Herman Alexander Jaeger, PhD

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Electronic Engineer, Research Scientist and Problem Solver

I'm an enthusiastic and highly motivated electronic engineer with a fascination of novel electronic circuits and systems. My research interests include biomedical analogue and digital circuit design, signal processing, precision sensor systems, control engineering, systems engineering, magnetics design, mathematical modelling, PCB layout, 3D printing and hands-on electronics prototyping.

Career Profile

2022 – present — **Lecturer.** School of Engineering, University College Cork. I teach EE2013 non-linear circuit analysis and EE2016 power engineering modules. My research focuses on magnetic tracking for AR/VR applications.

2019 – present — **Founder and CTO.** Quadrant Scientific. Technical design consultancy based in Cork that provides biomedical engineering design and prototyping services to clients to the MedTech industry.

2019 – 2022 — **Postdoctoral Researcher.** School of Engineering, University College Cork. I work in the Biomedical Design Research Group on the application of electromagnetic tracking in medical interventions.

Summer 2014 — **UROP Internship.** The Hamlyn Centre, Imperial College London. Hamlyn is a centre of excellence for research in robot-assisted surgery. My internship saw the development of a robust algorithm for augmented reality kidney imaging.

2012 – 2013 — **Engineering Internship.** Design Evaluation Group, Analog Devices, Cork (Summer 2012/2013). My work involved the evaluation of new analog-to-digital converter products for a proprietary blood-glucose monitoring system.

Education

2015 – 2018 — **Ph.D., Electrical & Electronic Engineering, University College Cork.**
Thesis title: *Creating an open source electromagnetic tracking platform.*

2014 – 2015 — **M.Eng.Sc., Electrical & Electronic Engineering, University College Cork**.
Thesis title: *Automated airway navigation in bronchoscopy*.

2010 – 2014 — **B.Eng., Electrical & Electronic Engineering, University College Cork.**
Thesis title: *Intelligent toy interfaces*.

Publications

I have co-authored 15 peer reviewed articles (including 5 first author publications) and 10 conference papers (including 7 as first author) with over 8500 reads (ResearchGate 07/01/2022) and a h-index of **5** (Google Scholar 07/01/2022). A full list of my publications is available on Google Scholar: `https://scholar.google.com/citations?hl=en&user=sFTJ6t0AAAAJ`.

Journal Articles

1. Crowley, D., Cavaliere, M., Higgins, E., Pande, C., **Jaeger**, **H. A.**, O'Donoghue, K., & Cantillon-Murphy, P. (2024). Wireless electromagnetic sensors for image-guided cardiothoracic procedures. *IEEE Sensors Journal*, *24*(22), 37724–37733.

2. Srivastava, M., O'Donoghue, K., Sidun, A., **Jaeger**, **H. A.**, Ferro, A., Crowley, D., … Cantillon-Murphy, P. (2024). 3d position tracking using on-chip magnetic sensing in image-guided navigation bronchoscopy. *IEEE Transactions on Biomedical Circuits and Systems*, *18*(5), 1123–1139.

3. Cavaliere, M., Crowley, D., **Jaeger**, **H. A.**, O'Donoghue, K., & Cantillon-Murphy, P. (2023). Magnetic model calibration and distortion compensation for electromagnetic tracking in a clinical environment. *IEEE Transactions on Magnetics*, *59*(7), 1–12. doi:10.1109/TMAG.2023.3275297

4. Sidun, A., Srivastava, M., O'Donoghue, K., **Jaeger**, **H. A.**, Cavaliere, M., O'Hare, D., … Cantillon-Murphy, P. (2023). Planar on-silicon inductor design for electromagnetic tracking. *IEEE Sensors Journal*, *23*(18), 21129–21136.

5. Cavaliere, M., **Jaeger**, **H. A.**, O'Donoghue, K., & Cantillon-Murphy, P. (2021). Planar body-mounted sensors for electromagnetic tracking. *Sensors*, *21*(8).

6. Cavaliere, M., Walsh, C., **Jaeger**, **H. A.**, O'Donoghue, K., & Cantillon-Murphy, P. (2021). Magnetic tracking using a modular c++ environment for image-guided interventions. *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization*, 1–7.

7. O'Donoghue, K., **Jaeger**, **H. A.**, & Cantillon-Murphy, P. (2021). A radiolucent electromagnetic tracking system for use with intraoperative x-ray imaging. *Sensors*, *21*(10).

8. Cantillon-Murphy, P., **Jaeger**, **H. A.**, Donovan, M., Standley, L., O'Shea, C., Sweeney, P., … Piechaud, T. (2020). A Novel Simulated Training Platform and Study of Performance Among Different Levels of Learners in Flexible Cystoscopy. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*, *15*(3), 214–220.

