



ProRaster Scientific Feature Sheet

What is ProRaster Scientific?

ProRaster Scientific is software for rendering, processing, and analysing Earth Observation imagery. The advanced virtual raster processing pipeline technology minimises time, costs, and computation resources, whilst maximising efficiency, performance, and data quality.

The fully automated import process applies corrections to your Landsat (1-9) or Sentinel2 imagery scenes and builds pixel masks from QA data. Graphically and spatially query your scene database to select scenes from which to create new multispectral imagery products. Preview your scene using any band combination, pan-sharpening, and pixel masking, or preview scenes as a computed spectral index.

Using the graphical product editor, chain together processing operations to operate on your product. Apply pixel masking to remove clouds, then choose from more than 100 spectral indices that help quantify vegetation characteristics, map surface water or fire scars, measure soil moisture, and much more. Apply calculator operations and non-linear data transformations, if required, and focus on a region of interest by clipping to a polygon. Complete your analysis by computing multidimensional statistics, rendering imagery and spectral indices, and batch exporting imagery for video production.

ProRaster Scientific uses virtual raster technology to apply processing operations in real-time, at any scale, to rasters of any size. It takes no time, uses no resources, and the results can be rendered immediately allowing you to see if your processing operation has acted appropriately. The virtual raster output can be used as input to another operation, so you can build chains of processing operations. To take your data into other platforms, crystallise your virtual raster at any time by exporting it to a standard raster format like GeoTIFF or MRR.

ProRaster Scientific inherits and extends all the capabilities of ProRaster Premium. Render and explore rasters of any size or format, displayed in stunning clarity and rendered with industry-leading speed. Create, edit, display, export, and publish raster rendering algorithms that combine any rasters, regardless of differing coordinate system, cell size, or band structure. Open multiple map windows for each algorithm. Save your algorithms to MRD file and export to located images of any size that you can display in any GIS or mapping application that supports located imagery.

High Level Overview

- Effortlessly import multispectral satellite imagery scenes and tiles (without duplicating the raster data) and display the multispectral imagery using inbuilt spectral band combinations.
- From a collection of one or more scenes/tiles, build a product using the concepts of mosaicing, and compositing. Combine products together into temporal sequence products.
- In the Product Editor, build branching chains of processing operations that are implemented using virtual rasters. Effortlessly compute any of more than two hundred spectral indices. Render the final raster products, compute spatial and temporal statistics, or export to transportable raster formats.
- Use virtual raster technology to apply raster processing operations that render immediately and in real time. Crystallise your virtual raster at any time by exporting it to a standard raster format like GeoTIFF or MRR.
- Create, open, and edit multiple rendering algorithms simultaneously and generate default algorithms for rasters.
- Render the algorithm in multiple resizable map windows supporting zoom and pan. Display the data values and coordinates at any pixel in a floating tooltip.
- Export located imagery, of any size and at any scale, to a variety of standard formats. Use temporal batch export to export image sequences for video creation.
- Prepare your raster data using the Raster Source Editor, combine rasters together for convenience and control how rasters are loaded.
- Build, edit and import color look-up tables in the Color Table Editor.
- Build and edit Data Conditioning Filters for application to raster data prior to rendering.
- Build and edit custom data transforms in the Data Transform Editor.



Multispectral Satellite Scenes

- Import Landsat Scenes (Birds 1 – 9, Pre-collection to Collection 2, Level 1 – 2) automatically into a scene database. The raster data is not duplicated. Corrections are applied.
- Import Sentinel2 Tiles (Birds A&B, Level 1 – 2) automatically into a scene database. The raster data is not duplicated. Corrections are applied.
- Import multispectral imagery from any platform manually. The raster data is not duplicated.
- Browse a scene database spatially and by spreadsheet. Query for scenes and select scenes to render or from which to create products. Preview scenes in the browser using any band combination, pan-sharpening, and pixel masking, or preview scenes as a computed spectral index.
- Render scenes using valid spectral band combinations. Incorporate on-the-fly pan-sharpening and pixel masking to remove cloud affected data, when supported. Employ the full power of the rendering engine to exercise total control over rendering imagery.

