Tudor Jianu

PhD Candidate

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Summary

Proven expertise in applying computer vision and machine learning techniques to enhance autonomy in medical procedures. Skilled in designing and improving AI models using Python, with a focus on real-world applications in healthcare technology. Strong ability to work independently or in small, focused teams on complex, interdisciplinary projects. Thriving in mentally stimulating environments with an affinity for solving complex problems. Passionate about technology, with a deep appreciation for open-source projects and a commitment to leveraging innovative tools to optimize workflows and drive efficiency.

Skills

Technical Skills:	Medical Image Analysis, Multi-Modal Models, Deep Learning, Machine Learning, Computer Vision
Programming Languages:	Python, JavaScript, HTML, CSS, SQL, Bash
Tools:	PyTorch, Tensorflow, VIM, Docker, Linux, Git, Jupyter Notebooks

Work

Oct 2021 - Present — **PhD Researcher in Artificial Intelligence and Endovascular Navigation** — **University of Liverpool**

- Designed and implemented **CathSim**, a simulation environment for training and evaluating guidewire navigation tasks, showcasing expertise in multi-modal model development and streamlining AI-driven solutions in healthcare.
- Addressed complex challenges in 3D reconstruction and triangulation using advanced computer vision techniques, leading to the creation of **Guide3D**, a biplanar X-Ray dataset for segmentation and 3D reconstruction — demonstrating innovation in medical image analysis (MIA).
- Optimized autonomous navigation in complex vascular structures using Multi Modal Reinforcement Learning (RL) algorithms, underlining strong background in deep learning and model optimization.
- Developed 'Splineformer', a transformer-based architecture utilizing B-spline representations to predict guidewire shapes efficiently, highlighting advanced knowledge in model architecture design and novel solutions.
- Supervised students in diverse research projects, fostering interdisciplinary collaboration and promoting effective knowledge sharing, aligning with team-based research approaches.

Oct 2021 - Present — **Teaching Assistant** — **University of Liverpool**

- Teaching Assistant for Computer Vision (COMP338): Supported students with coursework on image processing, feature extraction, and machine learning applications in vision.
- Teaching Assistant for Robotic Perception and Manipulation (COMP341): Assisted students with robotic control algorithms, perception systems, and manipulation tasks.

Jan 2023 - Apr 2023 — **Technical Lead** — **Digital Theme UK-Ukraine Twinning Initiative**

- Designed and implemented the technical architecture for a seamless virtual conference experience.
- Collaborated with UK and Ukrainian academic institutions to align on research priorities and fostered international knowledge exchange.

Education

Oct 2021 - Present — **PhD in Artificial Intelligence within Endovascular Navigation** — **University of Liverpool**

- Developed novel AI techniques for autonomous guidewire navigation in endovascular procedures using deep learning and reinforcement learning.
- Collaborated with interdisciplinary teams and engineering to advance medical robotics research.

Sep 2020 - Sep 2021 — **Masters of Science in Computer Science** — **University of Liverpool**

Courses: Database and Information Systems, Data Mining and Visualisation, Machine Learning and BioInspired Optimisation, Applied Artificial Intelligence, Computational Intelligence

- Published a **novel texture generation network** for Sim2Real gap research in IEEE International Conference on Robotics and Automation (ICRA), contributing original insights to the field.

| Sep 2017 - | **Bachelours of Arts in Business Administration** | **Coventry University** |
| Aug 2021 | **Courses:** Project Management, Principles of Business Accounting, Introduction to Financial Services, International Finance | |

Publications

Dec 2024   **Guide3D: A Bi-planar X-ray Dataset for 3D Shape Reconstruction**
T. Jianu, B. Huang, H. Nguyen, B. Bhattarai, T. Do, E. Tjiputra, Q. Tran, P. Berthet-Rayne, N. Le, S. Fichera, and A. Nguyen
Asian Conference on Computer Vision (ACCV)

Developed **Guide3D**, the first high-resolution bi-planar X-ray dataset for 3D reconstruction in endovascular surgery, enabling accurate segmentation and advancing machine learning techniques for surgical tool navigation.

Oct 2024   **Translating simulation images to x-ray images via multi-scale semantic matching**
J. Kang, **T. Jianu**, B. Huang, B. Bhattarai, N. Le, F. Coenen, and A. Nguyen
MICCAI Workshop on Data Engineering in Medical Imaging

This paper introduces a method using multi-scale semantic matching to translate endovascular simulator images into realistic X-ray images, preserving structure critical for medical applications while addressing style discrepancies.