9. Cavaliere, M., McVeigh, O., **Jaeger**, **H. A.**, Hinds, S., O'Donoghue, K., & Cantillon-Murphy, P. (2020). Inductive sensor design for electromagnetic tracking in image guided interventions. *IEEE Sensors Journal*, *20*(15), 8623–8630.

10. Hinds, S., **Jaeger**, **H. A.**, Burke, R., O'Sullivan, B., Keane, J., Trauzettel, F., … Cantillon-Murphy, P. (2019). An open electromagnetic tracking framework applied to targeted liver tumour ablation. *International Journal of Computer Assisted Radiology and Surgery*.

11. **Jaeger**, **H. A.**, & Cantillon-Murphy, P. (2019). Electromagnetic Tracking using Modular, Tiled Field Generators. *IEEE Transactions on Instrumentation and Measurement*, *68*(12), 4845–4852.

12. McCarthy, C., Kanterman, I., Trauzettel, F., **Jaeger**, **H. A.**, Goetz, A.-A., Colvard, B., … Cantillon-Murphy, P. (2019). Automated balloon control in resuscitative endovascular balloon occlusion of the aorta. *IEEE Transactions on Biomedical Engineering*, *66*(6), 1723–1729.

13. **Jaeger**, **H. A.**, & Cantillon-Murphy, P. (2018). Distorter Characterisation Using Mutual Inductance in Electromagnetic Tracking. *Sensors*, *18*(9), 1–25.

14. **Jaeger**, **H. A.**, Trauzettel, F., Nardelli, P., Daverieux, F., Hofstad, E. F., Leira, H. O., … Cantillon-Murphy, P. (2018b). Peripheral tumour targeting using open-source virtual bronchoscopy with electromagnetic tracking: a multi-user pre-clinical study. *Minimally Invasive Therapies and Allied Technologies*.

15. **Jaeger**, **H. A.**, Franz, A. M., O'Donoghue, K., Seitel, A., Trauzettel, F., Maier-Hein, L., & Cantillon-Murphy, P. (2017). Anser EMT: the first open-source electromagnetic tracking platform for image-guided interventions. *International Journal of Computer Assisted Radiology and Surgery*, *12*(6), 1059–1067.

16. **Jaeger**, **H. A.**, Nardelli, P., O'Shea, C., Tugwell, J., Khan, K. A., Power, T., … Cantillon-Murphy, P. (2017). Automated Catheter Navigation With Electromagnetic Image Guidance. *IEEE Transactions on Biomedical Engineering*, *64*(8), 1972–1979.

17. Khan, K. A., Nardelli, P., **Jaeger**, **H. A.**, O'Shea, C., Cantillon-Murphy, P., & Kennedy, M. P. (2016). Navigational Bronchoscopy for Early Lung Cancer: A Road to Therapy. *Advances in Therapy*, *33*(4), 580–596.

18. Nardelli, P., **Jaeger**, **H. A.**, O'Shea, C., Khan, K. A., Kennedy, M. P., & Cantillon-Murphy, P. (2016). Pre-clinical validation of virtual bronchoscopy using 3D Slicer. *International Journal of Computer Assisted Radiology and Surgery*, *12*(1), 25–38.

19. O'Shea, C., Khan, K. A., Nardelli, P., **Jaeger**, **H. A.**, Kennedy, M. P., & Cantillon-Murphy, P. (2016). Evaluation of endoscopically deployed radiopaque tumor models in bronchoscopy. *Journal of Bronchology and Interventional Pulmonology*, *23*(2), 112–122.

20. Pratt, P., **Jaeger**, **H. A.**, Hughes-Hallett, A., Mayer, E., Vale, J., Darzi, A., … Yang, G. Z. (2015). Robust ultrasound probe tracking: initial clinical experiences during robot-assisted partial nephrectomy. *International Journal of Computer Assisted Radiology and Surgery*, *10*(12), 1905–1913.

Conference Proceedings

1. **Jaeger**, **H. A.**, O'Donoghue, K., & Murphy, P. C. (2022). Induction sensor characterisation for electromagnetic tracking systems. In *2022 IEEE International Instrumentation and Measurement Technology Conference (I2MTC)* (pp. 1–6).

2. O'Donoghue, K., **Jaeger**, **H. A.**, & Cantillon-Murphy, P. (2022). Sensor fusion hardware platform for robust electromagnetic navigation. In *IEEE International Instrumentation and Measurement Conference* (under–review). Ottawa, Canada.

