Mathew H. Evans.
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Postdoctoral Researcher in Computational and Systems Neuroscience
University of Nottingham. PIs: Mark Humphries (Nottingham) and Rasmus Petersen (Manchester). Funding: MRC Grant MR/P005659/1 *Resolving the size and nature of neocortical population codes*. MRC grant MR/L01064X7/1 *Function of the thalamo-cortical pathway in sensory-guided behaviour*. Post duration: 01.07.2014 - 31.12.2019.

Roles:

- Development and application of analysis methods (Matlab, python, TensorFlow) to population recordings from somatosensory thalamus (electrophysiology) and somatosensory cortex (two photon calcium imaging) of mice taking part in decision making experiments.
- Automated and human-in-the-loop Machine Learning analysis of large-scale behaviour data ($>$50 terabytes of 1000fps high-speed video).
- Developing new decision-making tasks for mice to probe neural coding.
- Implementing algorithms for large-scale neuroscience data analysis on cluster computers.
- Successful application for grant funds (£255,367 from the MRC)

Employment history
Postdoctoral Research Associate
Active Touch Laboratory (Prof. Tony Prescott), Sheffield Centre for Robotics,
University of Sheffield, United Kingdom. 01.10.2013 - 30.06.2014
EPSRC/University of Sheffield Doctoral Prize Research Fellow
Sheffield Centre for Robotics, Department of Psychology,
University of Sheffield, United Kingdom. 01.10.2012 - 30.09.2013
Postdoctoral Research Associate
Active Touch Laboratory (Prof. Tony Prescott), Department of Psychology,
University of Sheffield, United Kingdom. 01.10.2011 - 30.09.2012
Support Worker
Jane Lewis Health and Social Care, St Asaph, Denbighshire, U.K. 01.02.2006 - 30.09.2006. Mental Health Care Group, Llangwyfan, Denbigh, Denbighshire, U.K. 01.10.2004 - 30.05.2005.

Abridged list of roles:

- Programming experience in Matlab, Python and C++.
- Disseminated research findings in Journal articles and at leading robotics conferences.
- Developed research agenda: Applied for fellowships from Leverhulme Trust (shortlisted for submission by University of Sheffield) and MRC (sponsored by the University of Manchester, shortlisted for interview).
- Developed novel real-time robotics platforms for understanding active tactile sensing.
- Collaborated on UK and EU FP7 projects.
- Helped to write successful EPSRC Capital for Great Technologies grant *Human-Machine Co-operation in Robotics and Autonomous Systems* (£999,794, PI Tony Prescott).
- Helped to write a patent application for an 'Active Sensory Augmentation Device' (UK Patent Application No 1201654.9).

Educational Qualifications
Ph.D., Machine Learning and Robotics. Department of Psychology, University of Sheffield, United Kingdom. 01.10.2007 - 30.09.2011. Supervisors: Prof. Tony Prescott, Dr. Charles Fox. Examiners: Dr Yiannis Demiris (Imperial College, London), Prof. John Porrill (University of Sheffield).

M.Sc., Computational and Systems Neuroscience Department of Psychology, University of Sheffield, United Kingdom. 01.10.2006 - 30.09.2007

B.Sc., Psychology Department of Psychology, University of Sheffield, United Kingdom. 01.09.2001 - 01.06.2004.

Publications. ***Current H-index : 13 (Google Scholar).***

Full publication list (including media coverage) available at mathewzilla.github.io, *or* Google Scholar, *or on request if unpublished.*

Evans, M. H.*, Campagner, D.*, Svoboda, K., Humphries, M. D., and Petersen, R. S. Active discrimination and reward history drive choice in mice. *In preparation*. **(* joint first authors).**

Campagner, D., **Evans, M. H.,** Loft, M. S. E. and Petersen, R. S. What the whiskers tell the brain *Neuroscience. 2017*.

Evans, M. H., and Brumberg, J. C. (2017). Barrels XXIX: Barrels go Hollywood. *Somatosensory & Motor Research*, 34(1), 58-64.

