



ENVI[®] Pocket Guide

Deep Learning

N|V|5 GEOSPATIAL

Authored as a derivative from ENVI Deep Learning Tutorials & ENVI Documentation Center by:
CW3 Daniel Ruepong, 125D EN

In association with the U.S. Army Training with Industry (TWI) Program.

©2020 NV5 Geospatial Solutions, Inc. All rights reserved. ENVI® is a registered trademark of NV5 Geospatial Solutions, Inc. All other marks are the property of their respective owners.

The ENVI Pocket Guide is a quick reference booklet not intended to be read from cover to cover although it can be. The intent is to provide users with succinct steps on how to accomplish common tasks in ENVI.

If you need or desire comprehensive explanations of tasks from this guide refer to the following resources:

ENVI Documentation Center

NV5GeospatialSoftware.com/docs

ENVI Tutorials

NV5GeospatialSoftware.com/docs/tutorials.html

ENVI Help Articles and Tech Support

NV5GeospatialSoftware.com/Support

ENVI Videos

NV5GeospatialSoftware.com/Learn/Videos

CONTENTS

■ Getting Started.....	7-9
■ Deep Learning Single Class	
Open and Display Data	11
Region of Interest (ROI)	12-16
Build a Label Raster	17-20
Train a Deep Learning Model	21-29
TensorBoard	30-34
Perform Classification	35-41
Convert Classification Values to ROIs	42-45
Training a Deep Learning Model Using the ENVI Modeler	46-51
Generate and Run Code from ENVI Modeler	52-55

■ Deep Learning Multi Class

Label Training Rasters with ROIs	57
- Set Up a Deep Learning Project	58-59
- Define Classes	60-61
- Add Training Rasters	62-66
- Draw ROIs	67-70
- Restore ROIs	71-72
- View Project and Labeling Statistics	73
Train a Deep Learning Model	74-79
TensorBoard	80
Perform Classification	81-88
Export Classes to Shapefiles	89-96
View Class Activation Rasters	97-101
Training a Deep Learning Model Using the ENVI Modeler	102
Generate and Run Code from ENVI Modeler	102

GETTING STARTED

HARDWARE AND SOFTWARE REQUIREMENTS

1. In addition to having ENVI Deep Learning properly licensed and installed on your system, you also must have the following:
 - a. NVIDIA GPU driver version 410.x or higher
 - b. NVIDIA graphics card with CUDA® Compute Capability version 3.5 to 7.5
 - c. A minimum of 8GB of GPU memory to train the deep learning models

TEST INSTALLATION AND CONFIGURATION

1. Launch **ENVI** (5.5.x (64-Bit)) to determine if your system meets the requirements and is properly configured to run ENVI Deep Learning.
2. In the ENVI Toolbox, select **Deep Learning -> Deep Learning Guide Map**. In the Deep Learning Guide Map, click on **Tools** and select **Test Installation and Configuration**. It may take a few minutes for your system to perform its test.
3. The Test Results dialog opens when the test is complete. The following message will appear at the top of the Test Results dialog if your system is properly configured:

=====

YOUR SYSTEM IS PROPERLY CONFIGURED AND READY TO RUN ENVI DEEP LEARNING.

