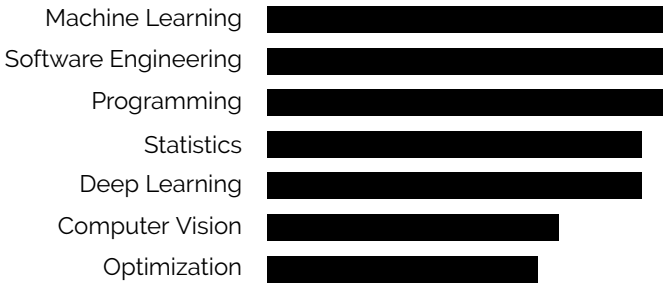
PAUL MELKI

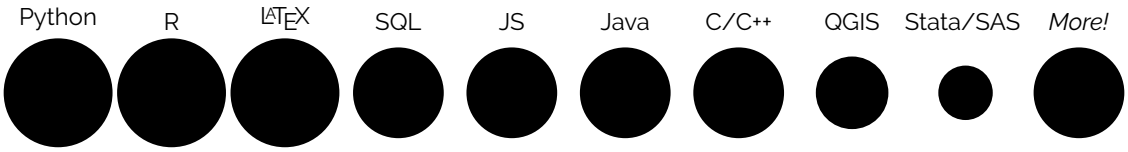
Machine Learning Researcher

Bordeaux, France
+33 6 45 15 16 20
paul.a.melki@gmail.com
Paul Melki
github.com/paulmelki

AT A GLANCE

I'm a deeply self-motivated Master's student in Statistics at Toulouse School of Economics, currently pursuing my final internship at Exxact Robotics and IMS Laboratory - Université de Bordeaux. I'm working on the development of a valid methodology for the evaluation and quantification of the behavior of image processing supervised learning algorithms in uncertain environments with the aim of building more robust AI vision systems.





EXPERIENCE

4/2021 – 10/2021 **Data Scientist Intern** ***Exxact Robotics*** **- Epernay, FRANCE**

- Development of a statistical methodology for the evaluation and quantification of the robustness of supervised learning models in the context of image segmentation.
- Proposal of novel combinations of evaluation metrics for a better assessment and comparison of machine learning models.
- Development of an experimental environment to streamline the work following OOP standards.
- Worked in a fast-moving startup environment.

4/2021 – 10/2021 **Research Intern** ***IMS Laboratory*** **- Bordeaux, FRANCE**

- Conducted the research and work done with *Exxact Robotics* at the laboratory.
- Daily interactions with top researchers in Signal & Image Processing.

9/2020 – 3/2021 **Academic Statistical Consultant** ***BVA Research*** **- Toulouse, FRANCE**

- The aim of the project is to model fraud behavior in a public transport system by analysing data in their socio-economic, spatial and temporal contexts; focusing on the Paris & Ile-de-France network system.
- Manipulating heterogeneous data from different sources and structures including survey, public census and geographic data and studying the validity of different models.
- Working in a team of four students under joint supervision from *Toulouse School of Economics* & *BVA Research*.

5/2020 – 7/2020 **Shipping Intelligence Intern** ***The Signal Group*** **- Athens, GREECE**

- Worked on a proof of concept study extracting valuable intelligence from geospatial, meteorological and maritime data and applying machine learning techniques with the aim of optimizing *Signal*'s predictive capabilities (classified project).
- Worked with data from different sources (human-generated reports, AIS data, meteorological data..), and spanning different dimensions (spatial + temporal).
- Reported directly to the VP of Data Science Engineering at *Signal*.

2/2019 – 4/2019
volunteering

Volunteer Ground Surveyor (Logistics) — ***Lebanese Red Cross*** **- Al-Koura, LEBANON**

- Volunteered with the Disaster Management Unit, filling surveys with people responsible of critical points in town (churches, halls, bakeries, markets...) that can be used as shelter or to provide aid in case of emergencies and disasters.
- Received training in basic first aid and disaster management skills.
- Chosen as the manager of the local DMU team in town.

10/2018 – 12/2018

Lab and Teaching Assistant — ***University of Balamand*** **- Al-Koura, LEBANON**

- Personally chosen by professors and lab instructors at the Department of Computer Science.
- Contributed to the correction and grading of students' projects in *Data Structures* course.
- Assisted lab instructors during the weekly lab sessions in *Data Structures* (in C++) and *Introduction to Programming* (in Java).

8/2017 – 10/2017
freelance work

Database Developer — **Al-Koura, LEBANON**

- Developed a *Microsoft Access* Database System for a newly opened student residence and provided support and guidance for the clients upon the deployment of the system.

EDUCATION

2019 – 2021

MSc - Applied Mathematics: Statistics & Econometrics — **Toulouse School of Economics - FRANCE**

- *M1 Statistics & Applied Econometrics, International Track*, (Validated, 13.2 / 20, rank 4).
- Main courses in M1: *Intermediate Econometrics*, *Mathematical Statistics I & II*, *Introduction to Big Data*, *Optimization for Big Data*, *Game Theory*, *Program Evaluation*, *Time Series*, *Applied Econometrics*.
- Main courses in M2 (in collaboration with **Université Toulouse III Paul Sabatier**: *Data Mining*, *Mathematics of Deep Learning Algorithms I & II*, *Non-parametric Models*, *Outlier Detection & Extreme Value Theory*, *Spatial Econometrics*, *Graph Theory & Analytics*, *Scoring*, *Geomarketing*.