Martinez-Hernandez, M., Dodd, T. J., **Evans, M. H.,** Prescott, T. J., and Lepora, N.F. Active sensorimotor control for tactile exploration. *Robotics and Autonomous Systems 87, 15-27. 2017*

Freeman, O. J., **Evans, M. H.,** Cooper, G. J., Petersen, R. S., and Gardiner, N. J. Thalamic amplification of sensory input in experimental diabetes. *European Journal of Neuroscience, 44(1), 1779-1786. 2016*

Campagner, D., **Evans, M. H.,** Bale, M. R., Erskine, A., and Petersen, R. S. Prediction of primary somatosensory neuron activity during active tactile exploration. *eLife, 5, e10696. 2016*

Silberzahn R.,Uhlmann E. L., Martin D. P., Anselmi P., Aust F., Awtrey E., Bahník Š., Bai F., Bannard C., Bonnier E., Carlsson R., Cheung F., Christensen G., Clay R., Craig M. A., Dalla Rosa A., Dam L., **Evans M. H.,** Flores Cervantes I., Fong N., Gamez-Djokic M., Glenz A., Gordon-McKeon S., Heaton T. J., Hederos Eriksson K., Heene M., Hofelich Mohr A. J., HoÌĹgden F., Hui K., Johannesson M., Kalodimos J., Kaszubowski E., Kennedy D.M., Lei R., Lindsay T. A., Liverani S., Madan C. R., Molden D., Molleman E., Morey R. D., Mulder L. B., Nijstad B. R., Pope N. G., Pope B., Prenoveau J. M., Rink F., Robusto E., Roderique H., Sandberg A., SchluÌĹter E., SchÃűnbrodt F. D., Sherman M. F., Sommer S.A., Sotak K., Spain S., SpoÌĹrlein C., Stafford T., Stefanutti L., Tauber S., Ullrich J., Vianello M., Wagenmakers E.-J., Witkowiak M., Yoon S., and Nosek B. A. Many analysts, one dataset: Making transparent how variations in analytical choices affect results. *In Press, Perspectives on Psychological Science. Preprint, data and interactive visualisation available at the Open Science Framework. Links to media coverage at* mathewzilla.github.io

Lepora, N. F., Martinez-Hernandez, U., **Evans, M. H.,** Natale, L., Metta, G., and Prescott, T. J. (2015). Tactile superresolution and biomimetic hyperacuity. *IEEE Transactions on Robotics, 31(3), 605-618, 2015.*

Evans, M. H., Fox, C.W., Lepora, N. F., Pearson, M. J., Sullivan, J. C., and Prescott, T. J. (2013). The effect of whisker movement on radial distance estimation: a case study in comparative robotics. *Frontiers in Neurorobotics, 6 (12)*.

Fox, C. W.*, **Evans, M. H.***, Pearson, M. J. and Prescott, T. (2012). Towards hierarchical blackboard mapping on a whiskered robot. *Robotics and Autonomous Systems, 60 (11), 1356–1366*. **(* joint first authors).**

Lepora, N. F, Fox, C., **Evans, M. H.** Diamond, M., Gurney, K. and Prescott, T. J. (2012). Optimal decision-making in mammals: insights from a robot study of rodent texture discrimination. *Journal of The Royal Society Interface, 9 (72), 1517–1528*.

Sullivan, J.C., Mitchinson, B., Pearson, M. J., **Evans, M. H.,** Lepora, N. F., Fox, C. W., Melhuish, C., and Prescott. T.J. (2012). Tactile discrimination using active whisker sensors. *Sensors Journal, IEEE, 12 (2), 350 - 362.* (Journal cover figure, right).

Book chapters

Evans, M. H., Loft, M. S. E. and Petersen, R. S. Sensing the Environment with Whiskers. *In Press. Encyclopedia of Sensory Systems for Oxford University Press*.

Peer reviewed conference papers

Evans, M. H., Fox, C. W., and Prescott, T. J. (2014). Machines Learning-Towards a New Synthetic Autobiographical Memory. *In: Biomimetic and Biohybrid Systems (Living Machines), pp. 84-96. LNCS. Springer International Publishing.*

Bertram, C., **Evans, M. H.,** Javaid, M., Stafford, T. and Prescott, T. J. (2013). Sensory Augmentation with Distal Touch: The Tactile Helmet Project. - *In: Biomimetic and Biohybrid Systems (Living Machines), pp. 24-35. LNCS. Springer Berlin Heidelberg.*

Lepora, N. F., Martinez-Hernandez, U., **Evans, M. H.,** Natale, L., Metta, G., and Prescott, T. J. (2013). Embodied hyperacuity for robot touch. *In Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), Karlsruhe, Germany.*

Evans, M. H., Fox, C. W., Lepora, N. F., Pearson, M. J., and Prescott, T. J. (2012). Whisker based texture discrimination for mobile robots. *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 7-13*.

