Florent **Forest**

AI Research Scientist | Data & ML Expert with Research & Industry experience
PhD in Machine Learning | ISAE-Supaero Engineer (MSc)

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Education

2021 **PhD in Computer Science (Machine Learning), Université Sorbonne Paris Nord, Paris area, France**
2018 LIPN lab (CNRS UMR 7030), A3 team (Machine learning). Research topics :
- Unsupervised learning (clustering, deep learning, self-organizing maps, visualization…)
- Scalable machine learning algorithms
- Big Data processing and distributed computing (map-reduce)
- Industrial applications in aerospace on aircraft engine flight data (time series)

2017 **Supaero Engineering Diploma (MSc), ISAE-Supaero, Toulouse, France**
2013 Specialization in **Data & Decision Sciences** and **Space Systems Engineering**

2016 **Erasmus semester, TU Berlin, Berlin, Germany**
2015 Master Luft- und Raumfahrttechnik (aerospace engineering).

2013 **Preparatory classes, Lycée Janson-de-Sailly, Paris, France**
2011 Preparation in Mathematics, Physics and Computer science for the top French engineering schools.

2011 **Baccalauréat S, Lycée Marie Laurencin, Mennecy, France**
2008 equiv. A-levels with highest honors.

Work Experience

Today 2022 **Scientist, EPFL (École Polytechnique Fédérale de Lausanne), Lausanne, Switzerland**
Researcher at IMOS (Intelligent Maintenance and Operations Systems) lab led by Prof. Olga Fink.

Research topics :
- Explainable AI & interpretable deep learning
- Domain adaptation
- Computer vision, Signal processing

Applications :
- Predictive maintenance, PHM
- Fault detection, diagnosis and prognosis
- Vision-based automated inspection

Other activities and skills :
- Scientific and technical writing/presentation
- Teaching at EPFL (lectures and exercises)
- Mentoring PhD, Master and Bachelor students
- Organizer and speaker at conferences
- Reviewer for journals and conferences

Research | Machine learning | PHM | PyTorch | Docker | Python

2022 2021 **Data Scientist & Software Engineer, Nagi Bioscience SA, Lausanne, Switzerland**
Development of data analysis and software tools for revolutionary worm-on-chip technology combining biology, robotics, optics, microfluidics and AI, for ethical and efficient bioassays.
- Built an end-to-end automated data analysis pipeline (AWS), increasing throughput and efficiency
- Developed deep learning models for microscopy image analysis (object detection and segmentation)
- Extracted relevant features from images and videos, in collaboration with biologists
- Front-end and back-end development, databases, APIs
- Embedded software development for robotics/optics/fluidics control
- Agile development, Management of subcontractor software devs

Machine learning | Cloud | AWS | PyTorch | Spark | Node.js | Vue.js | Electron | Docker | Python | Javascript

2021 2018 **Data Scientist, Safran Aircraft Engines, Paris area, France**
Industry research contract. My role is to enable large-scale analytics of data generated by civil aircraft engines during flights, to develop scalable engine health monitoring algorithms, and apply research to industry use cases.
- Designed a generic Big Data processing pipeline for flight data analytics on the production cluster
- End-to-end implementation of health monitoring methodologies based on unsupervised learning
- Development and deployment of visualization apps
- Support engineers on distributed computing technologies

Data science | Machine learning | Aerospace | Hadoop | Hive | Spark | Scala | Keras | PyTorch | Python | MongoDB

October 2017 – April 2017

Intern, Airbus — Central Research & Technology, Toulouse, France

Studied and applied various Artificial Intelligence methods to extract and query information from unstructured technical documents (scanned PDF, text, images) for cognitive assistant applications.

- Developed several deep learning models (computer vision, natural language processing) and chatbots
- Designed an interactive Polymer web application for data annotation and prediction
- Reading research articles

Deep learning | Python | Keras | TensorFlow | spaCy | Rasa NLU | HTML/CSS | Javascript | Polymer | MongoDB | REST

August 2016 – March 2016

Intern, CNES (French Space Center), Toulouse, France

Implementation and validation of a Manual Thrust mode in an AOCS (Attitude and Orbit Control System) simulator, in order to analyze end-of-life experiments on the CoRoT satellite (PROTEUS family).

Space mechanics | Signal processing | Matlab | Simulink

June 2015 – February 2015

Intern, IRAP (Research Institute in Astrophysics and Planetology), Toulouse, France

Contributed to developing an open-source scientific library enabling astrophysicists to perform statistical analysis of gamma ray data measured by telescopes.

