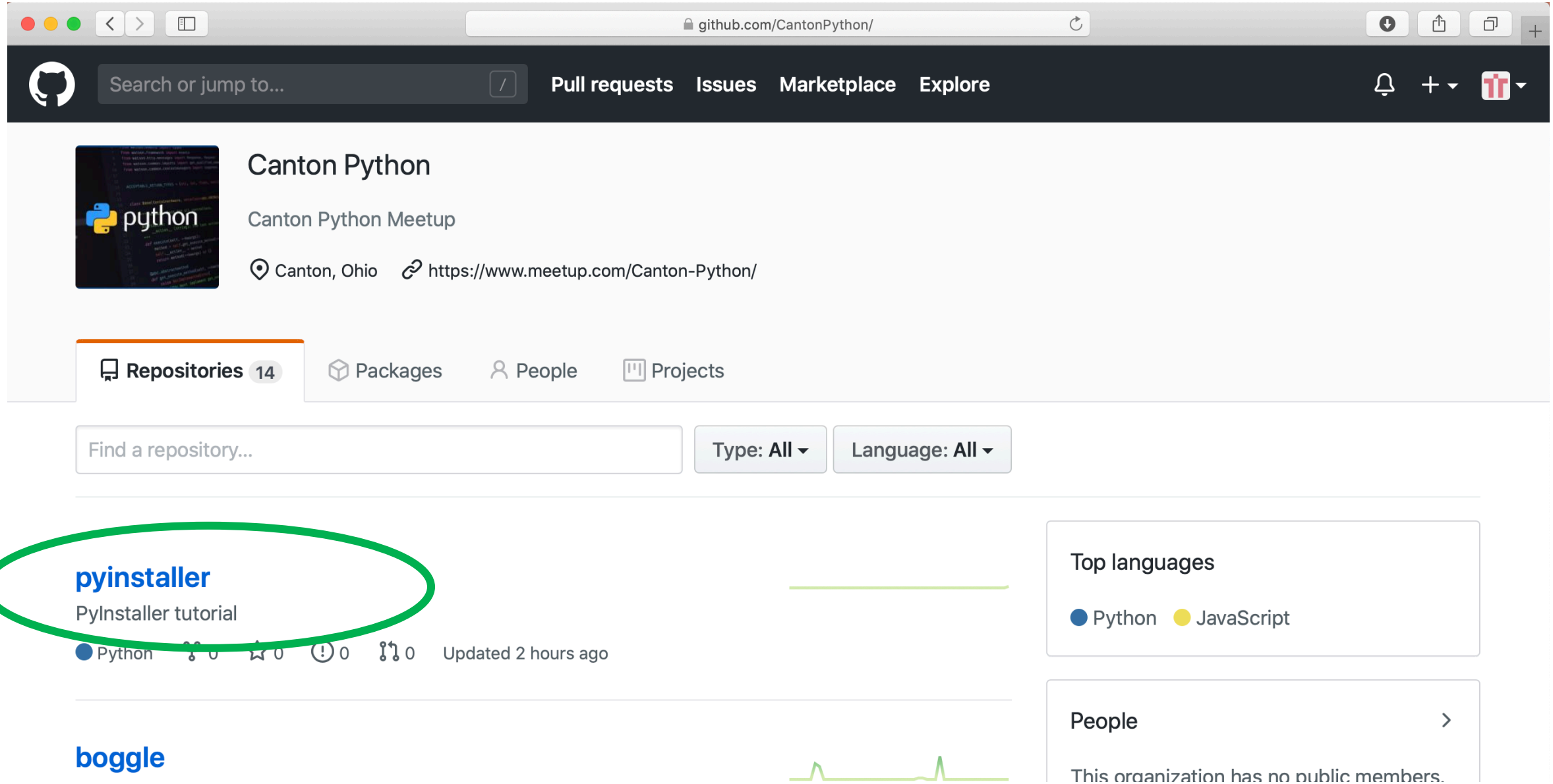
Canton Python Meet-up

Brief bio

- Ph.D., Applied Mathematics, (cough) Michigan State University
- B.A., Russian Language & Literature / Mathematics, University of Kansas
- Several years experience teaching college mathematics
- A year as an aerospace reliability engineer (statistics, software development in Python, laser physics, materials/structural engineering) at N&R Engineering
- Transitioning to Professor of Applied Mathematics and Statistics at University of Mount Union
- Hobbies & Interests: Hiking, Writing, Drawing, Fuel Cell Technology, Paper Airplanes, Music, Non-intense board games, Uniting diverse communities

Files for tutorial are on GitHub https://github.com/CantonPython/



What is  Pyinstaller ?

https://www.pyinstaller.org
https://pyinstaller.readthedocs.io/en/stable/

- Bundles a Python application and dependencies into a single package
- Can run bundled app without installing Python interpreter or modules
- Supports Python 2.7 and 3.5+, and major packages: numpy, PyQt, Django, wxPython, etc.
- Windows, Mac OS X, GNU/Linux (but cannot cross-compile)