Multispectral Satellite Products

- A product is sourced from one or more scenes or tiles. The basic products are - Scene, Mosaic, Composited Scene, and Composited Mosaic. A mosaic merges scenes into a single image. Compositing takes imagery collected at different times and chooses or computes the best data value for each pixel based on a set of rules.
- Products of the same type, containing data acquired at different times, can be combined into a product sequence. The sequence products are - Scene Sequence, Mosaic Sequence, Composited Scene Sequence, and Composited Mosaic Sequence.
- The Product Editor can be used to apply processing operations to a product. Most processing operations are implemented as virtual rasters and executed on-the-fly.
- Product processing operations are linked together into branching chains. If any operation in the chain is modified, all the downstream operations are updated.
- The Product Editor takes advantage of the rendering engine to provide rich visualisation options.
- The following operations transform all events, fields, and bands of a raster - Mask by raster, Clip to polygon, Reproject. Masking is usually used to remove cloud affected pixels. Clipping is usually the final operation before computing statistics for an area of interest.
- The following operations produce a single or multi-banded output for all events - Index, Difference, Calculator, Transform. Select from over 200 spectral index computations. Compute the difference between each frame in a sequence. Design your own computation formula. Apply a non-linear transformation to turn an index into a proxy.
- The following operations create rendering algorithms that are conveniently stored with the product - Render Algorithm, Display Algorithm. Render a spectral band combination in an RGB Color layer, or display a spectral index using a LUT Color layer.
- The following operations crystallise the data and evaluate the whole processing chain - Statistics, Export. Compute summary statistics, distribution statistics and temporal (multidimensional) statistics. Export complex virtual rasters to a collection of GeoTIFF or BIL rasters or an MRR raster.

Raster Processing Operations

- Raster processing operations are implemented by generating a virtual raster which will be immediately rendered. The virtual raster engine applies the operation on the source raster on-the-fly.
- Processing operations can operate on a single input raster or applied in a batch mode to multiple inputs.
- The following operations create a virtual raster output - Join, Classify (raster), Clip to polygon, Clip to raster, Reproject, Resample, Realign, Calculator, Create Raster Mask, Conditioning, Transform, Image Sequence.
- “Join” is a simple merge operation that joins together a collection of similar rasters.
- Classify (raster) will generate a true classified raster by mapping values to a flexible class table.
- “Clip to polygon” will clip an input raster to a polygon. The clipping polygon must be stored in a MapInfo Pro TAB format file. Complex polygons sets are supported including multiple polygons, and polygons with holes and islands.
- “Clip to raster” applies a raster mask, clipping data where the mask raster evaluates as invalid.
- “Reproject” changes the coordinate system of a raster and reprojects. “Resample” changes the cell size of a raster. “Realign” moves the cell edges in a raster.



- “Calculator” evaluates a calculator style expression. Multiple rasters or raster bands can be used as input variables to the expression.
- “Create Raster Mask” simplifies the process of creating a raster suitable for use in a masking (clip to raster) operation.
- “Conditioning” applies a Data Conditioning Filter (that you design in the Data Conditioning Editor) to a raster band.
- “Transform” applies a data transform (that you design in the Data Transform Editor) to a raster band.
- “Image Sequence” takes multiple MRD rendering algorithms and turns them into an image sequence raster. When displayed, you can use the Time Control Panel to flip through images in the sequence.
- The following operations crystallise the raster data - Statistics, Export, Classify (vector), Declutter.
- Compute and explore summary statistics, distribution statistics and temporal (multidimensional) statistics.
- Export virtual rasters (or rasters of any supported format) to a collection of GeoTIFF or BIL rasters or an MRR raster.
- Classify (vector) will generate a true classified raster directly from a MapInfo table containing polygons. It is designed to “convert” a polygonal table database directly to a high-resolution classified raster.
- Declutter will remove small isolated “islands” of cells from a raster to remove unwanted details.
- The following operations publish algorithms to MapInfo - Publish Algorithm, Publish Polygon Clipped Algorithm. See the notes regarding incompatibility, below.

