Maxime Mulamba Ke Tchomba, PhD

+32497914642 | mula.max@hotmail.com | linkedin.com/in/maxime-mulamba-ke-tchomba | github.com/CryoCardiogram
Nationality: Belgian 🇧🇪

Experience

Research Scientist II November 2024 - ongoing
Amazon *Paris, France*

- Mentored 1 intern's Master Thesis (🏆 outstanding undergraduate project at Imperial College London)
- Co-led the team's biweekly paper reading club, promoting knowledge sharing and innovation.
- Reviewer for AMLC2025 and NeurIPS2025
- **Volume Shift Model in Rust**
  - Developed a lightweight Volume Shift simulation model to accurately assess the impact of changes to the fulfillment network within a few ms.
  - Optimized its memory usage from 80GB to under 5GB, while retaining performance.
  - Designed an inverse optimization approach to learn to imitate slower but more accurate volume shift tools, thus improving its accuracy by 10% while retaining runtime speed.
- **JuLS - A Julia Local Search Solver** | github.com/amazon-science/JuLS
  - Contributed to an open-source, modular solver combining Constraint-Based Local Search and Constraint Programming for complex logistics and scheduling problems.
  - Designed an Adaptive Large Neighbourhood Search (ALNS), a metaheuristic that leverages multi-armed bandits from Reinforcement Learning to dynamically select heuristics during the search process, improving the objective compared to the default heuristic over 100 iterations.

PhD Researcher October 2019 – Spring 2024
Vrije Universiteit Brussel & KU Leuven *Belgium*

- Research interest in Deep Learning, Combinatorial Optimization, Computer Vision, Neurosymbolic AI
- (Co)-authored 5 peer-reviewed publications at top conferences (CPAIOR, IJCAI, ICML, JAIR, AAAI).
- Supervised 5 master's students in Computer Science and Management Science.
- Animated a tutorial on Perception-based Constraint Solving at the ACP Summer School 2023.
- **Decision-focused learning for Energy-Cost Aware Scheduling** | Paper
  - Developed a decision-focused learning (DFL) framework to optimize day-ahead job scheduling for energy-cost minimization, integrating predictive ML models with integer linear programming (ILP) solvers.
  - Predicted energy prices using historical data (Irish Single Electricity Market) and optimized task allocation under resource constraints, reducing operational costs by up to 20% compared to traditional predict-then-optimize approaches
  - Designed and implemented a solution caching mechanism that reduced training time by up to 90% for DFL methods, enabling faster convergence and scalability for large-scale optimization problems.
- **Sudoku Assistant (🏆 Best Demo at AAAI 2023)** | visualsudoku.cs.kuleuven.be
  - Developed a hybrid framework combining a Vision Transformer (ViT) for digit recognition and a Constraint Programming solver to correct prediction errors, improving the accuracy of the solution by 30%.
  - Enhanced ViT architecture to detect handwritten input, allowing robust reasoning over both neural network inference errors and user mistakes.

Teaching Assistant Spring 2019
LINFO1103 Introduction to Algorithms – UCLouvain *Belgium*

- Instructed weekly exercise sessions, reinforcing foundational algorithmic and optimization concepts.
- Provided detailed reports on student progress, ensuring tailored support for learning needs.

Skills

Programming: Python, Rust, Julia, C/C++, Bash
Optimization: (Mixed) Integer Linear Programming, Constraint Programming, Gurobi, OR-Tools
AI/ML: Deep Learning, Image Processing, Object Detection, PyTorch, Decision-focused Learning
DevOps/Data: Git, SQL, Docker, AWS, FastAPI, (Geo)Pandas, Polars, QGIS
Languages: French (Native), English (Full professional proficiency), Dutch (Elementary)

Education

Vrije Universiteit Brussel & KU Leuven — Belgium
joint PhD in in Business Economics & PhD Computer Science Engineering — *2019 – 2024*

- Title: From Prediction to Solution: Enhancing Constraint Solvers with Machine Learning for Perceptual Decision-Making Problems
- Supervisor: Tias Guns & Vincent Ginis

UCLouvain — Louvain-la-Neuve, Belgium
Master in Computer Science — *2017 – 2019*

- Track: Artificial Intelligence, Big Data, Optimization & Algorithms
- 🇪🇺 Erasmus Scholarship for a semester at Trinity College Dublin

UCLouvain — Louvain-la-Neuve, Belgium
Bachelor in Economics and Management — *2014 – 2017*

- Minor: Computer Science

Community & Leadership

Volunteer — 2022 – 2023
PUSLE — *Belgium*

- Contributed to organizing conferences with speakers to help students in their career orientation
- Animated workshops to help students with their education orientation
- Mentored students 1-to-1 throughout their academic year

Scientific Publications

[1] **Mulamba, Maxime**, Jayanta Mandi, Rocsildes Canoy, and Tias Guns. Hybrid classification and reasoning for image-based constraint solving. In *International Conference on Integration of Constraint Programming, Artificial Intelligence, and Operations Research*, pages 364–380. Springer, 2020.

[2] **Mulamba, Maxime**, Jayanta Mandi, Michelangelo Diligenti, Michele Lombardi, Victor Bucarey Lopez, and Tias Guns. Contrastive losses and solution caching for predict-and-optimize. In *30th International Joint Conference on Artificial Intelligence (IJCAI-21): IJCAI-21*, page 2833. International Joint Conferences on Artificial Intelligence, 2021.

[3] Jayanta Mandi, Víctor Bucarey, **Maxime Mulamba Ke Tchomba**, and Tias Guns. Decision-focused learning: Through the lens of learning to rank. In *ICML*, volume 162 of *Proceedings of Machine Learning Research*, pages 14935–14947. PMLR, 2022.

[4] Mattia Silvestri, Senne Berden, Jayanta Mandi, Ali Irfan Mahmutogullari, **Maxime Mulamba**, Allegra De Filippo, Tias Guns, and Michele Lombardi. Score function gradient estimation to widen the applicability of decision-focused learning. *CoRR*, abs/2307.05213, 2023.

[5] Tias Guns, Emilio Gamba, **Mulamba, Maxime**, Ignace Bleukx, Senne Berden, and Milan Pesa. Sudoku assistant–an ai-powered app to help solve pen-and-paper sudokus. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 37, pages 16440–16442, 2023.

[6] Jayanta Mandi, James Kotary, Senne Berden, **Maxime Mulamba**, Victor Bucarey, Tias Guns, and Ferdinando Fioretto. Decision-focused learning: Foundations, state of the art, benchmark and future opportunities. *J. Artif. Intell. Res.*, 80:1623–1701, 2024.

[7] Rocsildes Canoy, Victor Bucarey, Jayanta Mandi, **Mulamba, Maxime**, Yves Molenbruch, and Tias Guns. Probability estimation and structured output prediction for learning preferences in last mile delivery. *Computers & Industrial Engineering*, page 109932, 2024.

[8] **Maxime Mulamba**, Jayanta Mandi, Ali Irfan Mahmutogullari, and Tias Guns. Perception-based constraint solving for sudoku images. *Constraints An Int. J.*, 29(1-2):112–151, 2024.