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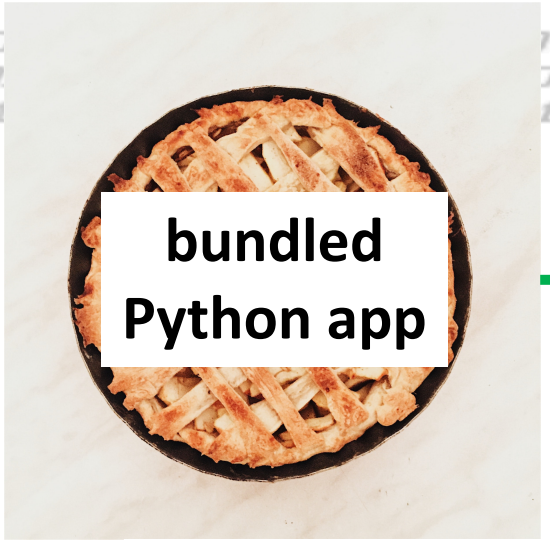
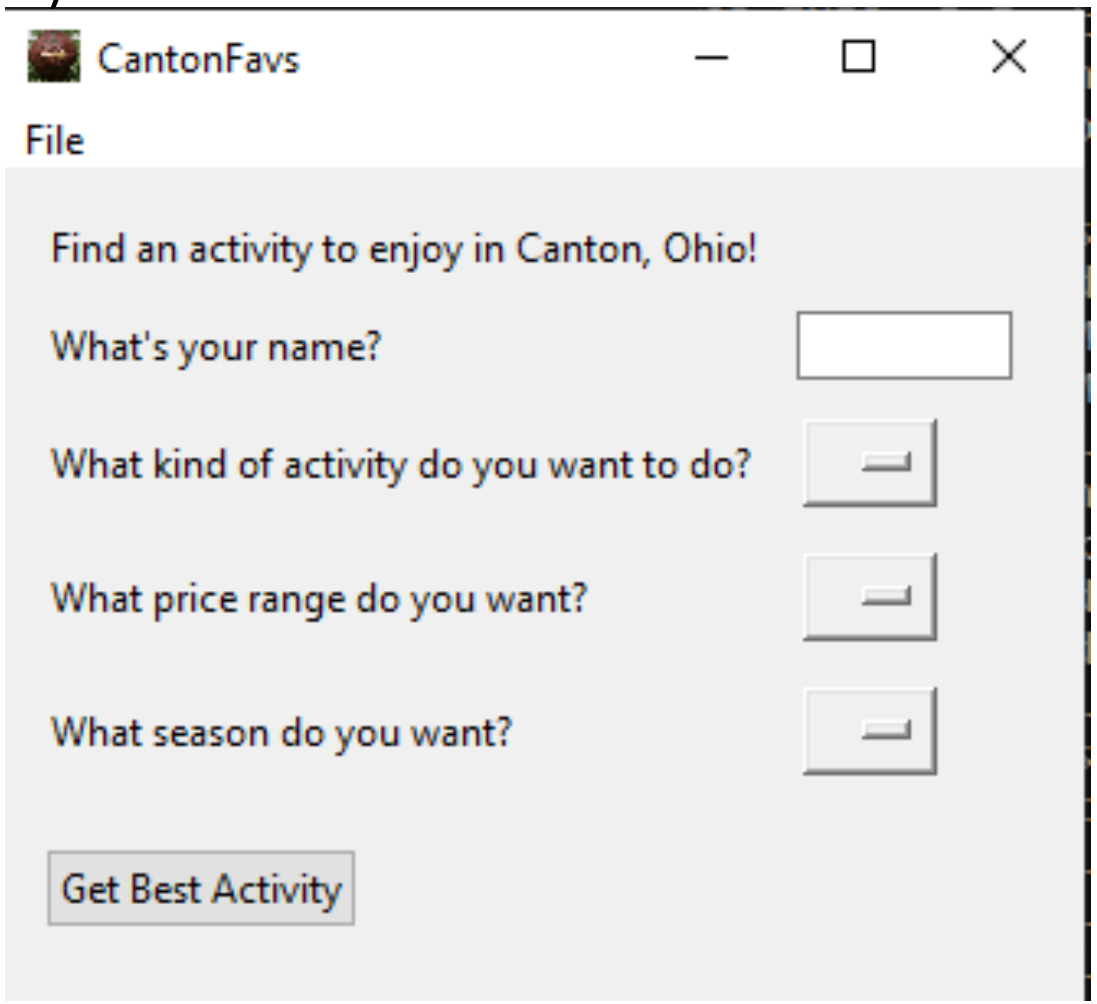


