Chiara Di Vece

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Experience

PhD Student in Computer Science, University College London - Dept of Computer Science **Sep 2020 — Present**
[Deep Learning, Deep Reinforcement Learning, Image analysis, Pytorch, Python, C#] London, UK

- Development of a training system for **autonomous navigation and guidance** in freehand fetal ultrasound scans exploiting **vision-based deep reinforcement learning**
- Collaboration with the Wellcome / EPSRC Centre for Interventional and Surgical Sciences (WEISS)

Software Engineer Intern, MathWorks - Deep Learning Algorithms **Jun 2023 — Sep 2023**
[Deep Learning, Algorithms, Matlab] Cambridge, UK

- Extended the Deep Learning Toolbox with the **sort method**, now supported by the Automatic Differentiation engine
- The function can be used to **build custom layers**.

Teaching Assistant, University College London - Dept of Computer Science **Sep 2021 — Present**
[Running the coding lab sessions + Q/A sessions + homework/exams development and marking | Python] London, UK

- **COMP0089: Reinforcement Learning** - Explores how to implement, apply, and test relevant learning algorithms.
- **COMP0037: Robotic Systems** - Explores how intelligent system knowledge representation is translated into actions to achieve goals using reinforcement learning both in pre-programmed and dynamic situations
- **COMP0088: Introduction to Machine Learning** - Provides a grounding in the main techniques of ”classical” machine learning, together with a briefer introduction to more advanced techniques
- **ENGF0003: Mathematical Modelling and Analysis 1** - Helps to develop your understanding of core mathematical concepts and modelling and analysis skills that underpin the practice of engineering

Research Intern, Politecnico di Milano - Dept of Electronics, Information and Bioengineering **Mar 2020 — Sep 2020**
[Unity, Deformation Simulation, C++, C#] Milan, Italy

- Worked at the Neuroengineering and Medical Robotics Lab on the European project *EDEN2020* for the development of a **position-based dynamics** simulator of brain deformations for **path planning** and intra-operative control in keyhole neurosurgery
- MSc student supervision on the thesis development (**KUKA robot and haptic interfaces** for palpation procedures)

Graduate Teaching Assistant, University of Illinois at Chicago - Dept of Bioengineering **Jan 2019 — May 2019**
[Running the exercise practice sessions + Q/A sessions + homework/exams marking | Matlab] Chicago (IL), USA

- *BME310: Biological Systems Analysis* - System dynamics and frequency-domain analysis in bioengineering systems. Topics include **population models, predator-prey models, metabolic networks, biological oscillation, dynamics of infectious diseases**

Graduate Research Student, University of Illinois at Chicago - Dept of Urology & UIC Innovation Center **Jan 2019 — May 2019**
[Segmentation, 3D Slicer, Blender, Haptic devices, C++] Chicago (IL), USA

- Development of a novel **haptic and virtual reality-based simulator** for improvement of psychomotor skill in Veress needle insertion

Education

PhD Student, Computer Science, University College London **Sep 2020 — Present**
Licence to lawfully engage in the professional practice of Industrial Engineer, Politecnico di Milano **Nov 2021**
Master of Science, Biomedical Engineering, Politecnico di Milano, GPA: 110/110 *cum Laude* **Sep 2017 — Dec 2019**
Master of Science, Bioengineering, University of Illinois at Chicago, GPA: 4.00/4.00 | Double Degree **Oct 2017 — Aug 2019**
Bachelor of Science, Biomedical Engineering, Politecnico di Milano, GPA: 107/110 **Oct 2014 — Jul 2017**

Publications

1. Le Lous, M. *et al.* Probe motion during mid-trimester fetal anomaly scan in the clinical setting: A prospective observational study. *European Journal of Obstetrics & Gynecology and Reproductive Biology* (2024).
2. Di Vece, C. *et al.* Measuring proximity to standard planes during fetal brain ultrasound scanning. *arXiv preprint arXiv:2404.07124.* Under review for the 27th International Conference on Medical Image Computing and Computer Assisted Intervention (2024).
3. **Di Vece**, **C.** *et al.* Ultrasound plane pose regression: assessing generalized pose coordinates in the fetal brain. *IEEE Transactions on Medical Robotics and Bionics* (2023).
4. **Di Vece**, **C.** *et al. Deep Learning-based Plane Pose Regression towards Training in Freehand Obstetric Ultrasound* in *Proceedings of the 12th Hamlyn Symposium on Medical Robotics 2022* (2022).

5. **Di Vece**, **C.** *et al.* Deep Learning-based Plane Pose Regression in Obstetric Ultrasound. *International Journal for Computer Assisted Radiology and Surgery (IJCARS).* Accepted for presentation at the 13th International Conference on Information Processing in Computer-Assisted Interventions (IPCAI 2022) (2022).
6. Segato*, A. and **Di Vece*, C.** *et al.* Position-Based Dynamics Simulator of Brain Deformations for Path Planning and Intra-Operative Control in Keyhole Neurosurgery. *IEEE Robotics and Automation Letters.* ***Equal contribution**; Accepted for presentation at the 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021) (2021).
7. **Di Vece**, **C.**, Luciano, C. & De Momi, E. Improvement of Psychomotor Skills Development for Veress Needle Placement using Haptics and Virtual Reality. *International Journal for Computer Assisted Radiology and Surgery (IJCARS)* (2021).
8. Crocioni*, G., **Di Vece***, **C.** & Esmailbeigi, H. *GLOS: GLOve for Speech Recognition* in *2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* ***Equal contribution** (2019).
9. Bracco*, F. and **Di Vece*, C.**, Cerina, L. & Santambrogio, M. D. *BIE-PInCS: Brain injury evaluation with pupillometer based on infrared camera system* in *2017 IEEE 3rd International Forum on Research and Technologies for Society and Industry (RTSI)* ***Equal contribution** (2017).