Lepora, N., Martinez, U., Barron, H., **Evans, M.H.,** Metta, G., and Prescott, T.J. (2012). Embodied hyperacuity from Bayesian perception. *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*

Fox, C., **Evans, M.H.,** Pearson, M. and Prescott, T.J. (2012). Tactile SLAM with a biomimetic whiskered robot. *Proc. IEEE Int. Conf. on Robotics and Automation (ICRA)*.

Fox, C., **Evans, M.H.,** Lepora, N., Pearson, M., Ham, A. and Prescott, T.J. (2011). CrunchBot: a mobile whiskered robot platform. *Towards Autonomous Robots (TAROS).Vol 6856, 102-113.* **Received highest review score at the conference.**

Lepora, N., Fox, C., **Evans, M.H.,** Mitchinson, B., Motiwala, A., Sullivan, C., Pearson, M.; Welsby, J., Pipe, T., Gurney, K. and Prescott, T.J. (2011). A General Classifier of Whisker Data using Stationary Naive Bayes: Application to BIOTACT Robots. *Proceedings of Towards Autonomous Robots, Springer. Vol 6856, 13-23.*

Evans, M.H., Fox, C.W., Pearson, M.J., Lepora, N.F., Prescott, T.J. (2010). Whisker-object contact speed affects radial distance estimation. *IEEE ROBIO*.

Lepora, N.F., **Evans, M.H.,** Fox, C.W., Pearson, M.J., and Prescott, T.J. (2010). Naive Bayes texture estimation. *IEEE Conference on Robotics and Biomimetics.*

Evans, M.H., Fox, C.W., and Prescott, T.J. (2010). Tactile discrimination using template classifiers: Towards a model of feature extraction in mammalian vibrissal systems. *11th International Conference on Simulation of Adaptive Behaviour, (SAB), p178-187.*

Lepora, N.F., **Evans, M.H.,** Fox, C.W., Diamond, M., Prescott, T. and Gurney, K. (2010). Naive Bayes texture classification applied to whisker data from a moving robot. *IEEE Proceedings of the International Joint Conference on Neural Networks (IJCNN).*

Prescott, T.J., Pearson, M., Fox, C., **Evans, M.H.,** Mitchinson, B., Anderson, S. and Pipe, T. (2010). Towards biomimetic vibrissal tactile sensing for robot exploration, navigation and object recognition in hazardous environments. *Proc. Robotics for Risky Interventions and Environmental Surveillance (RISE).*

Evans, M.H., Fox, C.W., Pearson, M.J., Prescott, T.J. (2009). Spectral template based classification of robotic whisker sensor signals in a floor texture discrimination task. *Proceedings of Towards Autonomous Robotic Systems (TAROS), p19-24.*

Fox, C., **Evans, M.H.,** Stone, J. and Prescott, T.J. (2008). Towards Temporal Inference for Shape Recognition from Whiskers. *Proceedings of Towards Autonomous Robotic Systems (TAROS).*

Posters and Abstracts

Loft, M.S., **Evans, M.H.**, Fox, S., and Petersen, R.S. A new dimension in multiple whisker tracking: imaging and tracking whisking behaviour in 3D. *In Society for Neuroscience Abstacts (2016, Program No. 149.07/FF9).*

Evans, M.H., Campagner, D. Fox„ S., Chlebikova, K., Pettifer, D., Humphries, M.D., Svoboda, K., and Petersen, R.S. Diverse strategies underlying active tactile discrimination in head-fixed mice: a novel, three-choice object localisation task. *In Society for Neuroscience Abstacts (2016, Program No. 149.08/FF10).*

Campagner, D., **Evans, M. H.,** Bale, M. R., Erskine, A., and Petersen, R. S. The somatosensory input to the brain during active sensation in awake mice. *In Society for Neuroscience Abstacts (2015, Program No. 156.03/O15). Also selected for a talk at the Barrels satellite meeting.*

