

# Martin Braquet

## Summary

Quantitative engineer and full-stack developer with 4 years of experience across aerospace robotics, climate-risk finance, and humanitarian open-source software. Equally at home designing clinical trials, optimizing cloud architectures, and shipping production applications end-to-end. Driven by transparent, data-backed impact in global development, public health, and other humanitarian causes.

## Experience

April 2026 – Present **Principal Investigator (Clinical Study)**, *Maya Care & Grow*, Agartala, India (Remote Oversight)

Designed, simulated, and executed a novel hierarchical Bayesian adaptive N-of-1 randomized crossover trial to identify personalized early intervention protocols for children with autism, maximizing clinical engagement while minimizing trial duration.

- **Experimental Design:** Formulated an N-of-1 crossover framework for 25 pediatric participants (ages 3–14), evaluating the distinct causal impacts of four randomized pre-session behavioral warm-ups against a baseline standard of care.
- **Adaptive Bayesian Modeling:** Developed a hierarchical statistical model implementing real-time weekly data updates and strict early-stopping criteria ( $\geq 90\%$  confidence thresholds), successfully accelerating clinical resolution and protecting participant welfare by cutting off ineffective routines.
- **Simulation & Sensitivity Analysis:** Conducted extensive Monte Carlo power simulations and rigorous model stress-tests using skeptical/vague priors and covariate removal, proving an 87.3% decision stability rate against background environmental noise.
- **Science Communication:** Architected and launched a dedicated open-access web platform translating the study's complex mathematical methodology, adaptive stopping safety nets, and simulation insights into accessible layman terms and data visualizations for parents and practitioners.
- **Clinical Rigor & Open Science:** Implemented a blinded protocol utilizing the BRES-10 engagement scale with a double-scored inter-rater reliability check; fully pre-registered the study workflow on OSF and open-sourced all code resources on GitHub.

*Core Technologies:* R, Stan, brms.

August 2025 – Present **Founder & Lead Engineer**, *Compass*, Independent / Open Source

Designed and built an open-source, cross-platform social ecosystem optimized for intentional human connection, growing the active community infrastructure to 600+ users in 6 months.

- **Full-Stack Engineering:** Developed the entire application using Next.js and TypeScript, delivering a unified codebase that powers a web application, an Android package, and a Progressive Web App (PWA) with functional iOS push notifications.
- **Infrastructure & Security Architecture:** Structured a real-time database layer combining Supabase and Firebase to support low-latency keyword search, customized notification alerting systems, and AES-256 database encryption for message privacy.
- **Open-Source Ecosystem:** Launched publicly on GitHub, establishing collaborative frameworks, automated code-styling workflows, and continuous error-monitoring via Sentry to seamlessly onboard community contributors.
- **Decentralized Governance:** Co-authored a transparent, democratic constitution enabling active contributors to vote on platform features and funding allocation, ensuring long-term mission protection and corporate independence.

*Core Technologies:* TypeScript, React, Next.js, Google Cloud Platform, Firebase, Supabase, Sentry.

- July 2022 – June 2024 **Quantitative Engineer**, *Arbol Climate Insurance*, Portland, OR, USA (Remote)  
 Designed, scaled, and optimized production-grade pricing architectures, serverless automation pipelines, and full-stack applications for climate-risk insurance, significantly reducing core pricing team operational overhead.
- **Enterprise Systems & APIs:** Engineered an end-to-end automated quoting API for enterprise clients, implementing custom data-cleaning pipelines and statistical modeling (Theil–Sen estimation) to deliver accurate risk quotes within minutes.
  - **High-Throughput Microservices:** Built scalable serverless architectures via AWS Lambda, Step Functions, and Celery to process high-volume batch requests (~100k rows) for the underwriting team, exposing functionality via automated Slack pricing bots.
  - **Quantitative & Analytical Tooling:** Developed Mark-to-Market pricing modules utilizing Black–Scholes models and realized volatility; used numerical solvers (Brent’s method) to inversely resolve target contract premiums.
  - **Performance Optimization:** Reduced risk-server report generation by 92% (40s → 3s) by architecting custom disk-caching and server-side load balancing, eliminating concurrency errors entirely.
  - **Data Pipeline Engineering:** Integrated real-time global predictive forecasting systems (GFS and ECMWF) into legacy historical climate models via specialized multi-loader structures.
  - **Machine Learning Innovation:** Built a proprietary recruitment screening tool utilizing 1536-dimensional OpenAI text embeddings and the Lever API to automate semantic profile matching for incoming talent pipelines.
- Core Technologies:* AWS, Python, Django, FastAPI, Celery, TensorFlow, JavaScript, Unicorn, Nginx, Sentry, Datadog.
- Aug. 2020 – May 2022 **Graduate Research Assistant**, *University of Texas at Austin*  
 Research focused on the design of dynamic decentralized decision-making algorithms (task allocation, motion planning, and obstacle avoidance) for multi-agent systems. Leveraged advanced concepts in market auctions, game theory, non-cooperative games, optimal control, and reinforcement learning.
- Feb. – July 2020 **Software and Electronic Engineer**, *LSM Conseil*, Louvain-La-Neuve, Belgium
- Engineered hardware devices and bare-metal firmware modules (C++) for industrial client contracts from scratch:
    - Designed an automated agricultural structural system harvesting solar energy using supercapacitors.
    - Conducted a hardware feasibility study for a dedicated low-power micro-USB audio reading appliance.
  - Programmed direct peripheral communications via high-performance microcontrollers using low-level SPI, DMA, USB, I<sup>2</sup>C, I<sup>2</sup>S, and hardware interrupts.
- 2018 – 2020 **Graduate Teaching Assistant**, *Université catholique de Louvain*, EPL  
 Instructed engineering exercise sessions, grading, and laboratory modules for classes of 20–50 undergraduate students.
- July – August 2019 **Robotics Engineering Intern**, *Massachusetts Institute of Technology*, Space Systems Laboratory  
 Collaborated within the Department of Aeronautics and Astronautics under Dr. Richard Linares.
- Developed physical avionics and electronics for a laboratory hardware test-bed built to emulate NASA’s Astrobee free-flying robot operating inside the International Space Station (ISS).
  - Architected comprehensive system schematics, soldered custom printed circuit boards (PCBs), and engineered low-level hardware verification drivers (C++, Linux).
- Sep. 2018 – May 2019 **Design and Control of a Driving Robot**, *Université catholique de Louvain*, Eurobot Team Lead
- Led a year-long mechatronics capstone project to engineer an autonomous wheeled robot from scratch for complex trajectory navigation.
  - Implemented advanced localization, real-time odometry, and LIDAR-based sensing utilizing Kalman Filters, Potential Field Methods, and optimization constraints (C program compiled directly into the Linux kernel of a Raspberry Pi).
  - Qualified for the Eurobot European Finals, achieving a 2nd-place ranking nationwide in Belgium.

