

COMPUTER VISION PHD

Linkedin: nicolas-dufour
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25 years old

Languages spoken:

French (Bilingual)
Spanish (Bilingual)
English (990 points Toeic)
Portuguese (Beginner)

Software proficiency:

Google Cloud Computer, Photoshop, Inkscape,
Premiere, Latex, SLURM.

Soft Skills:

Project Management, Fast Learner, Communication,
Problem solving, Entrepreneurial spirit, Curious, Creative.

Programming language:

Python (Pandas, Numpy, Scikit-learn, Matplotlib, Seaborn,
Plotly, Hadoop, Spark, Plotly), Javascript (React, AngularJS,
NodeJS, Socket.io), HTML5/CSS3, Bash, SQL, CamL.

Deep Learning Stack:

Pytorch, Pytorch Lightning, Wandb, Hydra.

PROFESSIONAL EXPERIENCE

Meta (ex-Facebook) | Software Engineering Intern

July 2022-October 2022, London, UK

Supervised by Vincent Moens

Worked on integrating model based Reinforcement Learning to torchrl, a Pytorch domains library.

Ecole Nationale des Ponts et Chaussées (ENPC) and Ecole Polytechnique / Research Intern

April 2021-September 2021

Supervised by David PICARD and Vicky KALOGÉITON.

Worked on subject transfer and conditional Generative Adversarial Networks (cGANs).

Designed a novel semantically conditioned GAN architecture improving the state of the art.

Joint internship between IMAGINE (ENPC) and GeoViC (Ecole Polytechnique) labs.

Upskills / Machine Learning Engineer Internship

February 2020-July 2020, Singapore

Worked on detecting fraudulent patterns between traders with anomaly detection for one of the largest Asian banks. Worked with Graph Neural Network in an unsupervised setting. Created a dataset from Murex trading data using Spark. Worked on novelty detection leveraging a Variational Auto-Encoder (VAE) architecture.

Boyce Thompson Institute - Cornell University / Research Internship

June 2018 / August 2018, Ithaca, NY, USA

Worked on a better way to store genotypic data. Tools such as Hadoop, Spark and the Parquet file format were used to optimize the storing performance. Developed some custom algorithms in Python to fit the data needs. Presented the results by a poster to a wide audience of researchers.

EDUCATION

Ecole Nationale des Ponts et Chaussées (ENPC) and Ecole Polytechnique / Computer Vision PhD Student

October 2021-September 2024, Paris, France

Supervised by David PICARD, Vicky KALOGÉITON and Vincent LEPETIT

Working on generation and comprehension of dynamic scenes.

Joint PhD between IMAGINE (ENPC) and GeoViC (Ecole Polytechnique) labs.

ENS Paris Saclay / MVA Master (Mathematics, Vision and Learning)

October 2020 to September 2021, Paris, France

Master of Science specialized in computer vision, applied mathematics and machine learning.

Relevant courses:

Deep Learning V.LEPETIT

Image denoising: the human machine competition J.-M. MOREL, G.FACCIOLO, P.ARIAS

Object recognition and computer vision I. LAPTEV, J. PONCE, C. SCHMID, J. SIVIC,

(Kaggle Competition: 1st / 167)

Introduction to Numerical Imaging J. DELON, Y. GOUSSEAU

Sparse Representation S. MALLAT

Deep Learning In Practice G. CHARPIAT

Kernel Methods for Machine Learning J. MAIRAL, J.P VERT

Machine Learning for Time Series L. OUDRE

Algorithms for speech and natural language processing E.DUPOUX, B.SAGOT

Télécom SudParis - Institut Polytechnique de Paris / Engineering diploma

September 2017 to September 2020, Evry, France

One of the top French Engineering Schools. Followed the MSA speciality (Modelisation, Statistics and Applications) which teaches the intricacies of statistical learning. Relevant Courses: Stochastic Processes, Machine Learning, Bayesian statistics, Graphical Models for image processing, Biostatistics and high dimensional data, Deep Learning, Economic modeling, Polls theory, Queuing theory, Convex optimization, Signal theory, Communication and information theory.

