

COMPUTER VISION METHODS FOR MICROSCOPIC IMAGE ANALYSIS USING  
MACHINE LEARNING

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**Introduction.** With the increase in the production of microscopic images in fields such as chemistry. The need for fast and automatic solutions has also grown. Current machine learning algorithms offer state-of-the-art solutions, but these solutions are encapsulated in different environments [2, 3], which presents a problem for researchers looking for simple and direct solutions. With this concern in mind, we began the construction of a framework that brings together new algorithms for morphological and geometric analysis [1]. In addition to other models and algorithms for use in microscopic images. With the intention of making the framework scalable, we take as an example existing frameworks that have a modern and friendly interface [3].

**Main part.** Here, we present the problems and the solutions we propose::

— The lack of centralized solutions for image pre-processing, analysis, evaluation, and export of results. For this, we offer the scientific community a framework equipped with algorithms and machine learning models for the analysis of microscopic images, all orchestrated by an easy-to-use interface.

— Specialists without programming experience find difficulties using general purpose software for the analysis of their samples, that also need additional software to extract results (values, tables, images, etc.). In response, we take into account different stages for the evaluation of samples. From image pre-processing to the production of results in .csv (numeric values) or .png/.jpg (plots) formats.

**Conclusions.** We make available an early version in our laboratory repository (<https://github.com/ITMO-MMRM-lab/DropClustGUI>). Which currently contains unsupervised algorithms (k-means, agglomerative clustering, DBSCAN), supervised algorithms (KNN, ANN), and different morphological and geometrical algorithms that evaluate metrics like: counting of elements, area of an element ( $\mu\text{m}^2$ ), roundness of an element (0.0 - 1.0), concentration (% of image covered), center coordinates of each element, Voronoi diagram and entropy, CSM (continuous symmetry measure). For further explanation, please, consult this source [1].

**References:**

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