Install pie to kitchenless house,
no pantry, no cooking utensils

Your house, with kitchen, fully stocked
pantry, and all cooking utensils

Example program to bundle: CantonFavs

- App purpose: Find a recreational activity in Canton based on user preferences
- Used tkinter dependency to make GUI (Python 3.7)



Relevant details for bundling CantonFavs app

- Windows OS (I used Windows 10, 64-bit)
- Main script: CantonFavs_GUI.py
- Imports standard modules: tkinter, random (from numpy), pandas, sys, os
- Imports custom modules:
  - data_and_images.py: list data and image files as functions used by program for easy modification of file names
  - cantonfavslib.py: meat of the program
- Loads a data (text) file
- Loads image files
- Creates a (text) file

Pyinstaller can handle all these, BUT…

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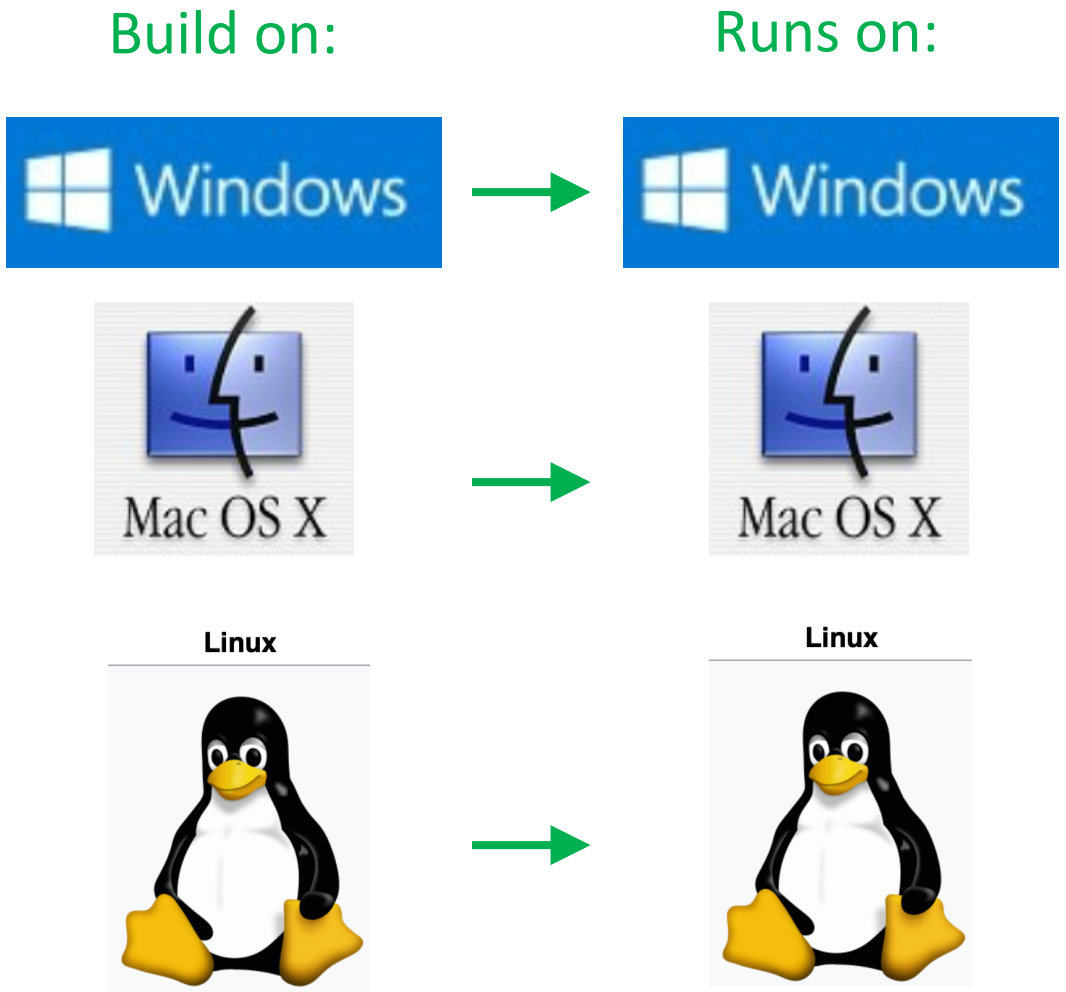
These (may) require special attention

Operating system matters

- Build your executable on the same kind of system your customers will run it on
- No cross-compiling
- *Version matters:* e.g. I made exe on Windows 10, 64-bit
  - Works best on Windows 10, 64-bit
  - Made on Windows 7, didn't run on Windows 10
  - Made on Windows 10, did run on Windows 7, but not tested for full functionality
  - May need to watch 32-bit vs 64-bit too (not tested but according to online forums…)

