🔥 Wildfire Vulnerability Analysis Training Manual 🔥

# 📘 Overview

This manual documents the end-to-end process for preparing, executing, debugging, and exporting a geospatial wildfire analysis Python notebook. It includes all major obstacles, solutions, and workflow recommendations.

# 🔧 Environment Setup and File Management

- ✅ Installed Anaconda Navigator and Jupyter Notebook

- 📁 Opened `.ipynb` from within the folder containing shapefiles

- ⚠️ Opening it from elsewhere caused broken file paths

- 🗂️ Recommendation: Always keep the notebook and data in the same directory

# 🧪 Path Fixes and Dataset Integration

- 🗂️ Data required: `California\_Fire\_Perimeters\_2017.shp`, `firestations.shp`, LiDAR-derived DSM, DEM, nDSM

- 🔧 Fixes: Relative path adjustment, notebook moved into data folder

# 🧮 Geometry, CRS & Projection Challenges

- ⚠️ CRS Error: Avoided redundant `set\_crs()` unless using `allow\_override=True`

- ❌ Some invalid geometries handled with `.is\_valid`

- ✅ Reprojection to EPSG:32611 (UTM Zone 11N for San Diego)

# 📏 Distance Analysis

- 🔥 Incorrect WGS84-based distance calculations resulted in overflow

- ✅ Switched to projected CRS and used `.distance() / 1000`

# 📊 Scatterplot & Correlation Plotting Issues

- 📉 `tile cannot extend outside image` resolved by margin tuning

- ✅ Pearson correlation recalculated after data cleaning

- 🔠 Label offsets applied using `.text()` in matplotlib

# 💾 Saving & Exporting Results

- 💾 Used Save and Checkpoint in Jupyter

- 🖨️ Printed to PDF for better layout

- 🚀 GitHub export: PDF + Notebook + README.md

# 📈 Final Interpretation Summary

- 📏 Larger fires may occur farther from stations (weak correlation)

- 🛰️ DSM - DEM = Canopy Height

- 🧭 Overlay factors: aspect, slope > 40%, canopy height

# 🧭 Full Challenge-to-Solution Timeline

- 📌 Path issues ➝ Fixed by opening notebook from correct folder

- 🔄 Invalid CRS ➝ Fixed with projection consistency

- 🧹 Geometry issues ➝ Cleaned invalid features

- 🖼️ Render error ➝ Fixed with label padding

- 📉 NaN correlation ➝ Cleaned distances and recalculated

# 📋 Recommendations

1. 📂 Run notebooks from correct folder

2. ✅ Validate geometries early

3. 🗺️ Confirm CRS before spatial calculations

4. 📝 Run all cells before export

5. 📦 Zip and archive all related files

6. 🚀 Upload .ipynb, .pdf, README.md to GitHub