Maxence Boels

AI Research Scientist | Robotics & Computer Vision

AI researcher specialising in computer vision and robotics with 4+ years of experience developing robust deep learning models for real-world, safety-critical applications. PhD candidate at King's College London with expertise in long-sequence video understanding, action prediction, and planning. Proven track record of publishing in top-tier conferences (MICCAI, MIA) and deploying AI systems in clinical environments.

EDUCATION

PhD in Artificial Intelligence, King's College London *2021 – 2025*
Thesis: *'Surgical Video Understanding in Robotic Surgery'* (Advisor: Prof. Sebastien Ourselin)

MSc in Electrical & Electronic Engineering, University of Surrey *2019 – 2020*
Thesis: *'Predicting Malignancy in Breast Cancer with Deep Learning' (*Advisor: Prof. Kevin Wells) .
Relevant Coursework: computer vision, deep learning, machine learning, robotics, signal processing.

MSc in Data Science and Advanced Analytics, University Nova of Lisbon *2017 – 2019*
Thesis *: 'Building a Data Analytics Tool for a Pharma Company',* (Advisor: Prof. Leonardo Vanneschi) .

SKILLS

Deep Learning & Computer Vision:	PyTorch (advanced), OpenCV, C++ (limited), CUDA (limited).
Robotics & Autonomy:	ROS2, TurtleBot, Gazebo, Isaac Gym.
Software Engineering:	Python, C#, Git, Docker, Linux.
Languages:	EN (fluent), FR (native), NL (fluent), ES (limited proficiency).

EXPERIENCE

Research Assistant, Surgical Interventional & Engineering Lab - London, UK *Jun 2021 – Jun 2025*
- Published **over three papers** in leading journals and conferences (MICCAI, MIA) .
- **Developed predictive models** on long surgical videos for recognition, next action prediction, and planning.

Research Assistant, Centre for Vision, Speech and Signal Processing - Surrey, UK *Jun 2021 – Jun 2025*
- Built **CNN-based breast cancer detection model**, achieving **89% sensitivity** on mammograms .
- Implemented visual search using **SIFT + HOG descriptors**, improving retrieval accuracy by **15%** .

Deep Learning Research Scientist, Radiomics - Brussels, BEL *Sep 2020 – Feb 2021*
- Developed **3D segmentation models** for tumour detection in lungs and liver, improving detection accuracy by **15%** over previous methods.
- Integrated ML models into a clinical product pipeline, reducing processing time by **10%**.

Software Engineer Intern, Deloitte - Paris, FR *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.

Data Scientist Intern, Air - Brussels, BEL *Jul 2016 – Sep 2016*
- Built a **customer segmentation model** for targeted marketing, increasing campaign conversion rates by **12%**.
- Presented market analysis to top executives, influencing strategic marketing decisions .

SELECTED PUBLICATIONS

[1] **M. Boels**, H. Robertshaw, T. C. Booth, A. Granados, P. Dasgupta, and S. Ourselin. Surgical Robot Learning: From Demonstration and Simulation to World Models – A Review, *Submitted to IEEE T-MRB (2025)*.
- Comprehensive review of surgical robot learning; proposes **Surgical World Models to overcome data bottlenecks** and enable scalable autonomy.

[2] **M. Boels**, Y. Liu, A. Granados, P. Dasgupta, and S. Ourselin. SWAG: Surgical Workflow Anticipation with Generative Modelling, *International Journal of Computer Assisted Radiology and Surgery* (*IJCARS, 2025)* .

- **Pioneered** transformer-based predictive models for robotic surgery that **anticipate surgical steps**.

[3] **M. Boels**, A. Granados, P. Dasgupta, and S. Ourselin. When Imitation Learning outperforms Reinforcement Learning in surgical action planning, *International Conference on Medical Image Computing and Computer Assisted Intervention* (*MICCAI, 2025)* .

- Developed a novel approach using **conditional world models and reinforcement learning** for surgical **actions prediction** in robotic surgery.

[4] Y. Liu**, M. Boels**, A. Granados, P. Dasgupta, and S. Ourselin. LoViT: Long Video Transformer for Surgical Phase Recognition, (*Medical Image Analysis*, *2024*) .

- Improved long context understanding in surgical videos, achieving a **new state-of-the-art performance (+3%)** over previous methods.

[5] J. Huo, L. Chen, Y. Liu, **M. Boels**, A. Granados, S. Ourselin, and R. Sparks. MAPPING: Model Average with Post-processing for Stroke Lesion Segmentation, *(MICCAI ATLAS Challenge, 2022 – 1st place)* .

- Contributed to a **winning model** for stroke lesion segmentation, setting a new benchmark.

ACADEMIC ACTIVITIES

Teaching Assistant : 'Advanced Machine Learning' *(2024, covering Unsupervised and Self-Supervised Learning).*
Mentoring : MEng student (Max Kinnear-Noch) on surgical AI applications.
Program Committee : MICCAI'24 – *Participated in community support and outreach* .

PROJECTS

FPV Drone: Built a custom **FPV drone**, the goal is to develop autonomy (work in progress) .

Object Tracking Turret: 3D printed turret with depth camera and NVIDIA **Jetson Nano** edge computer .

Surgical Assistant App: Developed a **workflow anticipation AI** integrating LLM APIs for surgical guidance .

Speech Synthesis: Generation of vowels with linear predictive coding and automatic **speech recognition** .

3D Segmentation of Lungs: Training and evaluating a **3D-UNet** for lung segmentation in CT scans .

Breast Cancer Classification: Trained Neural Networks in **Matlab** for breast cancer binary classification .

CERTIFICATIONS & CONTINUAL LEARNING

Deep Learning Specialisation - Coursera *(2020)* , Machine Learning Track – DataCamp *(2019)* .