

YI-SHIN LIN

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I'm an experimental and cognitive psychologist with expertise in statistics and mathematical modeling. My research focuses on decision-making in both fundamental and applied contexts, which have societal significance. I've explored topics such as Bayesian inference, visual search, choice behavior, behavioral economics, machine learning modeling, and traffic decisions.”.

APRIL 2020 – SEPTEMBER 2023

RESEARCH FELLOW, UNIVERSITY OF LEEDS

- I led the research projects in,
 - Studying the cognitive process of decision-making in traffic in a laboratory-controlled environment. The activity involves independently executing the project from its inception to the final report (**Work 1**).
 - Studying road-user interactions at the microscopic level in a video-based naturalistic traffic study (**Work 2**).
- **Work 1** results in a publication in an internationally renowned journal. In addition, **Work 1** produces a new piece of software enabling researchers to test a variant of the stochastic differential equation where equation components can vary in time (written in C++ and connected to the user via R interface). A publication associated with the second part of **Work 1** is currently under review.
- The impact of **Work 2** is a set of toolkits enabling the automated extraction of traffic trajectories from a pair of road users in multi-day video data. This work will also lead to a publication in an international journal and conference proceedings in Transport.
- (Collaboration **Works**) In addition to the above two projects, I collaborated on two projects led by other members. The impacts are (1) I assist the teams in fostering one publication demonstrating the application of a machine-learning model, dubbed long-short term memory, to showcase its ability to predict lane changing behaviours in highways, and (2) I also assist another publication, summarising five meaningful road user interactions based on laboratory data and accounting them using a computation model.
- I have also independently created new ideas to apply for research grants on nudging behaviour choice. This led to a travelling grant to Singapore and the establishing of two research collaborative projects (ongoing).
- Other regular university duties. Examples include supervising students, reviewing manuscripts, serving as a panel member for the transfer assessment and participating in institutional operation meetings.

NOVEMBER 2019 – JANUARY 2020

RESEARCH ASSISTANT, ACADEMIA SINICA

- I was responsible for designing and conducting behavioural experiments in assessing the just-noticeable differences (JNDs) in auditory perception in various machine-generated and honest human conversations. These customised machine-learning models use either an in-house chip (a hardware mean) or algorithms (a software mean) to reduce the bit-length of the IEEE-defined floating point number during computations. Such an innovation creates highly portable and efficient models

deployed in embedded systems.

- My duty was to test JNDs and to find out which model, at what level of floating number degradation, in what sort of background noise and so forth, human participants can and cannot distinguish the differences between actual human and generative conversations.
- My impact here is to bring in knowledge about testing human brain functions. The colleagues learnt that one must establish precision in a sub-millisecond testing environment. I produced such a tool in a MATLAB environment for team members to further the line of study.

SEPTEMBER 2015 - AUGUST 2018

RESEARCH FELLOW, TASMANIA COGNITION LAB

- I led two projects in creating high-performance computing (HPC) software to enable cognitive psychologists to conduct hierarchical Bayesian inference using one variant of genetic algorithm. This opportunity helped me to manage a computing server with 8 K80 Nvidia GPUs in an elastic cloud environment, like GCP and AWS.
- The impacts of these two projects are (1) a new simulation-based method, dubbed parallel PDA, to solve formal probability density functions and (2) a tool enabling researchers to conduct Bayesian inference in regular PC without needing the help of HPC. I documented these projects in two papers published by internationally renowned journals.
- In addition, I also assisted lab members in an international collaboration with prominent researchers in computational modelling across many countries, including the EU, USA, and Australia. I also supported two workshops in Bayesian Inference in Taiwan and Australia.
- In between, I delivered two speeches at Australian Mathematical Psychology Conferences.

MAY 2015 - JUNE 2015

PATENT ANALYST, NORTH AMERICAN INTELLECTUAL PROPERTY CORPORATION

- I helped to explore new business opportunities by mining patent documents. The goals are to find methods to help clients avoid infringing patents filed by competing companies and to create and introduce tools to colleagues in facilitating patent document analyses.

FEBRUARY 2008 - DECEMBER 2010; FEBRUARY 2002 - DECEMBER 2003

RESEARCH ASSISTANT, CHANGHUA CHRISTIAN HOSPITAL; NATIONAL TAIWAN UNIVERSITY HOSPITAL

- I helped to conduct two clinical drug trials in two psychiatric medicines under medical doctors' supervision. The work involves:
 - organising and submitting ethics review documents in clinical contexts,
 - Independently conducting sleep studies on the participants in the drug trials
 - Writing reports by analysing data on brain and physiological activities.
- My contribution helped the safety approvals of the two drugs in patients with hypersomnia and psychotic disorders.

AUGUST 2005 - MAY 2006; JULY 2007 - JANUARY 2008

RESEARCH AND TEACHING ASSISTANT, AND INSTRUCTOR NATIONAL CENTRAL UNIVERSITY; THE CITY COLLEGE OF THE CITY UNIVERSITY OF NEW YORK

- I taught two courses to undergraduate students: "Applied Statistics" and "Using Excel

on Statistical Computing".

- I also served as a teaching assistant in various capacities, tutoring students, marking coursework, and demonstrating course materials.

SEPTEMBER 2011 – DECEMBER 2015

PHD, UNIVERSITY OF BIRMINGHAM

Experimental Psychology, specialising in computational modelling and cognitive psychology.