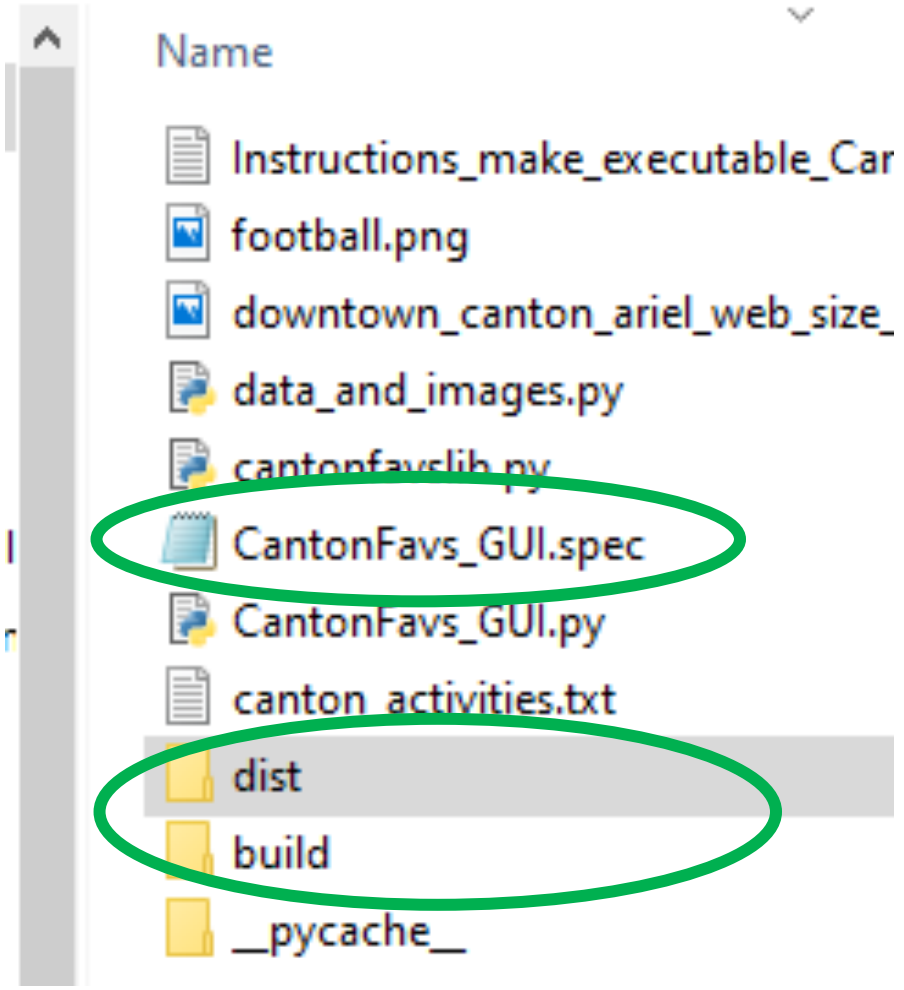


Basic use of pyinstaller

- Basic command:

