## Contents

## **Invited papers**

Some Open Questions on Morphological Operators and Representations in the Deep Learning Era *Jesus Angulo* 

Split Trees -A Unifying Model For Many Important Random Trees Of Logarithmic Height: A Brief Survey *Cecilia Holmgren* 

On topological analysis of cells organization in biological images *Maria-Jose Jimenez* 

## Applications in Image Processing, Computer Vision, and Pattern Recognition

A New Matching Algorithm between Trees of Shapes and its Application to Brain Tumor Segmentation *Nicolas Boutry and Thierry Géraud* 

Combining Deep Learning and Mathematical Morphology for Historical Map Segmentation Yizi Chen, Edwin Carlinet, Joseph Chazalon, Clément Mallet, Bertrand Duménieu and Julien Perret

Automatic forest road extraction from LiDAR data of mountainous areas *Philippe Even and Phuc Ngo* 

Fast Pattern Spectra using Tree Representation of the Image for Patch Retrieval Behzad Mirmahboub, Jérôme Moré, David Youssefi, Alain Giros, François Merciol and Sébastien Lefèvre

Watershed-based attribute profiles for pixel classification of remote sensing data *Deise Santana Maia, Minh-Tan Pham and Sébastien Lefèvre* 

# **Discrete and Combinatorial Topology**

Completions, perforations and fillings *Gilles Bertrand* 

Body Centered Cubic Grid --- Coordinate System and Discrete Analytical Plane Definition *Lidija Čomić, Rita Zrour, Gaëlle Largeteau-Skapin, Ranita Biswas and Eric Andres* 

Digital convex + unimodular mapping = almost 4-connected *Loic Crombez* 

Distance-Oriented Surface Skeletonization on the Face-Centered Cubic Grid *Gábor Karai* 

Homotopic Digital Rigid Motion: An Optimization Approach on Cellular Complexes *Nicolas Passat, Yukiko Kenmochi and Phuc Ngo* 

Locally turn-bounded curves are quasi-regular

Etienne Le Quentrec, Loïc Mazo, Etienne Baudrier and Mohamed Tajine

### **Discrete Geometry - Models, Transforms, Visualization**

Shear based Bijective Digital Rotation in Hexagonal Grids *Eric Andres, Gaëlle Largeteau-Skapin and Rita Zrour* 

An isometry classification of periodic point sets *Olga Anosova and Vitaliy Kurlin* 

Visiting bijective digitized reflections and rotations using geometric algebra *Stéphane Breuils, Yukiko Kenmochi and Akihiro Sugimoto* 

Digital Straight Segment Filter for Geometric Description *Rémi Decelle, Phuc Ngo, Isabelle Debled-Rennesson, Frédéric Mothe and Fleur Longuetaud* 

An alternative definition for digital convexity *Jacques-Olivier Lachaud* 

Digital geometry for the dual of some semi-regular tessellations Benedek Nagy and Mohammadreza Saadat

### **Discrete Tomography and Inverse Problems**

On the geometric aspects of the class of hv-convex switching components *Andrea Frosini and Paolo Dulio* 

Properties of unique degree sequences of 3-uniform hypergraphs Andrea Frosini, Lama Tarsissi, Michela Ascolese and William Lawrence Kocay

Power sum polynomials in a discrete tomography perspective *Silvia Pagani and Silvia Pianta* 

On the reconstruction of 3-uniform hypergraphs from step-two degree sequences *Giulia Palma, Simone Rinaldi and Andrea Frosini* 

### Hierarchical and Graph-based Models, Analysis and Segmentation

Towards Interactive Image Segmentation by Dynamic and Iterative Spanning Forest Isabela Borlido, Felipe Belem, Zenilton Patrocinio Jr, Paulo Miranda, Alexandre Falcao and Silvio Guimaraes

Stability of the tree of shapes to additive noise *Nicolas Boutry and Guillaume Tochon* 

An algebraic framework for out-of-core hierarchical segmentation algorithms *Jean Cousty, Benjamin Perret, Harold Phelippeau, Stela Carneiro, Pierre Kamlay and Lilian Buzer* 

Fuzzy-marker-based segmentation using hierarchies Gabriel B. Fonseca, Jean Cousty, Benjamin Perret, Romain Negrel and Silvio J. F. Guimarães

Graph-based Supervoxel Computation from Iterative Spanning Forest Carolina Jeronimo, Felipe Belem, Sarah Carneiro, Zenilton Patrocinio Jr, Laurent Najman, Alexandre Falcao and Silvio Guimaraes Graph-based M-tortuosity estimation

Adam Hammoumi, Maxime Moreaud, Elsa Jolimaitre, Thibaud Chevalier, Michaela Klotz and Alexey Novikov

A maximum-flow model for digital elastica shape optimization Daniel Martins Antunes, Jacques-Olivier Lachaud and Hugues Talbot

Image Segmentation by Relaxed Deep Extreme Cut with Connected Extreme Points *Débora Oliveira, Caio Demario and Paulo Miranda* 

# Learning-based Approaches to Mathematical Morphology

On some associations between mathematical morphology and artificial intelligence *Isabelle Bloch, Samy Blusseau, Ramon Pino Perez, Elodie Puybareau and Guillaume Tochon* 

Going beyond p-convolutions to learn grayscale morphological operators Alexandre Kirszenberg, Guillaume Tochon, Élodie Puybareau and Jesus Angulo

Scale Equivariant Neural Networks with Morphological Scale-Spaces Mateus Sangalli, Jesús Angulo, Samy Blusseau and Santiago Velasco-Forero

**Multivariate and PDE-based Mathematical morphology, Morphological Filtering** Eigenfunctions of Ultrametric Morphological Openings and Closings *Jesus Angulo* 

Measuring the Irregularity of Vector-valued Morphological Operators using Wasserstein Metric *Marcos Eduardo Valle, Samuel Francisco, Marco Aurélio Granero and Santiago Velasco-Forero* 

An Equivalence Relation between Morphological Dynamics and Persistent Homology in n-D *Nicolas Boutry, Thierry Geraud and Laurent Najman* 

Sparse Approximate Solutions to Max-Plus Equations Nikos Tsilivis, Anastasios Tsiamis and Petros Maragos