Julien Mendes Forte, Ph.D student.

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Education

2022 – Today
Ph.D. student, Université de Caen Normandie, GREYC Laboratory
Under the supervision of Yukiko Kenmochi, funded by the Normandy region.
Thesis title: *Partial partition trees: unified framework, topological modelling and connected operators.*
Keywords: *Mathematical morphology, connected operators, gray-level images, partial partition hierarchies, image filtering.*
Achieved work: *Theoretical definition of a hierarchical arborescent image descriptor called the Topological Tree of shapes. Definition of its algorithmic construction. Definition of model-preserving simplification method for the Tree of Shapes. Design of connected operators based on the Topological Tree of Shapes.*
Future works: *Application of the structure to medical image segmentation neural networks in order to avoid topological errors in the resulting images.*

2017 – 2019
Master's degree, Computer Science, Université Gustave Eiffel
Specialisation: *Image Science.*
Computer generated imagery, discrete geometry, discrete topology, mathematical morphology, embedded software, C++, Python, Java.

2014 – 2017
Bachelor's degree, Computer Science, Université Gustave Eiffel
C, assembly, turing machine (automata theory), graph theory (flow networks), PostgreSQL.

Professional Experience

2021 – 2022 (18 months)
Software engineer, Infass Systèmes, Montgeron, France.
Large data management, algorithmic optimization, object-oriented programming, database, human-machine interface.

2020
Application for a variety of image science related thesis topics, SURYS, France.

2019 (4 months)
Analysis, implementation and comparison of various binary image rotation algorithms, LIGM - ESIEE Paris, France.
Implementation of binary image rotation algorithms in two and three dimensions. Analysis of the results and evaluation of the induced topological errors based on topological criteria, allowing the comparison of these algorithms.

Research Visits

2024 (3 months)
Visiting Researcher, Shimizu Laboratory, Tokyo University of Agriculture and Technology (TUAT), Koganei, Japan. Erasmus + funding.
Research on partial partition hierarchies applied to medical imaging in collaboration with Prof. Akinobu Shimizu. Research on the definition of a distance between partial partition hierarchies, in particular the Tree of Shapes and the Topological Tree of Shapes.

Technical Skills

Programming: *C++, Java, Python, C, Perl.*
Tools: *Git, Linux, OpenCV, Higra, Numpy, OpenGL, Gprof, SQL, CLion, Pycharm, IntelliJ IDEA.*
Languages: *French (native), English (fluent), Japanese (N4-N3 level).*

Research Publications

Journal Article

1. J. Mendes Forte, N. Passat, A. Shimizu, and Y. Kenmochi, "Consistent connected operators based on trees of shapes," *SIAM Journal on Imaging Sciences*, In press.
2. N. Passat, J. Mendes Forte, and Y. Kenmochi, "Morphological hierarchies: A unifying framework with new trees," *Journal of Mathematical Imaging and Vision*, vol. 65, pp. 718–753, 2023.

International Conference Proceedings

1. J. Mendes Forte, N. Passat, and Y. Kenmochi, "Designing connected operators using the topological tree of shapes," in *International Conference on Discrete Geometry and Mathematical Morphology (DGMM)*, Groningen, Netherlands, 2025.
2. J. Mendes Forte, N. Passat, and Y. Kenmochi, "Building the topological tree of shapes from the tree of shapes," in *International Conference on Discrete Geometry and Mathematical Morphology (DGMM). LNCS, vol 14605. Springer*, Florence, Italy, 2024.
3. J. Mendes Forte, N. Passat, and Y. Kenmochi, "How to modify the tree of shapes of an image: Connected operators without gradient inversion," in *International Conference on Pattern Recognition (ICPR). LNCS, vol 15323. Springer*, vol. 15323, Kolkata, India, 2024, pp. 1–18.

National Conference Proceedings

1. J. Mendes Forte, *Arbre topologique des formes : Algorithme de construction et applications*, Carqueiranne, France, 2023.

Talks and poster presentations

2025
- **GT GDMM 2025, Chambéry, France.** *Oral presentation on the design of connected operators based on the Topological Tree of Shapes.*

2024
- **GT GDMM 2024, Luminy, France.** *Oral presentation on model-preserving connected operators based on the Tree of Shapes.*
- **GREYC Laboratory, Caen, France.** *Oral presentation on partial partition hierarchies, including Complete and Topological Tree of Shapes construction, as well as connected operators based on them.*
- **Shimizu Laboratory, Koganei, Japan.** *Oral presentation on partial partition hierarchies, including Complete and Topological Tree of Shapes construction, as well as connected operators based on them.*
- **DGMM 2024, Florence, Italy.** *Oral presentation on the construction of the Topological Tree of Shapes from the Tree of Shapes.*
- **DGMM 2024, Florence, Italy.** *Poster presentation of a model-preserving modification strategy for the Tree of Shapes.*

2023
- **GT GDMM 2023, Caen, France.** *Oral presentation on a more efficient Topological Tree of Shapes construction algorithm.*
- **EJCIM Summer School, Poitiers, France.** *Oral and poster presentation of the Topological Tree of Shapes and its construction.*

Teaching

2024-2025
- **Discrete Geometry.** *Teaching assistant for discrete geometry laboratory sessions (M2 level).*

Teaching (continued)

Industrial project supervision *Supervision of Master student's project on the graph representation of 3D CT images.*

2023-2024 **C Programming Language.** *Teaching to first year DUT students. Evaluation of the students skills through exams and frequent tests throughout the semester.*