3. Franz, A. M., **Jaeger**, **H. A.**, Seitel, A., Cantillon-Murphy, P., & Maier-Hein, L. (2019). Open-source tracked ultrasound with anser electromagnetic tracking. In *Bildverarbeitung für die medizin 2019* (pp. 232–237). Wiesbaden: Springer Fachmedien Wiesbaden.

4. **Jaeger**, **H. A.**, Hinds, S., Hofstad, E. F., Solberg, O. V., Scheltes, J., Leira, H. O., … Cantillon-Murphy, P. (2019). Novel instrument design for electromagnetic navigation bronchoscopy - long abstract. In *Information processing in computer assisted intervention - IPCAI 2019* (Vol. 187), Rennes, France.

5. **Jaeger**, **H. A.**, Hinds, S., & Cantillon-Murphy, P. (2018). An Open Framework Enabling Electromagnetic Tracking in Image-Guided Interventions. In *Medical Image Computing and Computer Assisted Intervention – MICCAI 2018* (pp. 168–175). Granada, Spain.

6. **Jaeger**, **H. A.**, Trauzettel, F., Nardelli, P., Daverieux, F., Hofstad, E. F., Leira, H. O., … Cantillon-Murphy, P. (2018a). Endobronchial tumor targeting using a novel alignment of an open-source virtual bronchoscopy platform with electromagnetic tracking: A multi-user preclinical study. In *Irish Thoracic Society Annual Scientific Meeting 2018* (Vol. 187, S270–S270).

7. Kennedy, M., **Jaeger**, **H. A.**, Trauzettel, F., Nardelli, P., Davrieux, C. F., Hofstad, E., … Cantillon-Murphy, P. (2018). Endobronchial Tumor Targeting Using a Novel Alignment of an Open-Source Virtual Bronchoscopy Platform With Electromagnetic Tracking: a Multi-User Preclinical Study. In *Chest* (Vol. 154, 869A). San Antonio, TX.

8. **Jaeger**, **H. A.**, Trauzettel, F., Hofstad, E. F., Leira, H. O., Lango, T., & Cantillon-Murphy, P. (2017). Open source airway navigation: initial experiences with CustusX and Anser EMT. In *Society for Minimally Invasive Therapy - SMIT 2017*, Turin, Italy.

9. **Jaeger**, **H. A.**, Nardelli, P., O'Shea, C., Tugwell, J., Khan, K. A., Power, T., … Cantillon-Murphy, P. (2016). Image-guided catheter navigation with electromagnetic tracking. In *Society for Minimally Invasive Therapy - SMIT 2016*, Delft, The Netherlands.

10. **Jaeger**, **H. A.**, Nardelli, P., O'Shea, C., Kennedy, M., & Cantillon-Murphy, P. (2015). Bronchial catheter automation for the diagnosis and treatment of lung cancer. In *Irish Thoracic Society Annual Scientific Meeting 2018* (Vol. 184, S516–S517).

Skills

Languages	English, French (basic)
Coding	Matlab, Python, LaTeX, C++, Embedded C
Web Tech.	Html, css, Nginx Web Server, Reveal.js, MediaWiki
CAD	SPICE, Multisim, SolidWorks, Altium Designer
Misc.	Tutoring, lab demonstrating, 3D printing, typesetting and publishing

Experience

Teaching

- 2020 – present: **Lecturer** for EE2013 (Non-linear Circuit Analysis) including setting of exam paper.
- **Project supervisor** for integrated master's student in 2021.
- 2015 – 2019: **Lab demonstrator** for EE2012 and EE2013 circuit analysis courses.
- 2011 – 2015: **IEEE student branch** committee member and IEEE Xtreme event organiser.
- 2015 – 2019: **Mathematics tutor** for 1st year engineering mathematics.

Awards and Achievements

- 2023: **SFI Pathway Grant 22/PATH-S/10867 "WiMag"**, Tyndall National Institute, University College Cork. Total award €530,473.
- 2019: **Best paper award runner up**, School of Engineering, University College Cork.
- 2017: **Audience Choice Award**, IPCAI 2017, Barcelona, Spain.
- 2016: **Best Presentation Award**, SMIT 2016, Delft, The Netherlands.
- 2014: **2nd place, ACM programming competition**, Department of Computer Science, University College Cork, Ireland.
- 2013: **2nd place, IEEE/IBM Smarter Planet Challenge**, School of Engineering, University College Cork, Ireland.

Other

- 2021: **Certified first aid responder**
- 2014: **Member of IEEE**
- 2012: **Full Irish driving license**