## Education

- 2020 – 2022 **Master of Science in Aerospace Engineering**, *University of Texas at Austin*, Austin, TX, GPA: 3.96/4  
 Specialization in Controls, Autonomy, and Robotics: *Statistical Estimation Theory, Optimal Control, Robot Learning*.  
 Master’s Thesis: *Decentralized Auction-based Task Allocation with Guaranteed Collision Avoidance in Dynamic Environments*.
- 2018 – 2020 **Master in Electromechanical Engineering**, *Université catholique de Louvain*, Belgium,  
 Magna cum laude (1st in class)  
 Specialization in Mechatronics: *Robotics, Machine Learning, AI, Game Theory*. Master’s Thesis: *Design of an ultra-low-power energy-harvesting audio sensor for ecosystem monitoring*. Served as Elected Student Representative.
- 2015 – 2018 **Bachelor in Electrical and Mechanical Engineering**, *Université catholique de Louvain*, Belgium,  
 Summa cum laude (Top 1%)

## Honors and Awards

- 2020 BAEF Fellowship (\$60,000) awarded annually to top-tier Belgian graduate students pursuing advanced academic research in the United States.

- 2020 Cockrell School of Engineering Fellowship (\$3,500) awarded for outstanding merit at UT Austin.
- 2019 MIT Research Scholarship (5,000€) awarded to the top 5 highest-ranked students at UCLouvain, funded by the International Lhoist Berghmans Innovation Chair.
- 2019 Vice Champion of Belgium across the national Robotix's autonomous engineering exposition.
- 2015 Finalist in the national Belgian Mathematical Olympiad.

## Technical Skills

Languages	Python, MATLAB, R, TypeScript, JavaScript, Java, C/C++, SQL
Data & ML	PyTorch, TensorFlow, Pandas, NumPy, PyMC, Stan
Cloud & Web	Amazon Web Services, Google Cloud Platform, Node.js, FastAPI, Django, Vercel, Next.js, Firebase, Supabase, MongoDB
DevOps	Git, Bash/Linux, Celery, Gunicorn, Nginx, Datadog, Sentry
Tools	SolidWorks, LaTeX

## Selected Publications & Manuscripts

- 2022 Braquet, M. *Decentralized Auction-based Task Allocation with Guaranteed Collision Avoidance in Dynamic Environments*. MSc Thesis @ UT Austin (Supervised by Dr. Efstathios Bakolas). <https://repositories.lib.utexas.edu/items/f6cf4ae2-6fed-4993-8023-f853f08d72c4>
- 2022 Braquet, M. and Bakolas, E. *Vector Field-based Collision Avoidance for Moving Obstacles with Time-Varying Shape*. Modeling, Estimation and Control Conference (MECC) 2022. <https://www.sciencedirect.com/science/article/pii/S2405896322028890> — 15+ citations
- 2021 Braquet, M. and Bakolas, E. *Greedy Decentralized Auction-based Task Allocation for Multi-Agent Systems*. Modeling, Estimation and Control Conference (MECC) 2021. <https://www.sciencedirect.com/science/article/pii/S240589632102293X> — 70+ citations
- 2020 Braquet, M. *Design of an ultra-low-power energy-harvesting audio sensor for ecosystem monitoring*. MSc Thesis @ UCLouvain (Supervised by Dr. David Bol and Dr. Ramin Sadre). <http://hdl.handle.net/2078.1/thesis:25100>

## Languages

English: Full professional proficiency (C1)  
 French: Native proficiency (C2)  
 Dutch: Intermediate proficiency (B1)

## Interests & Altruism

Global Cultures	Immersed myself in rural India, Indonesia, and Burundi for a combined year to study regional socio-economic needs, building a deep compassion for cross-cultural welfare perspectives.
Effective Altruism	Actively engaged with evidence-based philanthropy networks; personally contributed over \$10,000 to highly effective, transparent charities (GiveDirectly, Against Malaria Foundation, etc.).
Continuous Learning	Read 100+ non-fiction books across philosophy, global history, and sciences within the past 4 years.