Aug 2024   **CathAction: A Benchmark for Endovascular Intervention Understanding**
B. Huang, T. Vo, C. Kongtongvattana, G. Dagnino, D. Kundrat, W. Chi, M. Abdelaziz, T. Kwok, **T. Jianu**, T. Do, H. Le, M. Nguyen, H. Nguyen, E. Tjiputra, Q. Tran, J. Xie, Y. Meng, B. Bhattarai, Z. Tan, H. Liu, H. S. Gan, W. Wang, X. Yang, Q. Wang, J. Su, K. Huang, A. Stefanidis, M. Guo, B. Du, R. Tao, M. Vu, G. Zheng, Y. Zheng, F. Vasconcelos, D. Stoyanov, D. Elson, and A. Nguyen
IEEE Transactions on Medical Imaging (under review)

CathAction introduces a large-scale dataset with 500,000 annotated frames and 25,000 segmentation masks, setting benchmarks and addressing challenges in catheterization understanding to advance real-world endovascular intervention applications.

Aug 2024   **DeepWire: Spherical Coordinate-Based Deep Learning for Accurate Guidewire Shape Reconstruction**
T. Jianu, B. Huang, H. Nguyen, P. Berthet-Rayne, S. Fichera, and A. Nguyen
International Conference on Biomedical Signal and Image Processing (ICBIP)

Developed a novel deep learning network for 3D reconstruction of guidewire shapes in endovascular surgery applications, leveraging spherical coordinates to achieve high accuracy and outperform traditional methods

Jan 2024   **Autonomous Catheterization with Open-source Simulator and Expert Trajectory**
T. Jianu, B. Huang, T. V. Vo, M. N. Vu, J. Kang, H. C. Nguyen, O. M. Omisore, P. Berthet-Rayne, S. Fichera, and A. Nguyen
Elsevier (Handbook of Robotic and Image-Guided Surgery)

Developed and introduced **CathSim**, the first open-source simulator for endovascular intervention, addressing limitations in autonomous catheterization research. Validated the simulator against real robotic systems and demonstrated its effectiveness in training machine learning algorithms for endovascular navigation tasks.

Nov 2023   **3D Guidewire Shape Reconstruction from Monoplane Fluoroscopic Images**
T. Jianu, B. Huang, P. Berthet-Rayne, S. Fichera, and A. Nguyen
International Conference on Robot Intelligence Technology and Applications (RiTA)

We propose a novel method to reconstruct 3D shapes from monoplane fluoroscopic images, achieving state-of-the-art results on the 3D Guidewire dataset.

Apr 2023   **Unsupervised adversarial domain adaptation for sim-to-real transfer of tactile images**
X. Jing, K. Qian, **T. Jianu**, and S. Luo
IEEE Transactions on Instrumentation and Measurement

ACTNet introduces an adaptive attention mechanism and task-related constraints to enable zero-shot sim-to-real transfer for tactile perception, achieving state-of-the-art performance with 92.85% accuracy without real-world labels.

Aug 2022   **Cathsim: An open-source simulator for autonomous cannulation**
T. Jianu, B. Huang, M. N. Vu, M. E. M. K. Abdelaziz, S. Fichera, C.-Y. Lee, P. Berthet-Rayne, F. Rodriguez y Baena, and A. Nguyen
Transactions on Medical Robotics and Bionics (T-MRB)

An open-source simulator has been introduced to advance machine learning for autonomous endovascular navigation, offering high-fidelity catheter and aorta simulation with real-time force feedback.

May 2022 **Reducing Tactile Sim2Real Domain Gaps via Deep Texture Generation Networks**
T. Jianu, D. F. Gomes, and S. Luo
International Conference on Robotics and Automation (ICRA)

Engineered a neural network that synthesizes realistic textures on simulated tactile images, targeting only contact areas to enhance realism and reduce the Sim2Real accuracy gap in robotic sensing tasks.

Volunteering

Oct 2021 - **Team Member**   **University of Liverpool (CS Outreach)**
Present Contributed to educational outreach programs aimed at promoting computer science to schools and the general public, collaborating with the Electrical Engineering and Electronics Department.

- Led an Introduction to Programming Workshop at Liverpool World Museum using Pi2Go robots, engaging young learners with interactive coding lessons and fostering interdisciplinary knowledge-sharing.
- Led a Deep Learning Workshop for Year 12 students during the Biograd Residential Program, introducing them to neural networks and AI concepts, closely aligned with the development and application of machine learning models.

Sep 2020 - **President of Data Science and Artificial Intelligence (DSAI) Society**   **University of Liverpool**
Sep 2021 Founded and led the Data Science and Artificial Intelligence Society.

- Established the society from the ground up, setting strategic goals to foster student engagement in Data Science and AI.
- Organized networking events and hands-on workshops, connecting students with industry professionals and providing practical training.

Interests

Research: Medical Image Analysis, Deep Learning, Large Language Models

Sports & Fitness: Bouldering, Gymnastics