EnMAP-Box

EnMAP-Box - Imaging spectroscopy data processing in QGIS

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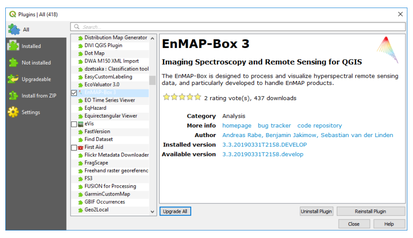
Short facts

- Free and open source QGIS plugin, GPL-3 licensed.
- Visualization & processing of imaging spectroscopy and common GIS data.
- Used in teaching and science.
- based on: QGIS, Qt, GDAL, NumPy, PyQtGraph, scikit learn

Installation

- Installation via QGIS Plugin Manager.



- Additional python requirements installable with python package installer (pip).

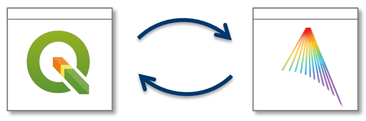
Getting started

- www.enmap-box.readthedocs.io
- Manuals and tutorials for beginners, advanced user and developers.
- Upcoming: EnMAP-Box tutorials on HYPERedu.

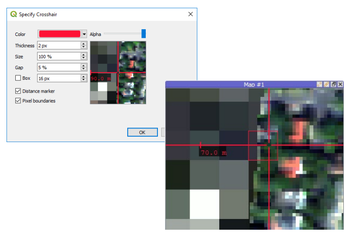
Visit the HYPERedu poster at ESA LPS 2019, Session C7.01 Board 355: Foerster et al.: HYPERedu - A New Online Learning Platform for Hyperspectral Remote Sensing.

Graphical User Interface

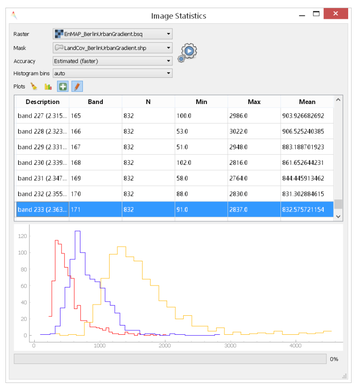
Interact between QGIS and EnMAP-Box windows, e.g. via drag & drop of map layers.



Map and Spectral library windows can be ordered in nested horizontal, vertical or tabbed layouts.



Customizable map crosshairs with surrounding pixel boundary of a selected raster grid (here simulated EnMAP 30 m).