2016 – 2019

BSc - Computer Science: Software Engineering — **University of Balamand - LEBANON**

- **Graduated *Summa Cum Laude* (Highest Distinction)**.
- **Awarded *The Faculty of Science Professors' Award* for excellence in performance and highest GPA among the Department of Computer Science graduates.**
- **Final GPA: 3.9 / 4.0.**
- Main courses: *Object-Oriented Programming*, *Data Structures*, *Advanced Data Structures*, *Introduction to Artificial Intelligence*, *Computer Graphics*, *Systems Analysis*, *Software Engineering & Quality Assurance*, *Databases*.
- **Obtained a Minor in Economics**, following the courses: *Microeconomics Theory*, *Macroeconomics Theory*, *Intermediate Microeconomics*, *Intermediate Macroeconomics*, *Econometrics*.

2001 – 2016

Lebanese Baccalaureate - General Sciences — **Lycée Saint Pierre - LEBANON**

- Graduated with Highest Distinction.
- Valedictorian, *Class of 2016*.

PROJECTS

- MELKI Paul, ABBAD Cylia, LE Anh-Dung, MERCADIE Aurélie | M2 TSE (2021)
  Modelling Fraud Behavior on RATP Public Transport Network
  Statistical Consulting: BVA Research + TSE

  This in-depth analysis of fraudulent behavior on the public tramway and bus transport networks in the Parisian area aimed at developing an applied statistical methodology for the modelling of fraud behavior. The methodology evolved analysis at different levels including statistical modelling of the typical profile of a fare evader, as well as the estimation of the expected fraud rate on a new transport line given the socio-economic characteristics of the population it serves and its spatio-temporal context. The methodological approach, as well as the developed code, have been adopted by *BVA* in production.

- MELKI Paul, & LE Anh-Dung | M2 TSE (2021)
  A Homemade BERT-based Search Engine.
  Course: *Mathematics of Deep Learning Algorithms, Part II*.

  This project aimed at comparing two information retrieval methods: BM25 and a BERT-based search engines. The project is inspired by the recent work by R. Noguiera and K. Cho (2019), *Passage Re-ranking with BERT*, which shows that language models are particularly useful for information retrieval. The project started with the construction of a corpus to be used by the BM25 system, then the implementation of multiple experiments to compare the quality of the results retrieved by the two methods, as well as their computational efficiency.

- MELKI Paul | M2 TSE (2020)
  Adaptive Boosting as a Gradient Descent Method: Implementation for Regression Problems.
  Course: *Mathematics of Deep Learning Algorithms, Part I*.

  The aim of the projection was bifold: First, the implementation, from scratch, of the Adaptive Boosting (AdaBoost) algorithm for regression problems, knowing that this algorithm is more famously and easily implemented for classification tasks. Second, a theoretical presentation and discussion of the AdaBoost algorithm in the light of gradient descent methods, and in particular, a presentation of the Gradient Boosting improvement. On the practical side, the homemade implementation was tested on the famous Boston Housing Dataset, and the results briefly discussed and linked to the theory.

- MELKI Paul & LE Anh-Dung | M1 TSE (2020)
  Optimization of Smooth and Convex Functions: Theory & Practice.
  Course: *Optimization for Big Data*.

  This project tackled both from theoretical and practical points of view some ingredients related to the optimization of convex and smooth functions constrained on smooth and convex sets. In particular, it includes a theoretical presentation of the projection on the probability simplex, projected gradient descent and Frank-Wolfe algorithms and a discussion of their convergence. Practically, an implementation in Python of the projection on simplex algorithm as well as a homemade implementation of the Frank-Wolfe algorithm is presented, and applied to solving the LASSO regularization problem.

- MELKI Paul, CHAUDHURI Mohar, & RAHAL Mira | M1 TSE (2020)
  Trade Unionism and Inequality in an Integrated Market: A Study on the European Union.
  Supervised by Prof. Michael Becher (TSE - IAST - Princeton University) and Tuuli Maria Vanhapelto (TSE).

  Abstract - As ever-increasing levels of inequality are seen to be coinciding with ever-declining levels of trade union participation and bargaining coverage, our study looks at the role of trade unions' power in curbing inequality, emphasising the effect of market integration, hypothesised as weakening the power of trade unions. We thus focus on a heavily integrated market: the European Union. Working with a fixed-effects econometric specification, we find a small but non-null relationship between the power of trade unions, measured by the *trade union density* and *collective bargaining coverage*, on inequality, measured by the *Gini coefficient*, with market integration apparently decreasing the effectiveness of trade unions.

INDEPENDENT COURSEWORK

- **DeepLearning.AI** - *Deep Learning & Neural Networks* (April 2020).
- **University of Helsinki** - *Elements of AI* (October 2018).
- **Harvard University** - *Python for Research* (April 2018).
- **University of Texas at Austin** - *Foundations of Data Analysis - Part 1: Statistics Using R* (August 2017).

EVENTS & PARTICIPATIONS

- 2016 - *UOB & UNESCO Mobile Development Youth Camp* - University of Balamand, LEBANON.
- 2017 - *Google DevFest Lebanon* - American University of Beirut, LEBANON.
- 2018 - *Google HashCode Coding Competition* - WORLDWIDE.
- 2019 - *Data Science & AI Bootcamp organized by Beirut.AI* - American University of Beirut, LEBANON.
- 2020 - *Défi IA 2021 organized by INSA Toulouse* - **Team Tesseract**, current rank 6th/65 (top 10%) - Toulouse, FRANCE.

LANGUAGES

English - Professional Proficiency
Arabic - Native Language
French - Proficient
Greek - Elementary Proficiency

HOBBIES

- Professional reader and reviewer on *Goodreads* & *NetGalley*.
- Amateur photographer on *Unsplash*. Former secretary of the *UOB Photography Club* for 2 consecutive years.
- Outdoors enthusiast, beginner trail runner and hiker & tennis player.
- Classical music and arts appreciator.