Algorithm Editing

- Open algorithm MRD files for display and editing.
- Create default algorithms for rasters or raster sources.
- Create default algorithms for WebMaps (WMS - georeferenced map images and data).
- Create algorithms that match rendering styles for a raster in MapInfo Pro.
- Create new algorithms with a one or more Image, LUT Color, or RGB Color layers.
- Add, delete, and reorder layers.
- Add default layers for rasters, raster sources, WebMaps, or WebMap Overlays. A WebMap Overlay layer is a greyscale transparent WMS map that preserves detail (like roads and place names) whilst removing other map information to maximise the color saturation of underlying raster layers.
- Edit multiple algorithms simultaneously using undo and redo.
- The floating Time Control Panel is used to change the event time in an algorithm (to go forward or backwards in time, or to a specific time).
- Render the algorithm as you edit it in an interactive preview map or one or more undocked map windows.
- Zoom and pan the map using the mouse and define zoom ranges manually.
- Display the data values and coordinates at any pixel in a floating tooltip and acquire a deep pixel report by double clicking on any map.
- Save your algorithm to an MRD file.

Imagery Export

- Render an algorithm and export to a located image in MRR, GeoTIFF, or BIL format.
- Clip to the current map extents or to a polygon. The clipping polygon must be stored in a MapInfo Pro TAB format file. Complex polygons sets are supported including multiple polygons, and polygons with holes and islands.
- Precisely control the resolution, size, and extent of the image.
- Batch export imagery when the algorithm contains multiple time points. Use the imagery sequence in video production.

Publishing

- Algorithms use extensions and reference virtual rasters that are not supported in MapInfo Pro. Consequently, publishing algorithms to MapInfo Pro may fail.
- Publish basic algorithms in the latest version of MapInfo Pro. This loads the algorithm and displays it in a map. MapInfo Pro will access the source rasters when it displays the algorithm to guarantee high quality rendering at any scale.
- Clip your algorithm to a polygon and publish it in the latest version of MapInfo Pro. The clipping polygon must be stored in a MapInfo Pro TAB format file. Complex polygons sets are supported including multiple polygons, and polygons with holes and islands.



Raster Source Editor

- The Raster Source Editor is used to create and edit raster source objects.
- A Raster Source is a global resource you can use in your algorithms to easily connect rasters to layer components.
- A raster source can link to one or more rasters, or all rasters in one or more folders.
- Render multiple rasters with a single layer in the algorithm using a raster source.
- Use the Validate, Clean and Prepare processing operations to build statistics and overview pyramids.
- Exercise control over how the raster engine mounts a raster Control by defining driver preferences.
- Acquire a raster information report, including statistics.

Color Table Editor

- The Color Table Editor is used to create, edit, and import color ramps, color tables, color maps, and color legends. You will use these global resources in the LUT Color layer in your algorithm.
- Color Ramps are simple color lookup tables that interpolate between two defined colors in RGB or HSL color space.
- Color Tables are color lookup tables that interpolate between multiple defined colors in RGB or HSL color space.
- Color Maps are color lookup tables that associate a data value with every defined color. They define both the data-color mapping and the color for a LUT Color layer.
- Color Legends are color lookup tables that associate a data value, data range, or text string with a defined color. They define both the data-color mapping and the color for a LUT Color layer.
- Link a folder to import all recognised color tables or color maps discovered in that folder.
- Automatically create a custom color table for a classified raster.

Data Conditioning Editor

- The Data Conditioning Editor is used to create and edit Data Conditioning Filters that can be applied to any raster in a component on-the-fly.
- Invalidate values, ranges of values, and ranges of color values to remove them from the raster on-the-fly.
- Apply a linear transformation to scale and translate raster values on-the-fly.
- Cap raster values to minimum and/or maximum values on-the-fly.
- Convert invalid values to a background value.

Data Transform Editor

- The Data Transform Editor is used to create and edit customised data transforms that are used in LUT Color and RGB Color layers to transform raster data values to color table indices.
- Create a data transform from any of the standard data transforms and customise it.
- Create unrestricted customised data transforms from tabulated data in a variety of ways.
- Display a preview map showing the transform applied to a raster of your choice.
- Display summary and distribution statistics for a raster of your choice.

Algorithm Properties

- Override the Coordinate System of the algorithm. All rasters will be reprojected into this coordinate system.
- Set a default Valid Cell By Component (VCBC) rule for all layers to determine whether pixels will be rendered if data is missing from one or more components.
- Reverse the layer rendering order.
- Fix the interpolation method for Color/Red/Green/Blue/Image/Pan and Intensity components. Options include Nearest, Linear, or Cubic.
- Define the invalid pixel color and opacity.
- Define the background pixel color and opacity.
- Specify the blending rule (opacity – transparency) and related properties.
- Override the Intensity component shadow and highlight parameters (to control hill shading for all layers).



