KARMEN**solutions**

advanced image and video analysis

KARMEN SOLUTION SOFTWARE

WHITEPAPER

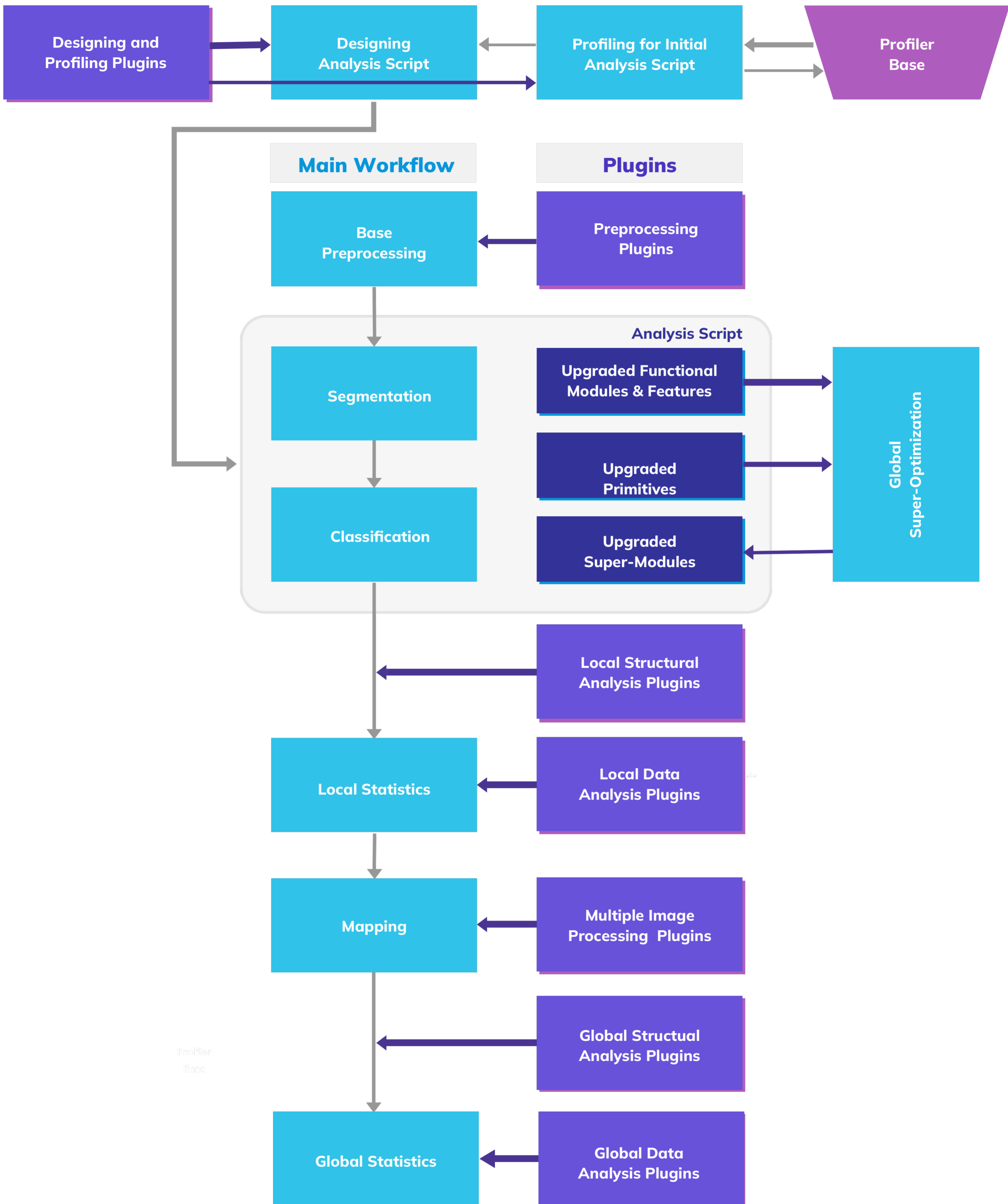# KARMEN**science**

advanced life science image analysis

KARMEN**studio**

advanced aquaculture video analysis

Designing flow

| Designing and Profiling Plugins | → | Designing Analysis Script | ← | Profiling for Initial Analysis Script | ← | Profiler Base |

Main Workflow

Plugins

Base Preprocessing ← **Preprocessing Plugins**

Analysis Script

Segmentation → **Upgraded Functional Modules & Features** →

Classification → **Upgraded Primitives** →

Upgraded Super-Modules ← **Global Super-Optimization**

← **Local Structural Analysis Plugins**

Local Statistics ← **Local Data Analysis Plugins**

Mapping ← **Multiple Image Processing Plugins**

← **Global Structual Analysis Plugins**

Global Statistics ← **Global Data Analysis Plugins**

KARMENstudio workflow

The main workflow consists of base preprocessing, segmentation and classification with integrated functional modules and features, mapping and statistics.

✓ The mapping module is merging individual images into one complete virtual image/folder.

✓ Statistics module contains basic data analysis of main image features. Any extended data analysis is provided by additional suitable plugins.

✓ Plugins supported: Image-based: include preprocessing step; Data-based: include data analysis; Based on image and data: include multiple image processing; Based on extended data: include structural analysis; Upgraded Functional Modules; Upgraded Features

Extensive workflow

Image analysis workflow includes following steps:

- preprocessing,
- segmentation,
- classification,
- multiple image processing,
- structural analysis and
- data analysis

Segmentation and classification contain intermediate computational scripts, each programmed as an independent functional module.

Deep Learning

Deep Learning allows fast and efficient image analysis containing complex visual structures. In addition, thanks to Deep Learning, we can also quickly develop novel analysis scripts for new applications through automated proposing patterns of new scripts, based on our extensive experiential database, and adjusting the parameters of the new script modules.

High-Speed and High-Throughput Image Processing

Full analysis of a typical 8-megapixel image with resolution 3266×2450 pixels rarely takes more than 2 seconds on an average computer today. Developing a novel script module for new applications takes only a few weeks.

Multiple-image orientation

Our image analysis is oriented to work with many related images, such as individual images forming a large visual scene, or a sequence of images captured in a short time, or slow time lapse of images, or images taken as cross-sections of 3D digitized objects.

This multiple-image orientation is ensured for high-speed image analysis and high data optimization, which enables simultaneous access and handling of even extremely large amounts of data.

Extensive Modularity and Flexibility

KARMENstudio is highly modular and easily upgradable for different applications.
Upgrade models include plugins with new segmentation and classification functionalities, as well as plugin extensions for preprocessing, multiple image processing, structural analysis and data analysis.

Global super-optimisation

Primitives provide advanced flow control of module execution, including learning primitives that bring module dynamic input parameters into convergence via dedicated multiple execution.
A sequence of modules and primitives that performs some unique and frequent task can be further accelerated several times by a using highly sophisticated AI module that translates it into super-modules through the process of global super-optimisation.

Intuitive interface and interactivity

Intuitive interface allows easy interactivity during all image analysis steps.
In the case of segmentation and classification it is possible to return to any previous intermediate step from the script, and to make adjustments to the parameters of the modules.

Wide-ranging applications

While the initial scope of KARMENstudio was developed for life-science microscopy, in particular in the field of cellular neuroscience, KARMENstudio has a much wider scope today, thanks to its distinct modularity and upgradability.

Examples of image processing modules used in KARMENstudio are: Structural analysis of bones and keypoint detection, Object tracing due to moving affinities, Point Spread Function detection, Validation by segment registration with other image analysis tools.

KARMENsolutions

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We like science!

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