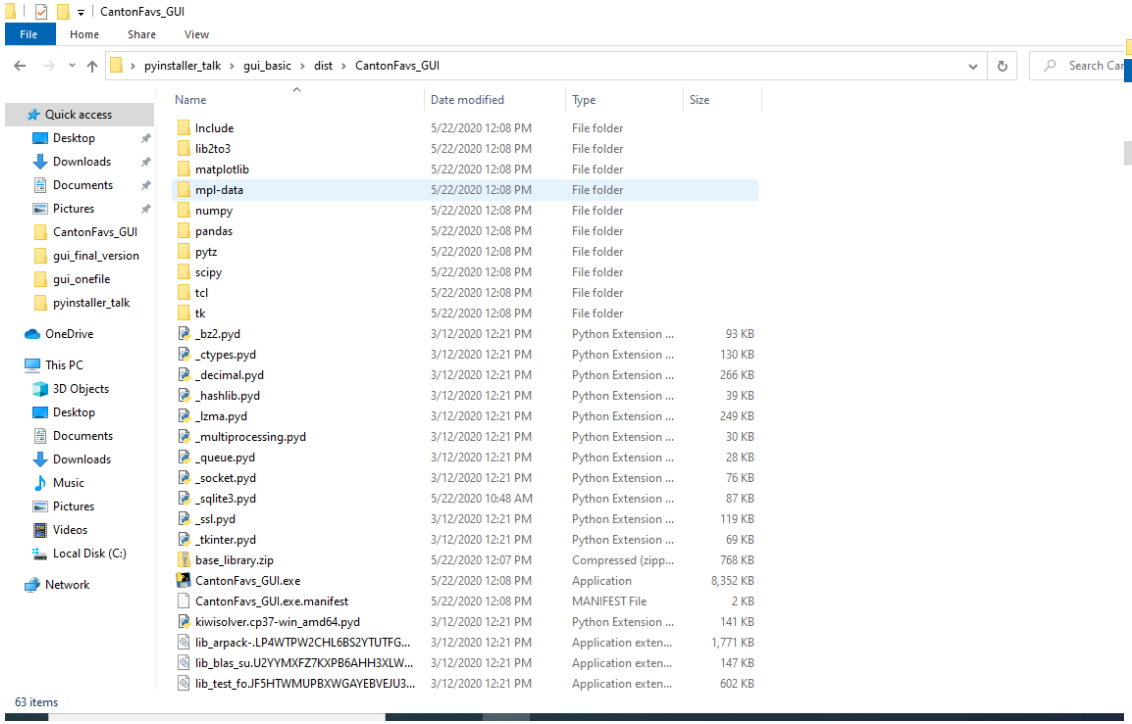
>> pyinstaller CantonFavs_GUI.py

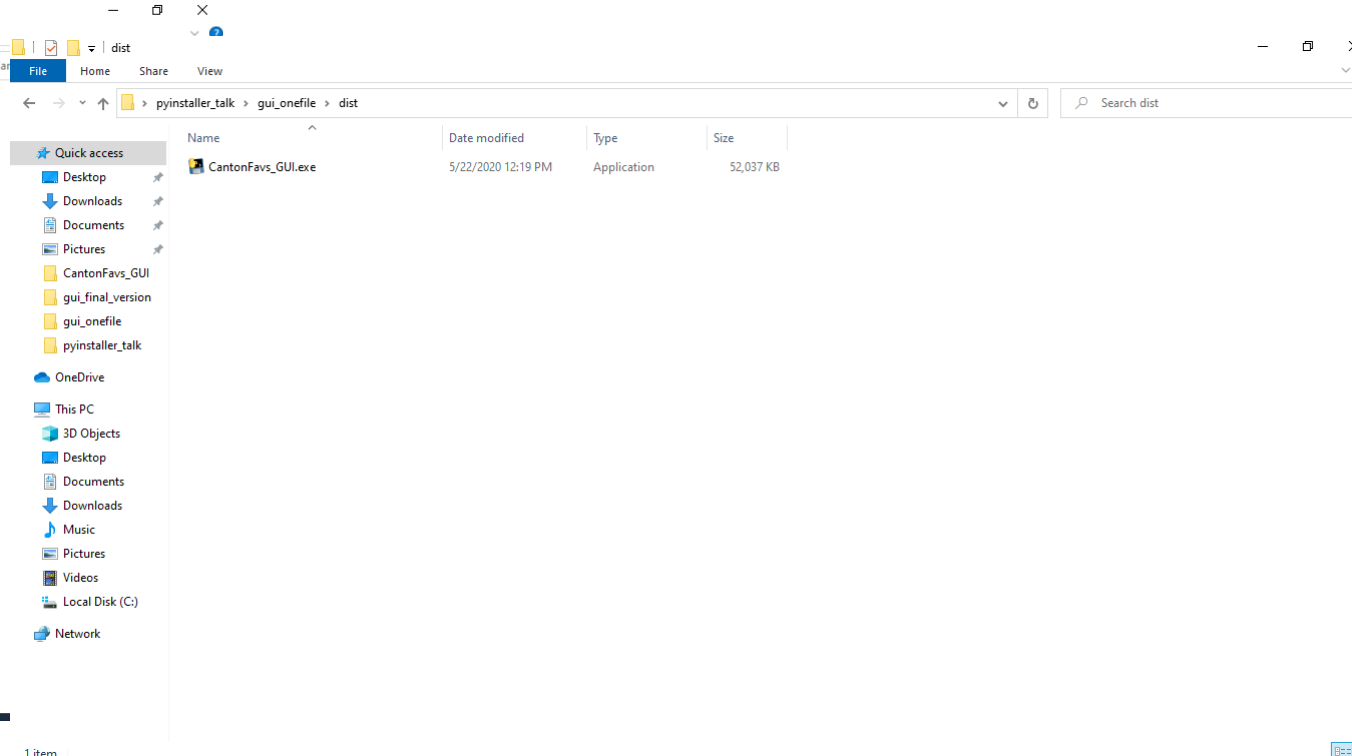
- Basic output:
  - dist folder: all contents must be distributed for executable to run
  - build folder: includes useful info like warnings file
  - spec file: can be used to adjust options for building, or repeat complicated build with simple command
- But
  - FAILS for our CantonFavs app
  - gives a LOT of files in dist folder (bad for non-programmer user)