Campagner, D., **Evans, M. H.,** Bale, M. R., Erskine, A., and Petersen, R. S. Input to the brain during active sensation cannot be predicted from passive stimulation: Study of whisker system of awake, behaving mice. *BNA 2015 Festival of Neuroscience, Edinburgh, UK.*

Evans, M.H. and Prescott T.J. Efficient and sparse coding in the whisker system. *In Society for Neuroscience Abstacts (2013, Program No. 644.07/MM6). Also selected for a talk at the Barrels satellite meeting*

Evans, M.H. Efficient coding in the whisker system: biomimetic pre-processing for robots? *Lecture Notes in Artificial Intelligence (Living Machines 2013), Biomimetic and Biohybrid Systems*.

Evans, M.H. Sparse somatosensory coding: towards explaining and predicting the response properties of rodent afferent pathway neurons. *CNS 2013 (Paris).*

Lepora, N., Martinez-Hernandez, U., **Evans, M.H.** , Natale, L., Metta, G. and Prescott, T. Embodied hyperacuity for robot touch. *ICRA workshop on tactile sensing, 2013.*

Grasso, F.W., **Evans, M.H.**, Basil, J., and Prescott. T.J. (2012). Toward a fusion model of feature and spatial tactile memory in the Australian crayfish Cherax destructor. *In Society for Neuroscience Abstracts. Society for Neuroscience (2012, Program No. 922.01/EEE56).*

Grasso, F.W., **Evans, M.H.**, Basil, J., and Prescott. T.J. (2012). Toward a fusion model of feature and spatial tactile memory in the crayfish Cherax destructor. *Lecture Notes in Artificial Intelligence (Living Machines), Biomimetic and Biohybrid Systems, 352-354, 2012.*

Martinez, U., Barron, H., **Evans, M.H.**, Lepora, N., Dodd, T. and Prescott, T.J. (2012). Texture classification through tactile sensing. *Lecture Notes in Artificial Intelligence (Living Machines), Biomimetic and Biohybrid Systems, 377-379, 2012.*

Barron, H., Lepora, N., Martinez, U., **Evans, M.H.** and Prescott, T.J. (2012). Towards a framework for tactile perception in social robotics. *Lecture Notes in Artificial Intelligence (Living Machines), Biomimetic and Biohybrid Systems, 335-336, 2012.*

Evans, M.H., Fox, C.W., Pearson, M.J., Prescott, T.J. (2009). Object location, orientation, and velocity extraction from artificial vibrissal signals. *In Society for Neuroscience Abstracts. Society for Neuroscience (Program No. 174.8/ Z12).*

Evans, M.H., Fox, C.W., Pearson, M.J., Prescott, T.J. (2008). Radial distance to contact estimation from dynamic robot whisker information. *In Barrels XXI (SfN Satellite Meeting), 2008.*

Fox, C.W., **Evans, M.H.**, Prescott, T.J. (2008). Template-based classification of whisker contact edge orientation and radial distance in a simulated mobile robot. *In Barrels XXI (SfN Satellite Meeting), 2008.*

Professional activities

Awards, Grants and Patents

EPSRC Doctoral Prize Fellowship (£50,000) *Real-time tactile SLAM for active touch sensing in biomimetic robots.* 10/2012-09/2013.

Co-author and named researcher: MRC Grant MR/P005659/1 (£255,367.54) *Resolving the size*

and nature of neocortical population codes. PI Mark Humphries, University of Manchester. 01/2017 - 12/2019.

Co-author: EPSRC Grant EP/J013714/1: (£999,794) *Human-Machine Cooperation In Robotics and Autonomous Systems*. PI Tony Prescott, Sheffield Centre for Robotics. 2013.

EPSRC Grant: *Upgrading the small scale equipment base for early career researchers in the Engineering and Physical Sciences call.* (£49,746, or which £8,712 was awarded for a robot positioning table for haptics research).

Applications shortlisted for interview: MRC Special Training Fellowship in Biomedical Informatics. *Early sensory coding in the rodent vibrissal system: from theory to experiment*. Sponsored by Dr Rasmus Petersen (Manchester) and Dr Mate Lengyel (Cambridge).