Astrophysics | C++ | Python | Git

July 2014

Intern, ONERA (French Aerospace Lab), Toulouse, France

Development of real-time software and deployment on Linux embedded systems.

Embedded systems | C | Linux

Languages

French	●●●●●
German	●●●●●
English	●●●●●
Spanish	●●○○○
Chinese	●○○○○

Skills

Programming	Python, Scala, R, Java, C, C++, Caml, Flutter, Web (front/back)
Tools & Frameworks	Hadoop, Spark, PyTorch, Keras, TensorFlow, scikit-learn, pandas
Databases	SQL, Hive, Athena, Postgres, MongoDB, SQLite
Collaborative & DevOps	Git, CI/CD, Docker, Artifactory/Nexus
Cloud	AWS (S3, EC2, SageMaker, Lambda, RDS, Athena, SFN)
OS	GNU/Linux, Windows
ML Applications	Computer Vision, Natural Language Processing, Time Series (sensor signals), Audio/Speech processing
Industries	Aerospace, Railway, Civil Engineering, Life sciences/Biotechnologies

Referees

Prof. Olga Fink
Associate professor, EPFL
@ olga.fink@epfl.ch

Dr. Jérôme Lacaille
Emeritus expert, Safran group
@ jerome.lacaille@safrangroup.com

Prof. Mustapha Lebbah
Full professor, Université Paris Saclay
@ mustapha.lebbah@uvsq.fr

Selected Publications

florentfo.rest/publications

Calibrated Adaptive Teacher for Domain-Adaptive Intelligent Fault Diagnosis 2024

Sensors mdpi.com/1424-8220/24/23/7539
Forest, F., & Fink, O.

Simplifying Source-Free Domain Adaptation for Object Detection : Effective Self-Training Strategies and Performance Insights 2024

ECCV 2024 arxiv.org/abs/2407.07586
Hao, Y., **Forest, F.**, & Fink, O.

Knowledge-based and Expert Systems in Prognostics and Health Management : a Survey 2024

International Journal of Prognostics and Health Management papers.phmsociety.org/[...]/ijphm/article/view/3986
Bouhadra, K., & **Forest, F.**

From classification to segmentation with explainable AI : A study on crack detection and growth monitoring 2024

Automation in Construction doi.org/10.1016/j.autcon.2024.105497
Forest, F., Porta, H., Tuia, D., & Fink, O.

Health Prediction for Lithium-Ion Batteries Under Unseen Working Conditions 2024

IEEE Transactions on Industrial Electronics doi.org/10.1109/TIE.2024.3379664
Che, Y., **Forest, F.**, Zheng, Y., Xu, L., & Teodorescu, R.

Predictive Health Assessment for Lithium-ion Batteries with Probabilistic Degradation Prediction and Accelerating Aging Detection 2023

Reliability Engineering & System Safety doi.org/10.1016/j.ress.2023.109603
Che, Y., Zheng, Y., **Forest, F.**, Sui, X., Hu, X., & Teodorescu, R.

Selecting the Number of Clusters K with a Stability Trade-off : an Internal Validation Criterion. 2023

PAKDD 2023 arxiv.org/abs/2006.08530 github.com/FlorentF9/skstab
Mourer, A., **Forest, F.**, Lebbah, M., Azzag, H., & Lacaille, J.

An Invariance-Guided Stability Criterion for Time Series Clustering Validation. 2021

ICPR 2021
Forest, F., Mourer, A., Lebbah, M., & Azzag, H.

Deep embedded self-organizing maps for joint representation learning and topology-preserving clustering. 2021

Neural Computing and Applications doi.org/10.1007/s00521-021-06331-w
Forest, F., Lebbah, M., Azzag, H., & Lacaille, J.

Large-scale Vibration Monitoring of Aircraft Engines from Operational Data using Self-organized Models 2020

Annual Conference of the PHM Society 2020 doi.org/10.36001/phmconf.2020.v12i1.1131
Forest, F., Cochard, Q., Noyer, C., Joncour, M., Lacaille, J., Lebbah, M., & Azzag, H.

Deep Embedded SOM : Joint Representation Learning and Self-Organization 2019

ESANN 2019 github.com/FlorentF9/DESOM
Forest, F., Lebbah, M., Azzag, H., & Lacaille, J.

A Generic and Scalable Pipeline for Large-Scale Analytics of Continuous Aircraft Engine Data 2018

IEEE International Conference on Big Data 2018 doi.org/10.1109/BigData.2018.8622297
Forest, F., Lacaille, J., Lebbah, M., & Azzag, H.

Patents

Computer environment system for monitoring aircraft engines 2020

FR Patent FR3089501 / US Patent 17/299,249