SEPTEMBER 2004 – JUNE 2007

MA, THE CITY UNIVERSITY OF NEW YORK

Cognitive Neuroscience.

SEPTEMBER 1997 – JANUARY 2002

BSC, NATIONAL TAIWAN UNIVERSITY

Psychology. Dean List

- Programming languages: R, Rcpp, C, C++, CUDA, Python, JavaScript, CSS, Html, MATLAB, PyTorch, TensorFlow, C#.
- Database: Microsoft SQL
- Linux LPI Level I System administrator
- Effective ability in English in verbal and written communication.
- Reviewing manuscripts for the journal: IEEE-Access, Transportation Letter, Psychophysiology and Frontier in Future Transportation, Journal of Cognition.
- Languages: Mother tongues are Mandarin Chinese and Taiwanese. I have learned French throughout my education and have a rudimentary ability to understand French speakers.
- Software Tools: VSCode, Visual Studio, Emacs, Vim, Linux, macOS, Windows, Zotero etc.

I love water sports, mountaineering and cycling. I have visited several renowned mountains in Taiwan, UK, and Australia. I also obtained the title of entry-level black belt in Shotokan.

PUBLICATIONS

MACHINE-LEARNING

- Srinivasan, A. R., Hasan, M., **Lin, Y.-S.**, Leonetti, M., Billington, J., Romano, R., & Markkula, G. (2021). Comparing merging behaviours observed in actual data with behaviours generated by a machine-learned model. 2021. IEEE International Intelligent Transportation Systems Conference (ITSC), 3787–3792.
- Srinivasan, A. R., **Lin, Y.-S.**, Antonello, M., Knittel, A. Hasan, M., Hawasly, M., Redford, J., Ramamoorthy, S., Leonetti, M., Billington, J., Romano, R., & Markkula, G. (2023, July). Beyond RMSE: Do machine-learned models of road user interaction produce human-like behaviour? IEEE Transactions on Intelligent Transportation Systems. 24(7), 7166-7177.

TRANSPORT

- Lin, Y.-S., Srinivasan, A. R., Leonetti, M., Billington, J., & Markkula, G. (2022, Oct). A Utility Maximization Model of Pedestrian and Driver Interactions. *IEEE Access*, 10, 118888–118899.
- Markkula, G., Lin, Y.-S., Srinivasan, A., Billington, J., Leonetti, M., Kalantari, A. M., Yang, Y., Lee, Y., Madigan, R., & Merat N. (2023, Jun). Explaining human interactions on the road requires Large-scale integration of psychological theory. *PNAS, Nexus*, 2(6), 7166-7177. <https://doi.org/10.1093/pnasnexus/pgad163>.
- Lin, Y.-S., Billington, J., Srinivasan, A. R., Leonetti, M., & Markkula, G. (2023). Extracting Microscopic Interactions in Road Users from Continuous Traffic Surveillance Videos. Manuscript under preparation.
- Kalantari, A. H., Lin, Y.-S., Mohammadi, A., Merat N., & Markkula G. (2023). Investigating vehicle-pedestrian interactions at marked crossings: A comparison of two methodologies. Preprint.
- Maksimenko, V., Li, X., Lin, Y.-S., Kim, E.-J., and Bansal, P. (2023). Understanding Choice Biases in Moral Machine Experiment Using Brain Recordings and Drift Diffusion Models. 17th International Conference on Travel Behaviour Research July 14 - 18, 2024 – Vienna, Austria.

BASIC SCIENCE

- Lin, Y.-S., Billington, J., Srinivasan, A.R., Leonetti, M., & Markkula, G. (2023). Unraveling the Cognitive Complexity of Road Crossing Decisions: A Novel Model Integrating Time-varying Drift Rates, Signal Suppression, and Utility Maximization. Under review.
- Lin, Y.-S., Heinke, D., & Humphreys, G. W. (2015, Feb). Modelling visual search using three-Parameter probability functions in a hierarchical Bayesian framework. *Attention, Perception, & Psychophysics*, 77(3), 985-1010.
- Dutilh, G., Annis, J., Brown, S.D., Cassey, P., ... Lin, Y.-S., ..., Donkin, C. (2016, Feb). The quality of Response time data inference: A blinded, collaborative assessment of the validity of cognitive models. *Psychonomic Bulletin & Review*, 26, 1-19.
- Narbutas, V., Lin, Y.-S., Kristan, M., & Heinke, D. (2017, Jan). Serial versus parallel search: A Model comparison approach based on reaction time distributions. *Visual Cognition*, 25(1-3), 306-325.

RESEARCH METHODS AND ALGORITHMS

- Heathcote, Lin, Y.-S., Reynolds, A., Strickland, L., Gretton, M., & Matzke, D. (2018, Jun). Dynamic Models of Choice. *Behaviour Research Methods*, 51, 1-25.
- Lin, Y.-S., Heathcote, A., & Holmes, R. W. (2019, Aug). Parallel probability density approximation. *Behaviour Research Methods*. 51(6), 2777-2799.
- Lin, Y.-S., & Strickland, L. (2020, Aug). Evidence accumulation models with R: A practical guide to Hierarchical Bayesian methods. *The Quantitative Methods for Psychology*. 16(2). 133-153.