Maxence Boels

Researcher in Artificial Intelligence | Robotics and Computer Vision Expert

AI researcher specialising in deep learning, computer vision, and robotics. Currently advancing robotic surgery through predictive modelling at King's College London. Published in top-tier venues (MICCAI, IPCAI, MIA) with experience deploying AI solutions in medical imaging and healthcare. Strong technical expertise in PyTorch, machine learning, and interdisciplinary collaborations across academia and industry – links : .

WORK EXPERIENCE

Deep Learning Research Scientist, Radiomics - Brussels, Belgium *Sept 2020 – Dec 2020*

- 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%**.

Data Scientist Intern, Deloitte - Paris, France *Sept 2018 – March 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, Belgium *July 2016 – Sept 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 .

EDUCATION

PhD Candidate in Artificial Intelligence, King's College London *2021 – present*
Thesis: *'Surgical Workflow Prediction in Robotic Surgery'* (Advisor: Prof. Sebastien Ourselin)

- Published **over three papers** in leading journals and conferences (MICCAI, MIA) .
- Teaching Assistant for 'Advanced Machine Learning' (2024), supervising **MEng thesis projects**.

MSc. in Computer Vision, Machine Learning, and Robotics, University of Surrey *2019 – 2020*
Thesis: *'Predicting Malignancy in Breast Cancer with Deep Learning' (*Advisor: Prof. Kevin Wells) .

- TurtleBot path planning and following for the 'Robotics' course.
- Built **CNN-based breast cancer detection model**, achieving **89% sensitivity** on mammograms .
- Implemented visual search using **SIFT + HOG descriptors**, improving retrieval accuracy by **15%** .

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) .

- Developed **deep learning models** to reconstruct images, reducing reconstruction error (top 5% student).

BSc. in Business Administration and Management, ICHEC Business Management School *2013 – 2017*
Thesis *: 'Financial Analysis of a Belgian Company'*

RESEARCH INTERESTS

Deep Learning, Computer Vision, Video Understanding, Action Planning, Robotics, Autonomous Systems.

SELECTED PUBLICATIONS

[1] **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 – Accepted)* .

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

[2] **M. Boels**, A. Granados, P. Dasgupta, and S. Ourselin. Surgical Action Prediction with Reinforcement Learning on latent World Models, *International Conference on Medical Image Computing and Computer Assisted Intervention* (*MICCAI – In Progress)* .

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

[3] 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.

[4] 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 – responsible for managing the social media accounts .

PROJECTS

Autonomous Drone Systems: Built and programmed a custom **FPV drone** with navigation capabilities .

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 .

TECHNICAL AND PERSONAL SKILLS

Deep Learning & Computer Vision: PyTorch, TensorFlow, Computer Vision (OpenCV), CUDA Optimisation.

Robotics & Autonomy: ROS2, TurtleBot, Gazebo, Isaac Gym, Drone Autonomy (PX4, AirSim).

Software Engineering: Python, C++, C#, Git, Docker, Linux.

Languages: English (fluent), French (native), Dutch (fluent), Spanish (limited proficiency), Portuguese (basic).

CERTIFICATIONS & ADDITIONAL TRAINING

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