Simplifying distribution to one file

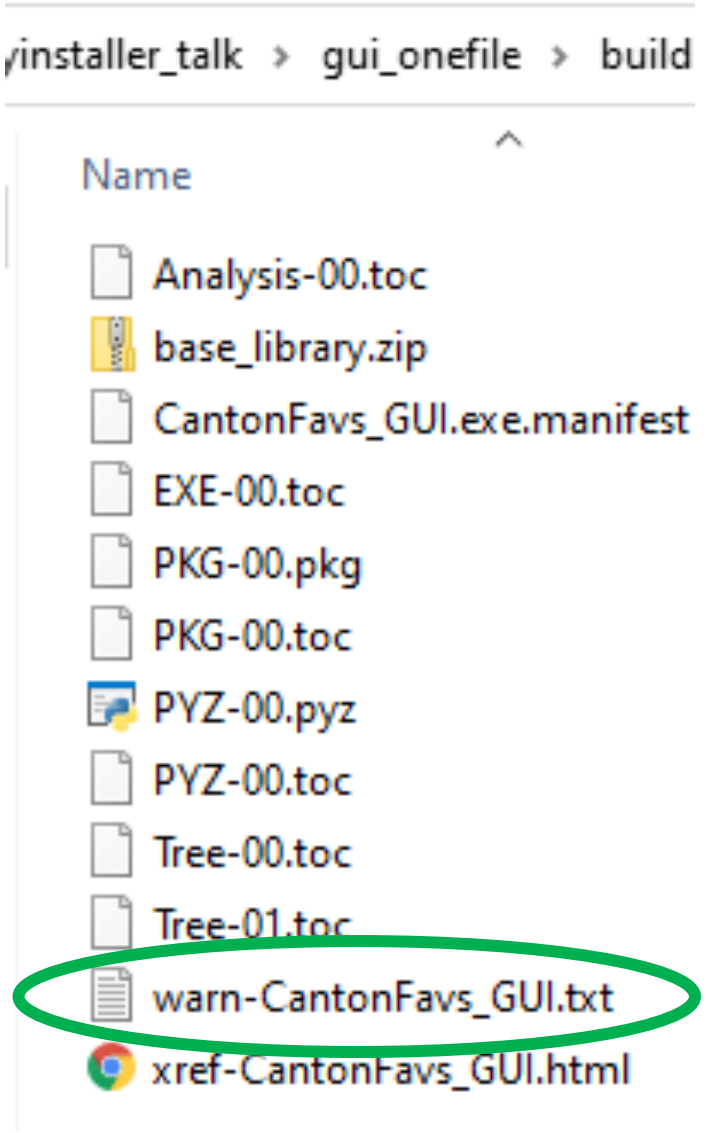
- Command: >> pyinstaller --onefile CantonFavs_GUI.py
- Nice for non-programmer; simplifies use on a different computer
- But it still FAILS to make our CantonFavs executable…





Possible issues: importing modules

- Look in build folder for: warn-CantonFavs_GUI.txt
- Lists missing modules that may or may not cause an issue…compare to what your app needs
- Possible fixes:
  - change your version(s) of the modules and/or pyinstaller
  - import specifically what you need in your python scripts e.g. “import numpy.random.rand” not just the basic “import numpy”
  - adjust CantonFavs_GUI.spec file: hiddenimports, hooks, etc. (…but we will look at spec file later)
- tkinter (hardest to fix), numpy, scipy have caused issues for me but ok for CantonFavs right now



Issue: Loading data and image files (same fix)

- Command with --add-data option:

>> pyinstaller --onefile **--add-data downtown_canton_ariel_web_size__large.png;. --add-data football.png;. --add-data canton_activities.txt;.** CantonFavs_GUI.py

- Create temporary folder for added files if you use --onefile:

  use sys._MEIPASS (see data_and_images.py module)

- Makes it easier: make functions out of files added
- CantonFavs app should now work!

Different for Linux/Mac, use colon instead, e.g., canton_activities.txt:.

```
def resource_path(relative_path):
    """ Get absolute path to resource, works for dev and for PyInstaller """
    try:
        # PyInstaller creates a temp folder and stores path in _MEIPASS
        base_path = sys._MEIPASS
    except Exception:
        # For dev
        base_path = os.path.abspath(".")

    return os.path.join(base_path, relative_path)
```

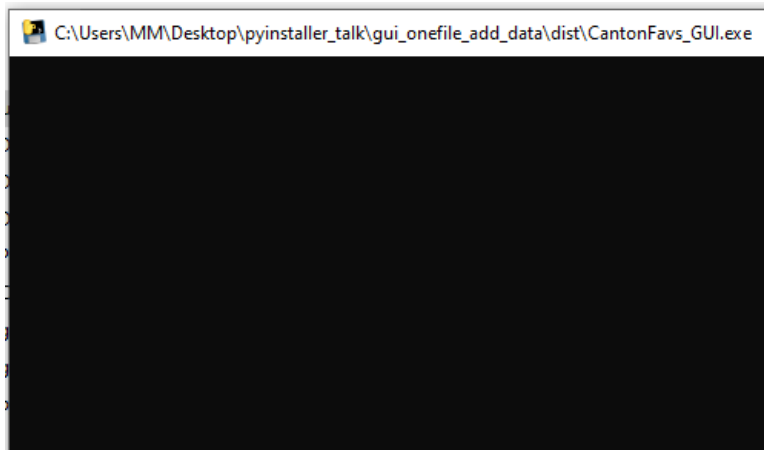
```
def UpperLeftPhoto():
    file_path = print_file('football.png')
    return file_path
```