Layer Properties

- Define one or more LUT Color layer, RGB Color layer, or Image layers in the algorithm.
- LUT Color layers have Color, Intensity, Opacity, and Mask components.
- RGB Color layers have Red, Green, Blue, Intensity, Opacity, Pan-sharpening, and Mask components.
- Image layers have Image, Intensity, Opacity, and Mask components.
- Define or override the Coordinate System of the layer if unknown or incorrect.
- Override the VCBC rule for this layer.
- Disable cell value reporting for a layer.
- Convert all color to greyscale.
- Set the Color – Intensity balance for the layer to balance color saturation and hill shading intensity.
- Set the opacity for the layer when blending.
- Define the interpolation method for Color/Red/Green/Blue/Opacity/Pan components.
- Ignore alpha (opacity) data in Image layers.

Component Properties

- For each component, select the Raster Source or browse to a raster. Specify the field and band. Specify the time range of data to accumulate.
- Select a Data Conditioning Filter if desired.
- Define or override the Coordinate System of the component if unknown or incorrect.
- Adjust the resolution of the layer, used to control WebMap scale and detail.
- For Color/Red/Green/Blue/Opacity/Pan components, select a data-color transform to map data to color index.
- For Color components, select a color table. Red/Green/Blue/Opacity components have a fixed color table.
- Option to clip to specified limits to prevent rendering of pixels.
- Option to reverse the color table.
- Define the interpolation method, if not overridden by the layer or algorithm.
- For Color/Red/Green/Blue/Opacity/Pan components where the data transform is based on statistical data, define an alternative raster source for those statistics.
- For the Intensity component, enable Shadow and specify the azimuth, altitude, and scale.
- For the Intensity component, enable Highlight and specify the azimuth, altitude, and scale.
- For the Intensity component, specify a manual scale.

Coordinate Systems

- Projection Explorer provides access to hundreds of defined coordinate systems.
- Search for appropriate coordinate systems graphically or by EPSG code or any other text.
- Create custom coordinate systems.

Data Transforms

- Select from a wide variety of standard transforms, many of which can be modified by setting clipping limits manually, as a percentage, or as a percentile.
- Non-transforms - Pass (Scaled, Index, Value), Rotate Index
- Linear transforms - Color Bits, Linear
- Non-linear transforms - Logarithmic, Equal Area (Fast, Stable), Sigmoid (Lightening, Darkening)
- Ranges – Ranges (over full range, between defined limits), Quantile Ranges
- Ranges - Ranges (about the mean, median, mode), Deviations about the mean
- Ranges - Jenks Natural Breaks.
- Select any system or user defined color map.
- Select any custom designed data transform.



Compatibility

- Located imagery (RGB/RGBA) is created in MRR, GeoTIFF, or BIL format. MRR format imagery can be displayed in MapInfo Pro 2015+. GeoTIFF and BIL format imagery can be displayed by a very wide variety of GIS and mapping applications.
- Qualitative rasters (continuous grids) are created in in MRR, GeoTIFF, or BIL format. MRR format rasters are supported by MapInfo Pro 2015+. GeoTIFF and BIL format rasters are supported by a very wide variety of GIS and mapping applications.
- Rendering algorithm files (MRD) are compatible with other tiers of ProRaster. Simple rendering algorithms may be compatible with MapInfo Pro 2021+ (see below).

Incompatibility

- ProRaster Scientific creates virtual rasters (MVR) that can only be used in other tiers of ProRaster.
- Rendering algorithms files (MRD) have advanced features that are not supported in MapInfo Pro and, as a rule, cannot be displayed in MapInfo Pro. However, some simpler rendering algorithms can be displayed. For more information, consult the “Incompatibility” section in the ProRaster Premium Feature List.

Contact

ProRaster Scientific is developed by Roberts Geospatial Engineering. Our software is proudly designed, developed, and supported in Australia. For more detailed information on all the features of ProRaster Scientific, please download the ProRaster User Guide from the Roberts Geospatial website.

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