

Packaging Python Projects with GeoPandas into Executables

When converting a Python project that uses GeoPandas and other dependencies into an executable, you have two main approaches. Below are detailed solutions for both.

Option 1: Standalone Executable with PyInstaller

This approach bundles Python and all required packages into a single .exe file. No downloads or installations are needed on the end-user's machine. Steps: 1. Install PyInstaller in your virtual environment: `pip install pyinstaller` 2. Build the executable: `pyinstaller --onefile your_script.py` 3. The EXE file will be available in the 'dist' folder. Characteristics: - Pros: End-users don't need Python or pip. Everything is bundled. - Cons: Large EXE size (200–400 MB when including GeoPandas and dependencies).

Option 2: Lightweight EXE with On-Demand Package Installation

This approach keeps the EXE smaller but requires Python and pip installed on the end-user's system. It automatically installs required packages at runtime using bootstrap code. Bootstrap code (place this at the top of your main script, before importing geopandas):

```
import subprocess, sys

def install_requirements():
    packages = ["geopandas", "shapely", "fiona", "pyproj", "rtree"]
    for pkg in packages:
        try:
            __import__(pkg)
        except ImportError:
            subprocess.check_call([sys.executable, "-m", "pip", "install", pkg])

install_requirements()

# Now safe to import geopandas and others
import geopandas as gpd
```

How to use: - Place the bootstrap code at the very beginning of your main Python file (before other imports). - When the program runs, it checks for each dependency. - If missing, it installs them automatically via pip. Characteristics: - Pros: Smaller EXE size. - Cons: Requires Python and pip installed on user's machine. Needs internet for package downloads.

Recommendation: - Use Option 1 (PyInstaller standalone) for non-technical users who just want to run the program easily. - Use Option 2 if your users already have Python and prefer smaller file sizes.