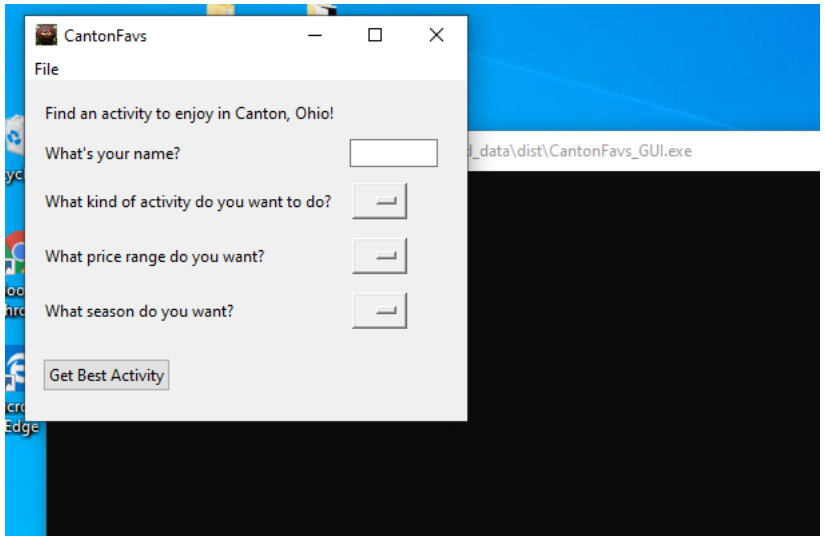
What's that console window doing first?

- Use --windowed option to get rid of it:

>>pyinstaller **--windowed** --onefile --add-data downtown_canton_ariel_web_size__large.png;. --add-data football.png;. --add-data canton_activities.txt;. CantonFavs_GUI.py

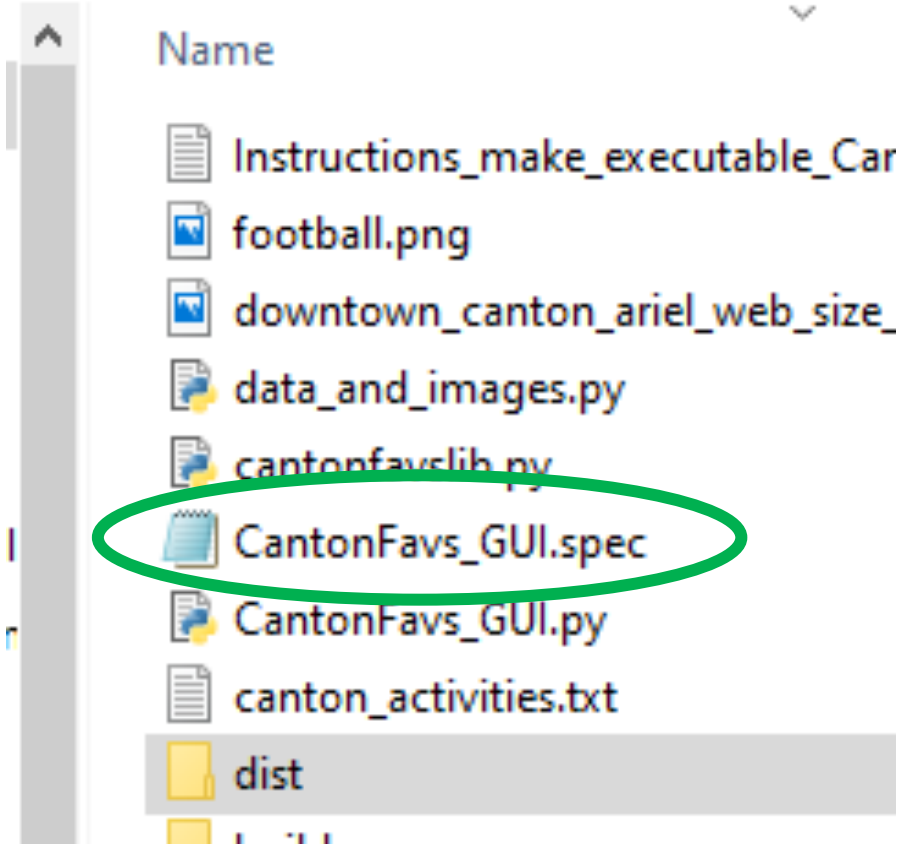
- Pros: lets you know app is loading since splash screen has to wait to load too, sometimes writes warnings/errors if you can read quickly
- Cons: could confuse user, isn't "pretty"