Submitted Grants: EU project applications (STREP $\approx$ €3M). 2012: *SeaTouch: Pinniped-inspired cognition for tactile AUVs.* 2013: *PROTEUS: Pinniped-inspired RObotic Technologies for Environment Understanding in the Subsea* (for which I was a co-investigator). *SENBIOSYS: Multimodal Bio-Inspired Active Sensing System for Quality Control.*

Leverhulme Early Career Fellowship (submitted following competitive University of Sheffield internal selection).

Teaching and supervision
Lectures: MSc in Cognitive and Computational Neuroscience (Department of Psychology, University of Sheffield). *PSY 6315: Current Issues in Systems Neuroscience* on the rodent whisker system, and biomimetic robots as tools for neuroscience).

Laboratory classes: BSc in Psychology (Department of Psychology, University of Sheffield). Organised, developed and taught a lab class series for *PSY 105: Discovering Cognitive Science: Minds, brains and machines.* . Disseminated teaching materials for the class to be run in subsequent years. I have also undertaken undergraduate tutoring duties on this course.

Supervision: Manchester: I have jointly supervised six successful undergraduate projects over two years (Students from Neuroscience, Physics and Bioinformatics).
Sheffield: MSc in Computational Intelligence (Departments of Automatic Control and Systems Engineering, Computer Science and Psychology, University of Sheffield). Research project (jointly with Prof. Tony Prescott and Dr Tony Dodd). “Hierarchical Temporal Memory and other machine learning approaches to whisker sensing."
MSc in Cognitive and Computational Neuroscience (Department of Psychology, University of Sheffield). Two Research Projects on “Whisker-based object recognition", and “Optimal whisker movements for object exploration" (awarded distinction).
All three Masters students that I supervised in Sheffield went on to PhD studies.

Administration
Coordinated the tendering and procurement of many items of robotics hardware from International vendors for the (£999,794) EPSRC *Human-Machine Cooperation In Robotics and Autonomous Systems* Grant, Sheffield Centre for Robotics. Managed funds and procurement for my EPSRC Fellowship.

Reviewing
Reviewed papers for *PLoS Computational Biology*, *Neural Networks*, *The Journal of Neurophysiology*, *The Journal of Open Research Software*, *Robotics and Automous Systems (journal)*, *IEEE Sensors Journal*, *IEEE International Conference on Robotics and Automation (ICRA)*, *Towards Autonomous Robotic Systems* conference (TAROS), *Living Machines (The International conference on Biomimetics and Neurotechnology)* and *Scholarpedia.* Program committee: *Towards Autonomous Robotic Systems* conference (TAROS 13, Oxford, UK). Living Machines 2013 (London, UK).

Visiting scientist
HHMI Janelia Research Campus, Ashburn, VA, USA (Karel Svoboda). September 2014. Weizmann Institute, Israel (Ehud Ahissar) and Ben-Gurion University, Beersheva, Israel (Rony Azouz). June 2013.

Science communication and outreach
Demonstrated robots at the Future Emerging Technologies conference (FET11, Budapest, Hungary; www.fet11.eu), at EU project evaluation meetings, and at public engagement sessions at the Towards Autonomous Robotic Systems conference (TAROS 11, Sheffield, UK). The whiskered robots and 'tactile helmet' I have helped to develop have also been featured in numerous news and media sources, including; the Times (London), Telegraph, Guardian, CBBC Newsround, Metro, Economist, BBC Look North, Science NOW, Futurity.org, machineslikeus.com, NBC News and The Scientist. *see* mathewzilla.github.io *for links.*

Patent:"Active Sensory Augmentation Device" (UK Patent Application No 1201654.9) - *co-author.*

Membership of learned societies
IEEE (2010-2014). Society for Neuroscience (2009-present).

Training courses and summer schools

Gaussian Process Winter School. 13-15th January 2014. Sheffield, UK.
CIC 6006 *Programming in C* Postgraduate Module. University of Sheffield 2010.
Cognitive Science and Machine Learning Summer School (MLSS), Sardegna Ricerche, Pula, Sardinina, Italy, May 6-12 2010.
Barcelona Cognition, Brain and Technology summer school (BCBT), Universitat Pompeu Fabra, Barcelona, Spain, September 7-18, 2009.

Languages

I am a native Welsh speaker.