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Hsin-Hao Yu, Ph.D.

Versatile, cross-disciplinary researcher in medical AI and neuroscience. Based in Melbourne. Australian citizen.

Career Statement

- My career started as a neuroscientist studying the architecture of the visual cortex. I switched to industry research in 2018. At IBM Research, I collaborated with clinicians to develop deep-learning algorithms for the analysis of eye-imaging data.
- I want to work in a dynamic environment, where I use powerful computational methods to solve difficult, large-scale problems that have real-world impacts.

Key Skills

- **Technical know-how**: AI, machine learning, statistical data analysis, data visualization, image processing, cloud computing.
- **Cross-disciplinary project development and management**: I have developed and managed collaborative projects with clinicians, neuroscientists, and psychologists in Australia, USA, and Japan.
- **Communication**: Extensive experience in giving presentations and demos (in academic and business settings), teaching, and science communication.
- **Business skills**: I worked closely with IBM's business development executive on developing business opportunities, contract negotiation and data sharing/licensing. Experienced in patenting, recruitment, and mentoring.

Portfolio

- See https://hhyu.org/portfolio/ for samples of my work in AI, data science, neuroscience, and science communication.

Employment

Research Scientist (Research Staff Member), **IBM Research Australia**   2018-

- Developed algorithms to detect and manage glaucoma from retinal scans (via Optical Coherence Tomography), as part of a NIH grant co-developed with New York University.
- Developed 3 large-scale grants involving multiple international clinical partners for public and private funding agencies. Managed collaboration and data sharing with clinical partners.

Postdoctoral Research Fellow at **Physiology**, **Monash University**   2008-2018

- I used electrophysiology, imaging, and computational modelling to study the primate visual cortex. Published papers in top journals. Managed 3 research grants, supervised 5 Honours students and 2 Ph.D. students. Lectured in neuroscience and computational neuroscience.
- Recipient of the prestigious Australian Research Council Discovery Early Career Researcher Award (**DECRA**) from the Australian government in 2013.

Education

- Ph.D. in **Cognitive Science**, University of California San Diego (USA)   1999-2007
- B.A. in **Applied Mathematics**, National Chiao Tung University (Taiwan)   1996-1999

Selected Publications (full list: https://hhyu.org/publications)

- Yu et al (2020) "Estimating global visual field indices in glaucoma by combining macula and optic disc OCT scans using 3D convolutional neural networks": A method to increase the clinical efficiency of glaucoma monitoring, using **deep neural networks and statistical models** to infer visual functions from retinal scans. Published in the clinical journal *Ophthalmology Glaucoma*.

- Yu et al (2020) "A twisted visual field map in the primate dorsomedial cortex predicted by topographic continuity": Used **self-organization algorithms** and vector field analysis to explain a large dataset collected with electrode arrays in the visual cortex. Published in the high impact journal *Science Advances*.

- Chaplin, Yu et al. (2013) "A conserved pattern of differential expansion of cortical areas in simian primates": A highly cited paper in *Journal of Neuroscience* that used **nonlinear surface registration algorithms** and **3D visualisation** to test a hypothesis about the evolution of primate brains.

Recent Presentations

- 2020: IBM Research Australia Seminar. Title: The traveling salesman in the brain - modeling the formation of topographical maps in the visual cortex using self-organization principles.

- 2019: New Advances in Biocomplexity Workshop (University of Sydney). Title: Artificial Intelligence and the eye: a window into health

- 2018: Monash University Machine Learning Symposium. Title: The visual cortex as a deep neural network

Other Activities

- 2020: Reviewer of IBM Research's Accomplishment Awards. IBM member of the ARC Training Centre in Cognitive Computing for Medical Technologies.

- 2019: Demonstrator in IBM's Think Summit event in Sydney. Communication Lead of the eye imaging analytics team at IBM Research. IBM representative in the Data Common Group of the Australian Brain Alliance (ABA).

- 2017: Co-organizer of a symposium for the Asian Pacific Conference on Vision (APCV).

- 2013: Australian delegate to the node workshop of the International Neuroinformatics Coordination Facility (INCF, Stockholm, Sweden).

- Since 2013, reviewer of fellowship and grant applications for Australian funding agencies (ARC and NHMRC). Reviewer of neuroscience and AI papers for academic journals.

Patents

- Two USA patents filed in 2020.

Programming Skills

Python, C, Mathematica, R, Matlab, Tensorflow, Docker

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