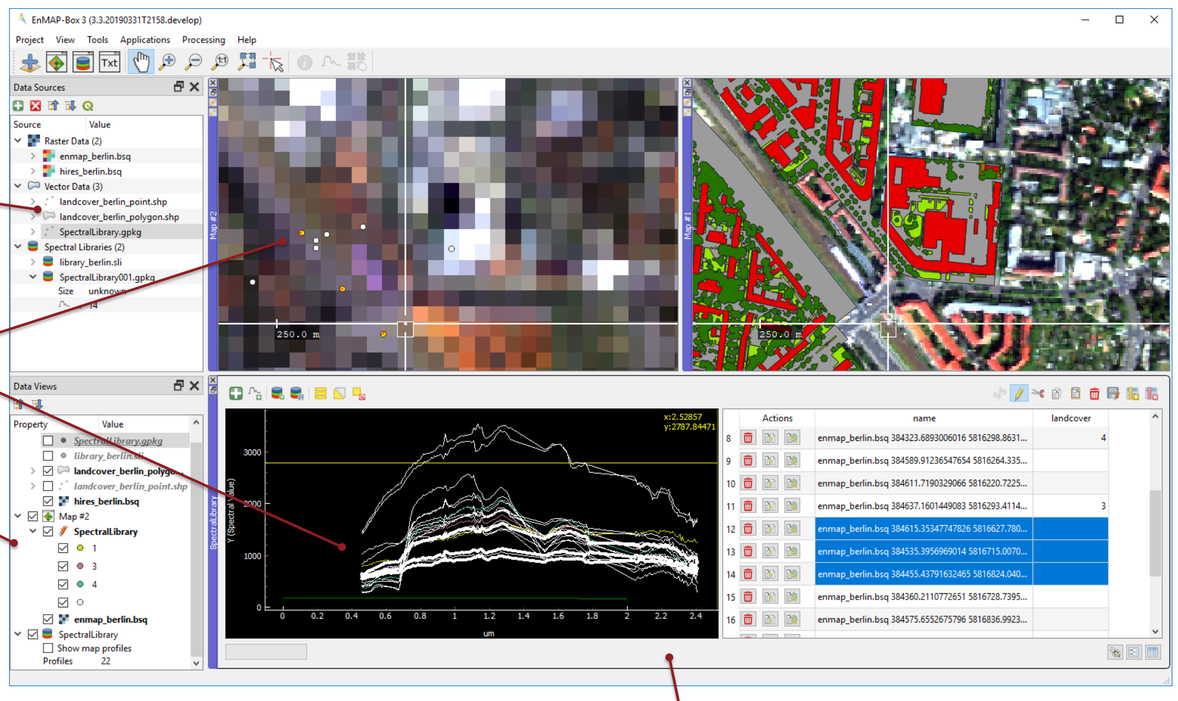


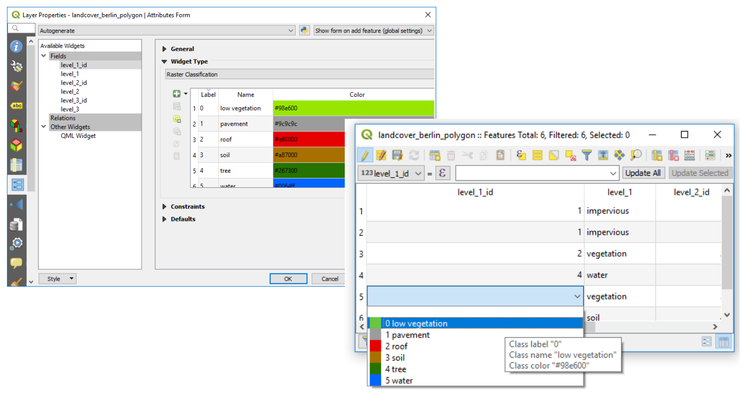
Interactive image statistics and histogram plotting.

Vector and raster sources + spectral libraries + processing models.

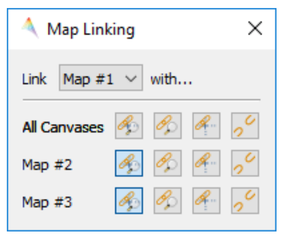
Profile coordinates visualized as point-layer.

Customizable layer-tree for each map window.





„Raster Classification“ form defines or imports a classification scheme (left) and ensures valid inputs to vector field attributes (right).

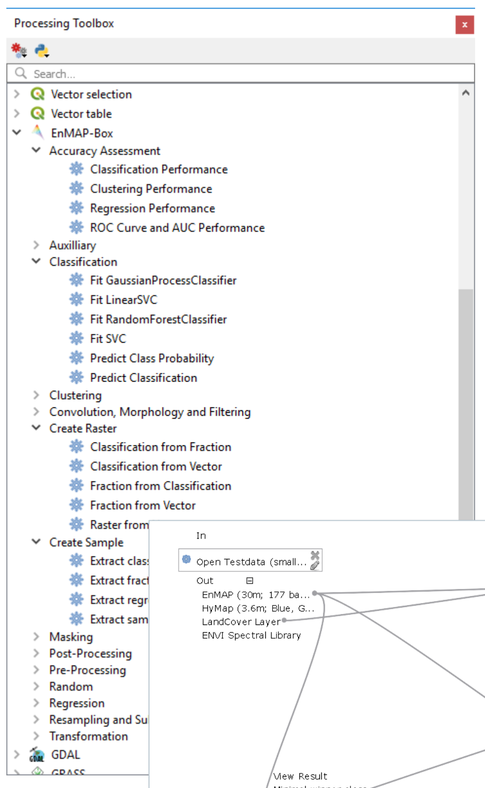


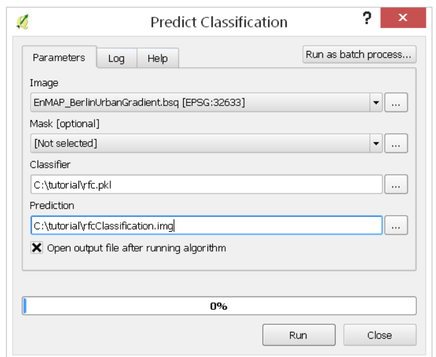
Maps can be linked by center, scale or both.