CPGE Joffre MPSI / MP speciality Computer Science

September 2014 to July 2017, Montpellier, France

Intensive preparation in Math and Physics for the highly competitive entrance exams to the French Grandes écoles. CPGE stands for Classes Préparatoires aux Grandes Écoles.

Lycée Français Paul Valéry de Cali / Baccalauréat with High Honors

September 2006 to July 2014, Cali, Colombia

Lived 8 years in Cali, Colombia and attend French School, a bilingual school (French, Spanish and English). Activities: UN Model (I was President of the International Penal Court), Creation of School Journal, Vice-President of the Student Council.

PROJECTS

SCAM! Transferring humans between images with Semantic Cross Attention Modulation / Under Review

April 2021/ November 2021

Work done with Vicky KALOGITON and David PICARD

In this work, we introduce SCAM (Semantic Cross Attention Modulation), a system that encodes rich and diverse information in each semantic region of the image (including foreground and background), thus achieving precise generation with emphasis on fine details. We use this new architecture to perform subject transfer and set a new state of the art for this task.

Github: https://github.com/nicolas-dufour/rakuten_colour_extraction

Multimodal Rakuten Product Color Prediction / MVA Sparse Representations

February 2021 / April 2021

Using both the description and the image of a product, the task was to predict which colors the website must assign to each color. Multiple colors can be assigned to a product. Colors weren't straightforward looking at the image or text, making the task challenging. The data came from the Japanese e-commerce website Rakuten, therefore description were in Japanese. We achieved best performances in class.

Github: <https://github.com/nicolas-dufour/SCAM>

Time series Self-Supervised Learning / MVA Times Series

February 2021 / April 2021

Leveraged contrastive learning to learn time series representations. We obtain very good representations, improving over the paper, we base our approach, «Unsupervised Scalable Representation Learning for Multivariate Time Series» Franceschi et al. This representation can then be used for multiple down stream task, such as classification, clustering, etc...

Github: <https://github.com/nicolas-dufour/time-series-self-supervised-learning>

Self Supervised Low Ressources Speech retrieval / MVA Speech and NLP

February 2021 / April 2021

Worked on leveraging a Wav2Vec unsupervised model trained on a massive speech dataset (English or Multilingual). Then we fine-tune this model in an unsupervised manner in a language with scarce speech resources. We observe a good transfer of representation and study the importance of the initial model language on the final results.

Github: <https://github.com/nicolas-dufour/self-supervised-low-res-speech>

Instance aware Video Colorization / MVA Numerical Imaging Project

December 2020 / February 2021

The goal of this project was to work on an image colorization model and apply it to video data without training on videos. We leveraged a pretrained image colorization model and made the output time consistent without retraining.

Github: <https://github.com/nicolas-dufour/instance-video-colorization>

Cassava Leaf Disease Classification / MVA Deep Learning Project

November 2020 / January 2021

This project aims to use pictures of cassava leaves taken by low budget smartphones and predict which disease the crop suffer from. The challenge with this project was that the data had a lot of noisy labels which forced an approach that needed to learn with this constraint.

Github: <https://github.com/nicolas-dufour/cassava-leaf-disease>

Video Question Answering / MVA Object recognition project

November 2020 / January 2021

The goal of this project was to work on question answering based on video data. We worked on improving the results from "Conditional Relation Networks for Video Question Answering" Le et al. We replaced the language modeling module by a BERT pretrained model and propose an adaptation of the architecture to leverage other modalities such as subtitles.

Github: <https://github.com/nicolas-dufour/video-qa-recvis>

For older projects see <https://github.com/nicolas-dufour>

OPEN-SOURCE CONTRIBUTIONS

TorchRL: Worked on the model based aspect of the library

Torchmetrics: Improved the FID metric to work online, avoiding storing features.

Huggingface/diffusers: Implemented the sampling for K-LMS sampler

REVIEWS

Reviewer at ACCV 2022.

AWARDS

Outstanding reviewer at ACCV 2022.

SCAN ME !

