Dr Martin Peniak

Applied AI · Computer Vision · Robotics

I design and build AI systems that connect cameras, computation and physical devices. Senior Innovation Engineer at Metropolis, formerly Head of Innovation at Cortexica, with a PhD in GPU computing for cognitive robotics.

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Based in Spain · Updated 12 November 2026

Professional experience

Senior Innovation Engineer - Metropolis

Oct 2019-present

Continuous role from AnyVision through Oosto and its acquisition by Metropolis.

- Implemented spatial calibration service v1 to connect camera observations to a shared geometric frame; six-view research combined source images with their 3D reconstruction.
- Explored controlled synthetic scenes with known camera geometry in Generator, providing a reference for perception experiments; shared the v1.0 demonstration in January 2024.

Head of Innovation - Cortexica Vision Systems

Jun 2016-Sep 2019

- Led innovation across machine vision, edge AI and AR/VR, including Prism and OVERPaSS.
- Developed Prism with the team: a distributed Jetson TX2 vision system addressing five-camera bandwidth and compute constraints, with production use documented in my 2017 project account.
- Developed edge-vision prototypes including CortexiCAM and PPE demonstrations, turning inference results into visible checks for helmets and high-visibility clothing.

GPU Engineer - Cortexica Vision Systems

Feb 2014-May 2016

Developed and optimised GPU image-processing pipelines using CUDA and OpenCL, alongside deep-learning experiments and cloud and edge systems.

Associate Lecturer (GPU programming) - University of Plymouth

2012-Feb 2014

Part-time alongside my research. Prepared and taught CUDA classes; helped establish GPU teaching infrastructure and the NVIDIA CUDA Teaching Center with Davide Marocco and the university team.

NVIDIA research internship - Santa Clara, California

Summer 2012

Research internship following my 2011 presentation of GPU cognitive-robotics applications at NVIDIA headquarters. Related public work includes CUDA Spotlight and GTC presentations.

PhD researcher, cognitive robotics - University of Plymouth

2008-2014

Developed Aquila's CPU/GPU cognitive-robotics toolkit and researched iCub action-language learning and recurrent neural networks within iTALK and POETICON++. First author of the Aquila 2.0 architecture paper.

Mars rover research - University of Plymouth and ESA ACT

2008-2010

My 2008 final-year rover simulator led to Plymouth's 2009-2010 collaboration with ESA's Advanced Concepts Team on evolving neural controllers for planetary rovers. Co-authored the 2010 study report and IJCNN paper.

Education

2014

PhD - GPU Computing for Cognitive Robotics

University of Plymouth. Research on GPU-accelerated cognitive robotics. Supervisors: Angelo Cangelosi, Tony Belpaeme and Davide Marocco.

2005-2008

BSc Computing

University of Plymouth. First Class Honours, Revell Research Systems Prize and Dean's List.

2006-2007

Life in the Universe

University of Manchester. Distance-learning astronomy course alongside full-time work and BSc study.

1999-2003

Stredná priemyselná škola strojnícka, Zvolen

Mechanical-engineering secondary school, Zvolen, Slovakia.

Selected technical areas

- **Perception:** computer vision, edge AI, embedded inference and image processing
- **Spatial systems:** multi-camera calibration, synchronised capture and synthetic scenes
- **Robotics:** neural networks, action-language learning and evolutionary robotics
- **Accelerated computing:** GPU/parallel computing and multi-GPU training
- **Software:** C++, Python, CUDA, OpenCL and OpenCV
- **Integration:** local AI, voice interaction, IoT, Home Assistant and home automation

AI-assisted engineering: I use AI coding and research agents for implementation, source checking and independent review, with automated tests and verification of deployed results.

Project Tao

I physically build and operate Project Tao, my personal off-grid project: hands-on solar installation, lithium-battery storage, water, irrigation and site construction, integrated with computing and automation. Local AI uses measurements and operating context to support decisions; equipment-control permissions remain separate.

Selected publications

A representative selection. The research bibliography includes full citations, source records, available PDFs and BibTeX.

Zhong, J., **Peniak, M.**, Tani, J., Ogata, T., & Cangelosi, A. (2019). Sensorimotor input as a language generalisation tool: a neurorobotics model for generation and generalisation of noun-verb combinations with sensorimotor inputs. Autonomous Robots, 43(5), 1271–1290. https://doi.org/10.1007/s10514-018-9793-7

Broz, F., et al. (2014). The ITALK project: A developmental robotics approach to the study of individual, social, and linguistic learning. Topics in Cognitive Science, 6(3), 534–544. https://doi.org/10.1111/tops.12099

Peniak, M., Morse, A., & Cangelosi, A. (2013). Aquila 2.0 software architecture for cognitive robotics. In 2013 IEEE Third Joint International Conference on Development and Learning and Epigenetic Robotics (ICDL) (pp. 1–6). IEEE. https://doi.org/10.1109/DEVLRN.2013.6652565

Peniak, M., Bentley, B., Marocco, D., Cangelosi, A., Ampatzis, C., Izzo, D., & Biscani, F. (2010). An island-model framework for evolving neuro-controllers for planetary rover control. In The 2010 International Joint Conference on Neural Networks (IJCNN) (pp. 1–8). IEEE. https://doi.org/10.1109/IJCNN.2010.5596942

Research bibliography: martinpeniak.com/publications

Selected talk: My dream about AI, TEDxBratislava (2014).
martinpeniak.com/talks