Selected Projects

6D Pose Regression of Ultrasound Diagnostic Planes, University College London **Sep 2020 — Present**
[Deep Learning, Medical image analysis, Pytorch, Python, C#]] - GitHub repo

- Developed a **regression CNN** that learns to predict the 6D pose (3D rotations and translations) of a plane in relation to the anatomy using image features and a Unity-based simulation environment for automatic acquisition of supervised synthetic data
- Reliable localization of US planes within the fetal brain in phantom data (**median error: 0.90 mm/1.17**$^\circ$) and successful generalization of pose regression for an unseen real fetal brain from a similar gestation age as in training (**median error: 11.84 mm/25.17**$^\circ$) with average **inference time of 2.97 ms** per plane
- Paper accepted for **publication** in a Health informatics journal (**IJCARS**) and associated conference (**IPCAI**)

Simulation of Brain Deformations in Keyhole Neurosurgery, Politecnico di Milano **Feb 2020 — Feb 2021**
[Unity, Simulation, Python, C#]

- Developed a **Unity**-based realistic and time-bounded simulator that mocks brain deformations during keyhole surgical procedures. Use of a **novel approach** with respect to the literature (position-based dynamics)
- Proved to be a **close match** with real brain deformations through validation using recorded deformation data of in-vivo animal trials (**mean mismatch: 4.73**$\pm$**2.15%**)
- Paper accepted for **publication** in a robotics and automation journal (**IEEE RA-L**) and associated conference (**IEEE/RSJ IROS**)

Virtual Reality and Haptics for Surgical Skills Training, University of Illinois at Chicago & Politecnico di Milano **Jan 2019 — Dec 2019**
[Segmentation, Medical Imaging, Blender, Haptic devices, C++] - GitHub repo

- Virtual reality and haptic-based simulator for the urological training in obtaining the pneumoperitoneum. Improved the acquisition of the necessary psychomotor skills, allowing for extended and more effective training without compromising patient safety (improved all the chosen performance indexes after training). The **System Usability Scale** test with experienced clinicians resulted in a **"good" usability**
- Paper accepted for **publication** in a Health informatics journal (**ICARS**)

Talks

Deep Reinforcement Learning-based Guidance in Freehand Obstetric Ultrasound Training **Jul 2022**
Invited Presenter, Women in Medical Image Understanding and Analysis workshop (WiMIUA) - University of Cambridge Cambridge, UK

Embodiment of AI: How robot can interpret environment information and act **May 2020**
Lecturer and Organizer, PhD Spring School - Università della Calabria - Dept of Computer Science Catanzaro, Italy

Theralight: Lightwave Technologies for Theranostic of Tumors **Feb 2020**
Invited Speaker, SharedCity: Innovation, Participation and Sustainability in Cities of the Future Milan, Italy

Awards & Honors

2024 Women's health tech grant - UCL's EPSRC Impact Acceleration Account (£5000)
2022 AURIS/IPCAI Young Investigator Travel Award | **1**st **place**; Microsoft/MathWorks WiMIUA Best Poster Award | **2**nd **place**; MICCAI2022 Women in MICCAI Inspirational Leadership Legacy | **1**st **place**
2021 Top 3 for group project work at the UCL Medical Image Computing Summer School (MedICSS)
2020 Alta Scuola Politecnica Top 3 projects; UCL Research Studentship in the Department of Computer Science (until Sep 2024)
2017 Rare Disease Hackathon, Florence (Italy) | **1**st **place**; Young Professional Demo Competition Event, IEEE 3rd International Forum on Research and Technologies for Society and Industry Leveraging a better tomorrow (RTSI) | **1**st **place**; Xilinx Open Hardware Contest, **finalist**

Extracurricular Experiences

Student Representative, WEISS, University College London **Sept 2021 — Present**
Volunteer Tutor, Alta Scuola Politecnica Alumni Mentoring Program - Mentor, Italy **Feb 2021 — Present**

- ASP alumni (Mentors) accompany the ASP students (Mentees) in their final year of the Alta Scuola Politecnica in an individual path of growth, suitably designed for the needs of each individual student. Mentors and students are thus able to create a relationship of trust and mutual exchange, to the benefit of a constructive and long-lasting interaction

Alta Scuola Politecnica (ASP), Technology Talents, Politecnico di Milano **Oct 2017 — Feb 2020**

- Joint honor program of Politecnico di Milano and Politecnico di Torino running in parallel with the MSc and based on merit (150 participants each year) with ad-hoc courses (innovation, management, decision-making, soft skills, design methods and processes)
- Awarded with the ASP diploma and Double Degree in Biomedical Engineering from Politecnico di Torino (MSc), both *cum Laude*
- Part of a team of 7 for the development of a multidisciplinary project (Theralight: Lightwave Technologies for Theranostic of Tumors) recognised as **one of the three best projects** of the cycle

IEEE Women in Engineering Student Branch Affinity Group, Politecnico di Milano **Mar 2018 — Present**

- Part of the executive board of one of the PoliMi largest associations, social media pages manager, networking events organizer

Ballet Academy, Professional Center of Academic Dance “La Dance”, Italy **Set 2000 — Jun 2015**

- Obtained the Diploma in Ballet, modern and contemporary dance