Spectral Library window to visualize & manage spectral profiles. Spectral Profiles can differ in number of bands and other properties, have editable metadata attributes (like other vector data), can be imported from maps or spectral libraries, can be dragged & dropped between spectral library windows.

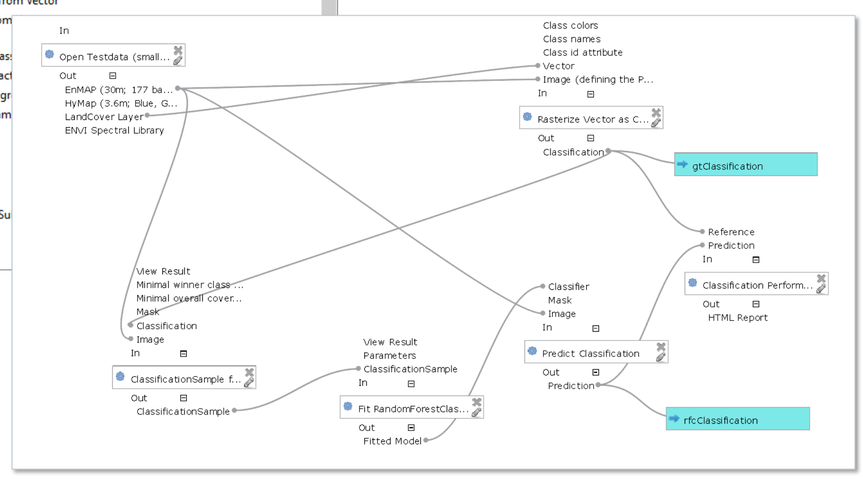
QGIS Processing Framework

EnMAP-Box brings more than 100 algorithms into the QGIS Processing Toolbox and Model Builder. These algorithms can be used together with algorithms from other providers.





Processing algorithm example that applies a fitted classification model to an image.



Model builder example showing an image classification workflow.

Application Programming Interface

The EnMAP-Box provides python application programming interfaces to interact with its graphical user interface, to visualize data, to create own applications and to easily implement efficient, higher-level workflows that process raster and vector data.

```
# start the EnMAP-Box
from enmapbox import EnMAPBox
enmapBox = EnMAPBox(None)
enmapBox.loadExampleData()

enmapBox.createDock('MAP') # add a new map
enmapBox.createDock('SPECLIB') # add a spectral library viewer
```

Example EnMAP-Box API: Create an EnMAP-Box instance, load test data, open a map and a spectral library window, like shown in Infobox “Graphical User Interface”.

```
from hubflow.core import *
from sklearn.ensemble import RandomForestClassifier
import enmapboxtestdata

# resample library spectra to EnMAP wavelength
library = EnviSpectralLibrary(filename=enmapboxtestdata.speclib)
enmapSensor = SensorDefinition.EnMAP()
enmapSpectra = enmapSensor.resampleRaster(filename='/vsimem/enmapSpectra.bsq',
                                          raster=library.raster())

# fit Random Forest Classifier and apply to an image
# get class labels from library metadata
labels = Classification.fromRasterMetadata(filename='/vsimem/labels.bsq',
                                           raster=library.raster(),
                                           classificationSchemeName='level 2')
# fit classifier on labeled spectra
classifier = Classifier(sklEstimator=RandomForestClassifier())
classifier.fit(sample=ClassificationSample(raster=enmapSpectra,
                                           classification=labels))
# apply classifier to another image
classification = classifier.predict(filename='/vsimem/classification.bsq',
                                    raster=Raster(filename=enmapboxtestdata.enmap))
```

HUB Workflow API example of an processing chain: A labeled spectral library is used to fit a random forest classification model, which afterwards is used to predict a land cover map from a simulated EnMAP image.

Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag
GFZ Helmholtz-Zentrum Potsdam
DLR
EnMAP Hyperspectral Imager

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