Using the spec file: CantonFavs_GUI.spec

- Handy for complicated builds, especially repeating them!
- Nice, simple command: >> pyinstaller CantonFavs_GUI.spec
- For example:
  - Add/change data and image filenames
  - Keep/remove console
  - Change name of exe file
  - Fix imports



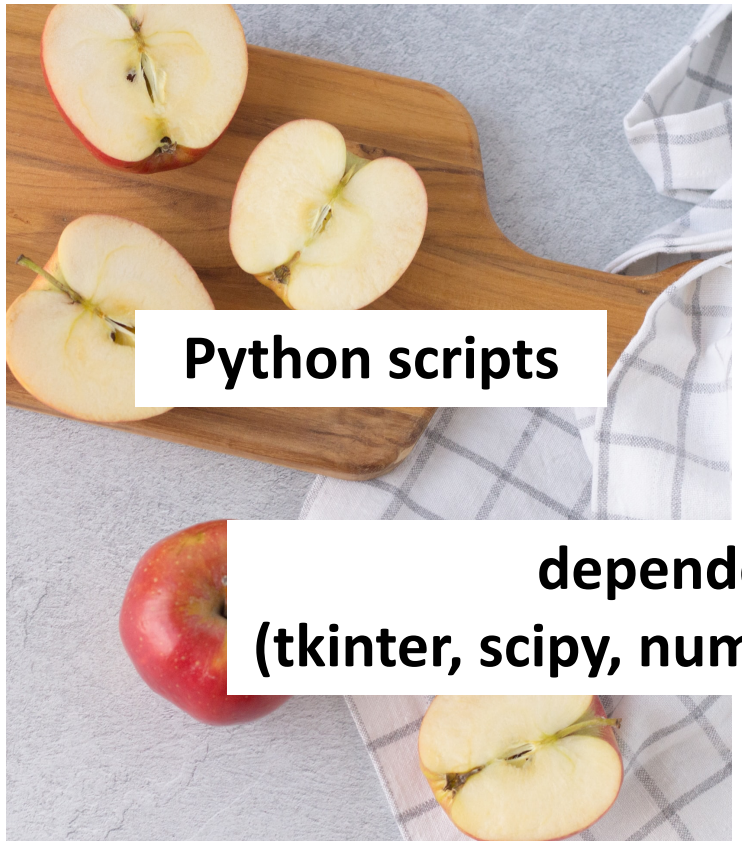
CantonFavs_GUI.spec - Notepad

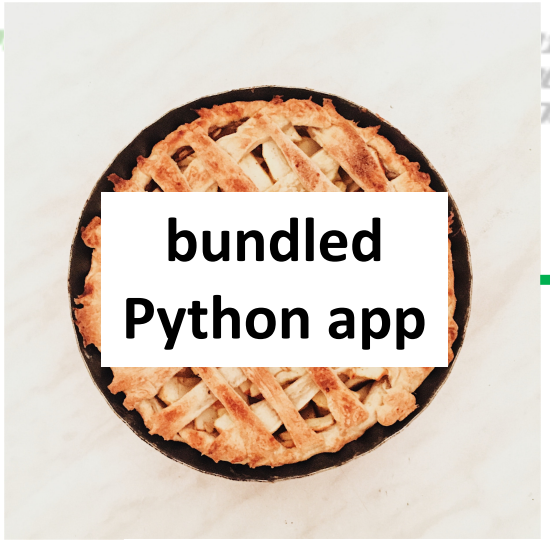
File Edit Format View Help

```
# -*- mode: python ; coding: utf-8 -*-

block_cipher = None


a = Analysis(['CantonFavs_GUI.py'],
             pathex=['C:\\Users\\MM\\Desktop\\pyinstaller_talk\\gui_version'],
             binaries=[],
             datas=[('football.png', '.'), ('downtown_canton_ariel_web_size__large.png', '.'), ('canton_activities.txt', '.')],
             hiddenimports=[],
             hookspath=[],
             runtime_hooks=[],
             excludes=[],
             win_no_prefer_redirects=False,
             win_private_assemblies=False,
             cipher=block_cipher,
             noarchive=False)
pyz = PYZ(a.pure, a.zipped_data,
             cipher=block_cipher)
exe = EXE(pyz,
          a.scripts,
          a.binaries,
          a.zipfiles,
          a.datas,
          [],
          name='CantonFavs_GUI',
          debug=False,
          bootloader_ignore_signals=False,
          strip=False,
          upx=True,
          upx_exclude=[],
          runtime_tmpdir=None,
          console=False )
```

In conclusion…

Pylnstaller





Install pie to kitchenless house, no pantry, no cooking utensils

Your house, with kitchen, fully stocked pantry, and all cooking utensils

Because not everyone likes to cook, but everyone likes to eat!

Pineapple Supply Co. on Unsplash

Have fun--try this on your own now!

Questions? ☺