Package: fvfmR (via r-universe)

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Type Package

Title Chlorophyll Fluorescence (Fv/Fm) Analysis of Leaf Disc Images

Version 1.0.0

Description Semi-automated analysis of chlorophyll fluorescence images of leaf discs taken with a 'Walz' 'IMAGING-PAM' fluorometer. Provides an R interface to the 'fvfmPy' 'Python' package, which detects leaf discs, assigns them to a grid of rows and columns, and computes the maximum quantum efficiency of photosystem II, Fv/Fm = (Fm - Fo) / Fm, for each disc. The interactive 'fvfmPy' window is launched from R and the results are returned to R as a data frame.

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URL https://github.com/garenj/fvfmR, https://github.com/garenj/fvfmPy

BugReports https://github.com/garenj/fvfmR/issues

Encoding UTF-8

Language en-GB

Imports reticulate, utils

Suggests testthat (>= 3.0.0)

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SystemRequirements Python (>= 3.10), fvfmPy (>= 1.0.0)

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NeedsCompilation no

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`fvfm_example` *Path to the example images*

Description

fvfmR ships with two example `.pim` images from a Walz ImagingPAM. Use them to try out `run_fvfm` or to check your installation.

Usage

```
fvfm_example(file = NULL)
```

Arguments

`file`	Name of an example file. `NULL` (default) returns the folder containing all example images.

Details

`example1.pim` A full 5 x 9 tray. The default settings detect all 45 ROIs and the correct grid, so it can be analysed straight away.

`example2.pim` A 6 x 10 tray with three empty cells (column 10, rows 4 to 6), which needs some adjustment before analysis:

- Fill the three empty cells with dummy ROIs (double-click) so that every ROI is assigned to the correct row and column.
- Rotating the image slightly helps align the grid.
- One leaf is split into two ROIs with the default settings; increasing *Watershed segmentation size* slightly (to about 36) merges them.

Remove any extra ROIs outside the leaves by double-clicking them.

Value

Path to the example folder, or to `file` within it.

Examples

```
fvfm_example()
list.files(fvfm_example())
fvfm_example("example1.pim")
## Not run:
results <- run_fvfm(fvfm_example())

## End(Not run)
```

`fvfm_setup` *Set up the Python environment for the fvfmR package*

Description

Creates a dedicated virtual environment called `fvfm-env` and installs the fvfmPy Python package and its dependencies into it. Run this once after installing the package, or again to update fvfmPy. The environment is created in reticulate's virtualenv folder (see `virtualenv_root`) and needs about 1.5 GB of disk space.

Usage

```
fvfm_setup(python = NULL, source = NULL, ask = interactive())
```

Arguments

`python`	Path to a Python 3.10+ executable used to create the virtual environment. `NULL` (default) lets reticulate find Python on your system.
`source`	Optional path to a local fvfmPy source (`.tar.gz`) or wheel (`.whl`) file. `NULL` (default) installs the latest release from PyPI.
`ask`	Logical. Ask for confirmation before creating or modifying the Python environment? Default: `TRUE` in interactive sessions.

Details

By default the latest release of fvfmPy is installed from PyPI. Use `source` to install from a downloaded `.tar.gz` or `.whl` file instead. Running `fvfm_setup()` again updates fvfmPy to the latest release.

If you already have a Python environment with fvfmPy installed, you can skip this step and point the package at it with `options(fvfmR.python = "/path/to/venv/bin/python")`.

Value

Invisible path to the environment's Python executable, or `NULL` if setup was cancelled.

Examples

```
## Not run:
fvfm_setup()
fvfm_setup(source = "~/Downloads/fvfmpy-1.0.0.tar.gz")

## End(Not run)
```

`run_fvfm` *Run the fvfmPy leaf disc analysis GUI*

Description

Opens the fvfmPy window, either on a folder of `.pim`, `.tif` or `.tiff` images from a Walz Imaging-PAM or with no folder open (choose one with the *Open folder* button). Use the window to check the detected leaf discs, adjust rotation, cropping, rows/columns and segmentation settings, and press *Analyze* (or Enter) to log each image. See the fvfmPy User's Guide for details.

Usage

```
run_fvfm(directory = NULL, output = NULL, overwrite = FALSE, python = NULL)
```

Arguments

`directory`	Optional path to the folder containing the images. `NULL` (default) opens the window without a folder.
`output`	Optional path to a CSV file to write the results to.
`overwrite`	Logical. Overwrite `output` if it already exists? Default: `FALSE`.
`python`	Optional path to a Python executable with fvfmPy installed. See `fvfm_setup` for how the default is chosen.

Details

R waits while the window is open. When you close it, every observation logged during the session is returned as a data frame, so there is no need to use the *Save results* button (it still works if you want an extra copy).

The GUI runs as a separate Python process, so a problem in the GUI cannot crash your R session.

Value

Invisibly, a data frame with one row per leaf disc and columns `filename`, `row`, `col`, `leaf_number`, `centroid_x`, `centroid_y`, `mean_Fo`, `mean_Fm` and `FvFm`; or `NULL` if no images were analysed.

Examples

```
## Not run:
results <- run_fvfm()   # choose a folder in the window
results <- run_fvfm("~/Dropbox/Experiment1/images")
run_fvfm("~/Dropbox/Experiment1/images", output = "results.csv")

## End(Not run)
```

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