

MAXENCE BOELS

Robotics & Perception Research Engineer

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Robotics and computer vision researcher who takes perception models from research to **hardware that runs them** — training in simulation, then deploying under real latency and compute budgets. **PhD in Artificial Intelligence** from King's College London on long-horizon video understanding, action anticipation and planning, published in **Medical Image Analysis, MICCAI and IJCARS**. Now a postdoctoral researcher at the **University of Cambridge** building vision-based autonomy for decentralised multi-robot flight, where I design the aircraft, train the policies and run them on embedded compute. **5+ years** across clinical and robotics deployment; looking to do that work at product scale in industry.

EDUCATION

PhD in Artificial Intelligence, King's College London 2021 – 2025
Thesis: 'Long-Horizon Surgical Workflow Anticipation and Action Planning from Video' (Advisor: Prof. S. Ourselin)
MSc in Electrical & Electronic Engineering, University of Surrey 2019 – 2020
Thesis: 'Predicting Malignancy in Breast Cancer with Deep Learning' (Advisor: Prof. K. Wells)
Coursework: computer vision, deep learning, machine learning, robotics, signal processing.
MSc in Data Science and Advanced Analytics, NOVA University Lisbon 2017 – 2019
Thesis: 'Building a Data Analytics Tool for a Pharma Company' (Advisor: Prof. L. Vanneschi)

SKILLS

Deep Learning & Vision	PyTorch (advanced), OpenCV, TensorRT, CUDA
Robotics & Autonomy	ROS2, Gazebo, Isaac Sim/Lab, ZED SDK (RGB-D, point clouds), BetaFlight/MSP, CAD
Edge AI & Embedded	NVIDIA Jetson, Raspberry Pi CM5, ESP32
Programming	Python, C++ (onboard autonomy), CUDA (simulation kernels), Git, Docker, Linux
Familiar with	Rust, DeepStream, JavaScript/React
Languages	English (fluent), French (native), Dutch (fluent), Spanish (basic)

EXPERIENCE

Postdoctoral Research Associate, Prorok Lab, University of Cambridge — Cambridge, UK Jan 2026 – present

- Vision-based navigation and coordination policies for **decentralised multi-agent** flight: wrote the simulator as a **custom CUDA kernel** to train them at scale, and transferred the policies to physical quadrotors.
- Onboard autonomy stack in **C++** on embedded compute (Raspberry Pi CM5, Jetson), with TensorRT inference inside a real-time control budget; Python for training and analysis.
- Built the research airframe end to end — CAD and 3D-printed frame, power budgeting, sensor and companion-compute integration, flight-stack bring-up over MSP.

Research Assistant, Surgical Interventional & Engineering Lab — London, UK Jun 2021 – Dec 2025

- Published papers in leading journals and conferences (MICCAI, MIA, IJCARS).
- Developed predictive models on long surgical videos for recognition, next-action prediction, and planning.

Deep Learning Research Scientist, Radiomics — Brussels, Belgium Sep 2020 – Feb 2021

- Developed 3D segmentation models for tumour detection in lungs and liver.
- Integrated models into a clinical product pipeline with testing, QA and monitoring.

Research Assistant, Centre for Vision, Speech and Signal Processing — Guildford, UK Sep 2019 – Jun 2020

- Built **CNN-based breast cancer detection model**, achieving 89% sensitivity on mammograms.
- Implemented visual search using **SIFT + HOG** descriptors.

Software Engineer Intern, Deloitte — Paris, France Sep 2018 – Mar 2019

- Designed a data integration tool for a pharma company, automating workflows in C# and Python.
- Led client presentations and roadmap discussions, ensuring alignment with business objectives.

SELECTED PUBLICATIONS

- [1] Y. Liu, **M. Boels**, A. Granados, P. Dasgupta, S. Ourselin. (2nd of 5) *LoViT: Long Video Transformer for Surgical Phase Recognition*. Medical Image Analysis (2024).
State of the art (+3%) in long-context surgical video understanding.
- [2] **M. Boels**, A. Granados, P. Dasgupta, S. Ourselin. *DARIL: When Imitation Learning Outperforms Reinforcement Learning in Surgical Action Planning*. MICCAI COLAS Workshop (2025). [code]
Conditional world models against RL baselines for long-horizon action prediction.

- [3] **M. Boels**, Y. Liu, A. Granados, P. Dasgupta, S. Ourselin. *SWAG: Surgical Workflow Anticipation with Generative Modelling*. IJCARS (2025).
Transformer models that anticipate upcoming surgical steps from video.
- [4] J. Huo, L. Chen, Y. Liu, **M. Boels**, A. Granados, S. Ourselin, R. Sparks. (4th of 7) *MAPPING: Model Average with Post-processing for Stroke Lesion Segmentation*. MICCAI ATLAS Challenge (2022) — **1st place**.
- [5] **M. Boels**, H. Robertshaw, T. C. Booth, A. Granados, P. Dasgupta, S. Ourselin. *Surgical Robot Learning: From Demonstration and Simulation to World Models — A Review*. Submitted to IEEE T-MRB (2025).
Proposes surgical world models to overcome data bottlenecks and enable scalable autonomy.

PROJECTS

- **FPV Drone**: custom-built quadrotor for autonomous vision-based navigation — frame, flight stack and onboard perception.
- **UGV**: autonomous RC-car navigation with vision-based imitation learning from teleoperated demonstrations.
- **LeSurgeon**: 3D-printed and customised SO-101 arm learning a visuomotor manipulation policy.
- **Real-time Object Tracking**: 3D-printed pan/tilt turret closing a detection-and-tracking loop on an NVIDIA Jetson Nano with an RGB-D camera.
- **Surgical Assistant App**: workflow-anticipation model served behind an LLM-driven guidance interface.
- **3D Lung Segmentation**: 3D-UNet for lung-lobe segmentation in CT volumes.

ACADEMIC ACTIVITIES

- **Teaching Assistant**: ‘Advanced Machine Learning’ (2024) — unsupervised and self-supervised learning.
- **Mentoring**: supervision of student research projects in AI and robotics, from scoping to write-up.
- **Conference Service**: RSS 2027 (Deputy Submission Chair); MICCAI 2024 (Program Committee).

CERTIFICATIONS & CONTINUAL LEARNING

Deep Learning Specialisation — Coursera (2020) · Machine Learning Track — DataCamp (2019)