Etienne Meunier

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Education

Sept. 2020 – Nov. 2023 | **PhD in signal, image processing and computer vision - Inria Rennes, France**

Unsupervised learning for motion segmentation and motion saliency in videos

Supervisor: Patrick Bouthemy – patrick.bouthemy@inria.fr

- Mathematical formulation of losses for unsupervised learning
- Development and diffusion of several research publications and code implementations
- Supervision of two master-level interns of 6 months on:
  - → *Efficient computation of optical flow fields on large-scale satellite images*
  - → *Unsupervised segmentation of small moving objects in image sequences*

Jan. 2019 – Sept. 2019 | **Master of Science - Boston University, USA**

Concentration in Computer Information Systems - GPA: 3.96/4

- Research project comparing generative networks and evolutionary approaches

Sept. 2014 – Dec. 2018 | **Diplôme d'ingénieur - ECE Paris, France**

Concentration in Computer Science - Top 5% overall ranking

- Mathematics, Programming, Electronics, Robotics, Data science

July 2016 – Dec. 2016 | **Exchange Semester - University of Newcastle, Australia**

Software Engineering, Operating Systems

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Peer-reviewed Publications

CVPR June 2023 *Highlight* | **Unsupervised space-time network for temporally-consistent segmentation of multiple motions**

Meunier E. & Bouthemy P.

TPAMI April 2023 | **EM-driven unsupervised learning for motion segmentation**

IEEE Transactions on Pattern Analysis and Machine Intelligence, 45(4):4462-4473, April 2023

Meunier E., Badoual A. & Bouthemy P.

CVPRw Jun. 2024 | **Efficient local correlation volume for unsupervised optical flow estimation on small moving objects in large images**

Khairi S, Meunier E., Fraisse R. & Bouthemy P.

arXiv Oct. 2023 | **Unsupervised motion segmentation in one go: Smooth long-term model over a video**

Submitted to IEEE T-PAMI

Meunier E. & Bouthemy P.

ACM IMWUT Jan. 2024 | **ADA-SHARK: A shark detection framework employing underwater cameras and domain adversarial neural nets**

Martin M., Meunier E., Moreau P., Gadenne J., Dautel J., Pinsky E., ... & Rawassizadeh R.

BMVC Nov. 2021 | **Unsupervised computation of salient motion maps from the interpretation of a frame-based classification network**

Meunier E. & Bouthemy P.

MLCB Dec. 2020 | **Convolutional additive models: a fully interpretable approach to deep learning in genomics**

Novakovsky G., Saraswat M., Meunier E., Fornes O., Mostafavi S., Wasserman W.

MLCB Dec. 2019 | **Interpreting deep learning models in genomics using genetic algorithm**

Meunier E., Novakovsky G. & Mostafavi S.

Practical and Professional Experience

Jan. 2025 – Today

Postdoc Inria - Paris

Machine learning for dynamical systems and differential equations

Supervisor: Julien Salomon – julien.salomon@inria.fr

- Hybrid models and Neural Differential Equations
- Constrained probabilistic models for physical states generation

Jan. 2024 – Dec. 2024

Postdoc CNRS - LOCEAN, Sorbonne Université - Paris

Deep learning parametrizations for general model of ocean circulation (OGCMs)

Supervisor: Julie Deshayes – julie.deshayes@locean.ipsl.fr

- Integration of deep learning closures into large-scale ocean models
- Investigation of optimisation methods for parameter calibration of OGCMs
- International collaborations through the M2Lines initiative

Sept. 2019 – Aug. 2020

Visiting Scholar, University of British Columbia, Mostafavi Lab - Vancouver

Developing computational and statistical approaches for interpreting genomics data

Supervisor: Sara Mostafavi – saramos@cs.washington.edu

- Developed evolutionary approaches to generate sequences conditioned by the activation of a convolutional neural network

Dec. 2018 – Sept. 2019

Freelance IT consultant, Seelk - Paris

Seelk leverage data analytic to help companies to develop their sales on Internet

- Developed analytical tools to understand how web markets are building rankings and evaluate the impact of business decisions

May 2018 – Aug. 2018

Researcher Intern, centre de ressources et d'appui sur le risque requin - La Réunion

The CRA is an organization created by the French Government to lead research on innovative solutions to reduce the risk of shark attacks on La Reunion Island (Indian Ocean)

Supervisor: Eric Chateauminois –

- During Internship
  - → Reduced by 10x the amount of videos to watch for biologists by developing a motion detection algorithm that works on underwater videos using several tracking techniques
- As a consultant (Sept. 2018 - Aug. 2020)
  - → Leading the development of shark detection algorithm using a deep learning approach
  - → Supervised the conception of a scientific paper on our domain adaptation strategy for shark detection in the wild

June 2017 – Aug. 2017

Data Engineer Intern, Datamaran - England

Datamaran is a London-based business intelligence provider that uses data analysis and AI to help businesses to monitor emerging regulatory and reputational risks

Supervisor: Alberto Pacheco –

- Integrated 10k+ financial reports into the database, by developing a process that extracts, preprocesses and stores data automatically from selected web sources
- Started a research project aimed to use machine learning techniques to extract opinions on companies from tweets

April 2016 – May 2016

Internship, Zodiac Aerospace - France

Zodiac Aerospace designs systems for aircraft

Supervisor: David Vicart –

- Improved the speed of accessing internal documentation by 5x by developing a program that uses Visual Basic to automate searching scanned technical documents

Additional Oral Presentations

Presentation (abstract) MIA 2023 - Berlin, Germany
EM-driven network for efficient unsupervised motion segmentation, Meunier E., Badoual A. & Bouthemy P.

Presentation, ImmGen Consortium 2019 - Harvard University - Boston, United States
AI-TAC and DNA sequence generation, Maslova S. & Meunier E.

Poster, Official Opening of the New Met College Building 2018 - Boston, United States
A simple computational approach to predict long term hourly electric consumption, Meunier E., Moreau P. & Pinsky E.

Teaching

Sept. 2024 – Dec. 2024 | **Machine Learning for Climate and Energy - Ecole Polytechnique, Palaiseau**
Master Level, Instructor

Sept. 2022 – Dec. 2022 | **Machine learning - EFREI, Paris**
Master Level, Instructor

Sept. 2021 – Sept. 2022 | **Research methods in computer vision - EFREI, Paris**
Master Level, lecturer for 40+ students
- Understanding mathematical reasoning and implementation of recent CV papers

Open Source Software

ST-Space-Time-Flow-Segmentation
Unsupervised space-time network for temporally-consistent segmentation of multiple motions

EM-Flow-Segmentation
EM-driven unsupervised learning for motion segmentation

LT-Segmentation
Unsupervised motion segmentation in one go: Smooth long-term model over a video - Release upon APP agreement

Optical Flow - SMOFlow
Efficient local correlation volume for unsupervised optical flow estimation on small moving objects in large images - Release upon APP agreement

General U-Net
Modular implementation of U-Net allowing to include attention-based connections between hierarchical levels

Shape-Checker
Minimal package extending einops and providing guardrails when performing tensor manipulations

Personal Projects

Nov. 2016 – Sept. 2018 | **Leader of project Kolibri - Paris, France**
Kolibri is a project aimed to offer alternative transportation solutions to French independent producers and use cost evaluation techniques to give them insights on their choice
- Selected as one of 110 projects to be part of the plan to promote innovative initiatives financed by the city of Paris

Jan. 2018 – Feb. 2018 | **4L Trophy - Paris-Morocco**
Humanitarian car race between Paris and southern Morocco

Reviews for: IEEE TIP, CVPR 2024, ISBI 2023