

# Workshop Development Proposal: Geospatial Programming

This document outlines a proposal for two distinct workshops focused on geospatial programming: one using open-source Python libraries and the other utilizing the Esri ArcGIS API for Python. Both proposals include course descriptions, learning goals, prerequisites, and a breakdown of key topics.

## 1. Open-Source GIS Programming with Python

### Course Description

This hands-on workshop introduces participants to the fundamentals of geospatial programming using free and open-source Python libraries. The course will demonstrate how to write Python code in a Jupyter Notebook environment to manage and analyze both vector and raster datasets. We will also explore advanced topics such as network analysis and building simple web applications. A core component of this workshop will be a practical approach to leveraging generative AI tools, specifically GitHub Copilot, to write code more efficiently and effectively.

### Prerequisites

- Basic knowledge of Python syntax and programming concepts.
- Basic understanding of GIS concepts (e.g., vectors, rasters, coordinate systems).

### Learning Goals

Upon completion of this workshop, students will be able to:

- Utilize open-source Python packages to manage and manipulate geospatial data.
- Write Python code to perform spatial and network analysis tasks.
- Develop a basic web application to display and interact with geospatial data.
- Effectively use generative AI tools like GitHub Copilot to assist in coding tasks.

### Key Topics

- **Module 1: The Open-Source GIS Stack in Python**
  - Introduction to key libraries: GeoPandas, Shapely, Rasterio, and Flask/Folium.
  - Setting up the development environment with Jupyter Notebook.
- **Module 2: Vector Data Management and Analysis**
  - Reading, writing, and manipulating shapefiles and GeoJSON with GeoPandas.
  - Performing geoprocessing tasks like buffering, intersecting, and merging.
- **Module 3: Raster Data Management and Analysis**
  - Working with raster data formats using Rasterio.

- Performing basic raster operations like clipping and reclassifying.
- **Module 4: Network Analysis**
  - Introduction to network datasets and basic routing algorithms.
  - Using Python libraries to find shortest paths or service areas.
- **Module 5: Building a Simple Web Application**
  - Creating an interactive web map with Python using Folium.
  - Setting up a basic web app with Flask.
- **Module 6: GenAI for Geospatial Programming**
  - Best practices for using GitHub Copilot to write code for geospatial tasks.
  - Troubleshooting code and exploring new functionalities with AI assistance.

## Resource

- **Textbook:** *Introduction to GIS Programming with Python: A Practical and Project-Based Approach to Geospatial Programming with Open-Source GIS Libraries*

## 2. Introduction to ArcGIS API for Python

### Course Description

This workshop provides a comprehensive introduction to the ArcGIS API for Python, a powerful library for automating and scripting tasks within the ArcGIS ecosystem. Participants will learn how to connect to their ArcGIS Online or ArcGIS Enterprise portal, manage content, create interactive web maps, and perform sophisticated spatial analysis using the API. This course is designed to empower users to automate repetitive tasks and extend the functionality of ArcGIS with Python.

### Prerequisites

- Basic experience with ArcGIS Online or ArcGIS Enterprise.

### Learning Goals

Upon completion of this workshop, students will be able to:

- Understand the key concepts and use cases of the ArcGIS API for Python.
- Connect to an ArcGIS portal and manage users, groups, and content.
- Programmatically create and share interactive web maps.
- Execute complex spatial analysis tools from the ArcGIS platform using Python scripts.

### Key Topics

- **Module 1: Getting Started with the API**
  - Connecting to ArcGIS Online or Enterprise from a Jupyter Notebook.
  - Understanding the GIS object and its properties.
- **Module 2: Content Management**
  - Searching for and accessing items in the portal.

- Programmatically adding, updating, and deleting content.
- Managing users and groups.
- **Module 3: Web Maps and Visualization**
  - Creating a WebMap object and adding layers from the portal.
  - Symbolizing features and configuring pop-ups.
  - Saving and sharing web maps with the organization or public.
- **Module 4: Advanced Analysis**
  - Executing geoprocessing services.
  - Performing analysis tasks such as finding nearest features or summarizing data.

## Resource

- **Online Documentation:** ArcGIS API for Python Samples