Guest Editorial: Special Issue on Discrete Geometry and Mathematical Morphology

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This special issue gathers recent developments in the fields of Discrete Geometry and of Mathematical Morphology.

Discrete Geometry takes advantage of the discrete nature of the digital shapes and therefore focuses on geometrical objects defined on lattices and grids. The achievements are theoretical results and efficient algorithms for digital object processing. It plays a role in various related fields such as image analysis, computer graphics, shape modeling, inverse problems and computer vision. Discrete Geometry has a strong connection with Mathematical morphology. Mathematical morphology deals with shape analysis of objects within images. It uses a set of operators based on set theory to extract and manipulate object structures. Its applications include image enhancement, noise reduction, edge detection, object segmentation, and pattern recognition, playing a vital role in fields like computer vision, medical imaging, and remote sensing. Morphological operators are notably used for deep learning methods.

These communities are very active in Europe but they are also present all over the world. The Communities of Digital Geometry and of Mathematical Morphology are represented by the Technical Committee 18 (TC18) in the International Association for Pattern Recognition, IAPR (http://tc18.org/).

The special issue presents seven articles from Mathematical Morphology or Digital Geometry domains from generation and recognition of planes, digital convexity and polyhedral model, periodic geometry and application in crystallography to superpixels, segmentation theory and graph-based structures for image processing.

The special issue was preceded by an international conference on Discrete Geometry and Mathematical Morphology that took place in October 2022 in Strasbourg, France. The articles featured in the special issue have been subjected to rigorous peer review in accordance with the journal's high standards.

The Guest Editors would like to express their sincere gratitude to the reviewers for their invaluable contributions and diligent efforts in reviewing the manuscripts for this special issue.

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Étienne Baudrier received a PhD degree in Image Processing and Applied Mathematics from the University of Reims in 2005. He is assistant Professor at the ICube Lab., University of Strasbourg, CNRS. He obtained his Habilitation diploma in 2019. Since 2021, he is co-head of the research group in Discrete Geometry and Mathematical Morphology of the Laboratoire ICube UMR 7357-CNRS. His research is mainly in the fields of inverse problems and discrete geometry.

Adrien Krähenbühl became PhD in Computer Sciences from University of Lorraine in 2014. He obtained a permanent position as associate professor at University of Strasbourg in 2017 to lead his research at the ICube laboratory and teaching at IUT Robert Schuman. His research domains are image analysis and processing, with a focus on segmentation problems and mainly applied to the medical domain. He is also interested in the reproducible research aspects.

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Benoît Naegel received the MSc and PhD in Computer Science in 2000 and 2004 from the University of Strasbourg. After a two-year postdoc position at University of Applied Sciences of Geneva (Switzerland) from 2005 to 2007, he was an assistant professor in Université de Nancy from 2007 to 2011. Since 2011, he has held an assistant professor position at University of Strasbourg, affiliated with the ICube Laboratory. He received the Habilitation in 2018. He is currently a full professor and deputy head of the IMAGeS team. His scientific interests include image processing, mathematical morphology and deep learning with applications on medical and biological imaging.