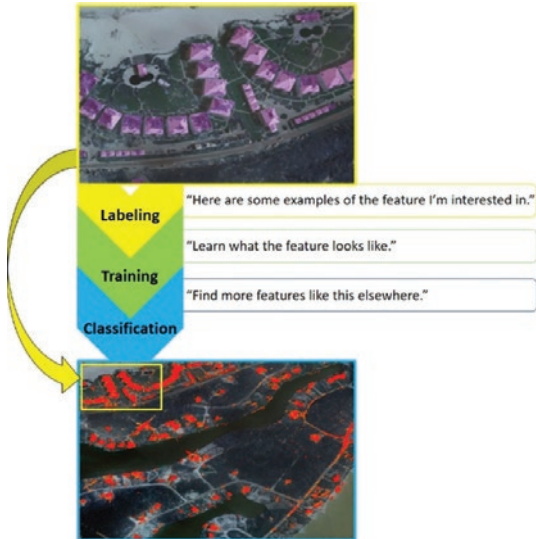
=====

4. Scroll to the bottom of the Test Results dialog to see the following message, further indicating that your system is ready to run ENVI Deep Learning:

```
Good news! This graphics card can be used with ENVI Deep Learning.  
*** Initializing a TensorFlow model ***  
OK.  
*** Creating a Label Raster ***  
OK.  
*** Training a TensorFlow Model ***  
OK.  
  
All tests completed.
```


5. If your system is not properly configured to run ENVI Deep Learning, review the information in the Test Results dialog to identify the problem and to contact Technical Support for assistance.

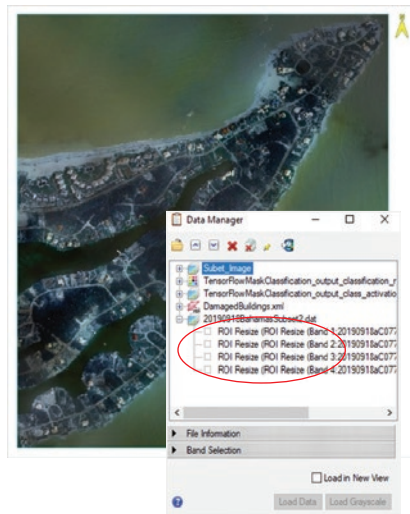
ENVI DEEP LEARNING: SINGLE CLASS



Deep Learning Single Class allows users to extract a single feature by labeling the feature of interest, creating a training model of what the feature looks like, and classifying data to find more of the same feature elsewhere. When executed properly, Deep Learning saves time and reduces margins of error.

OPEN AND DISPLAY DATA

1. Before you begin, it is recommended that you set up a Deep Learning project directory to keep your data and associated files organized.
2. Open your high-resolution image in ENVI. To view the full image, right-click on the image in the Layer Manager and select **Zoom to Layer Extent** or press **F12**.
3. Click the **Data Manager** button  in the ENVI toolbar. Expand the image to see the number of bands. The image used in this guide has 4 bands: red, green, blue, and near-infrared.



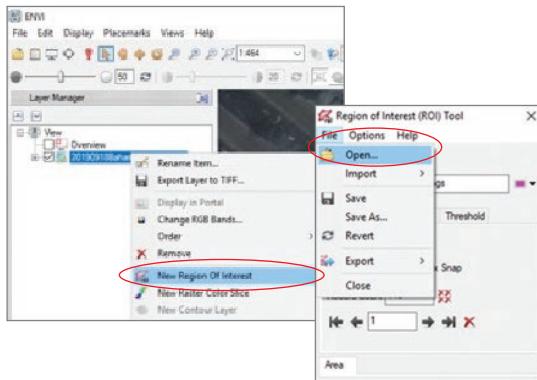
Images used throughout this guide obtained from the National Geodetic Survey:
<https://storms.ngs.noaa.gov/storms/dorian/index.html#7/26.970/-80.740>

REGION OF INTEREST (ROI)

1. If you are using an existing ROI, skip to **BUILD A LABEL RASTER** on page 16.

Note: You can convert features in other data formats such as ***.shp** and ***.csv** into ***.xml** ROIs to be used in Deep Learning. Go to **Help** in the ENVI main menu to learn more.

2. If you have an existing ROI but need to update or modify it before you use it, right-click on your image in the Layer Manager and select **New Region of Interest (ROI)**. In the ROI Tool, go to **File -> Open** and load your ROI.





Thank you for your interest in ENVI®

To continue reading the remaining chapters of the ENVI Deep Learning Pocket Guide please click the following button.

[DOWNLOAD THE COMPLETE POCKET GUIDE](#)

For more information:

nv5geospatialsoftware.com

Email: GeospatialInfo@nv5.com

Phone: 303.786.9900