Li Kevin Wenliang

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Education

Gatsby Unit, University College London, PhD candidate in machine learning and theoretical neuroscience **2015 – 2021**

- Supervised by **Maneesh Sahani** (primary) and **Peter Dayan** (secondary)
- **Thesis: nonparametric enrichment in computational and biological representation of distributions**
  - Amortised learning: maximum likelihood learning of latent variable models without inference
  - Density estimation: deep kernel exponential family
  - Human perception as inference: theory on how the brain may encode uncertainty in the environment
  - State-space models: inference and learning of nonlinear exponential family models
- **Other research:** perceptual learning, causal optimal transport GAN

University of Cambridge, Trinity College Information and Computer Engineering **2010 – 2014**

- B.A. (1st Hon.) and M.Eng. (Distinction), scholarship £18,510 p.a. for four years
- College Senior Scholar, product design competition prize winner
- Ranked within top 10 of the year for 1st, 2nd and 4th years (3rd year at MIT)
- Master thesis: inference and learning on a nonlinear state-space model for neural spiking data, with **Máté Lengyel**

Massachusetts Institute of Technology **2012 – 2013**

- GPA: 4.9/5.0, Cambridge-MIT Exchange in Electrical Engineering and Computer Science.
- Course projects: Shadow removal (image processing), modelling information propagation (network science)
- Research: an automated pipeline for a new peptide synthesis method at the Chemistry department.

Research and career experiences

Neurochat, invited talk, Chinese Association for Psychological & Brain Science **Apr 2020**

Neurocomputation and AI in Neuroscience, invited talk, Dynamics in vision and touch (cancelled) **Mar 2020**

DeepMind PhD workshop, UCL, invited talk **Feb 2020**

Brains, Minds and Machines Summer School, MIT/Harvard **Aug 2016**

Project: human perception of object stability, with **Josh Tenenbaum**

Tsinghua University **Dec 2014 – Mar 2015**

Research Intern, 3D object representation on point-cloud data, grasp planning, with **Funchun Sun**

Microsoft Research Cambridge **Jul – Oct 2014**

Research Intern, road network recognition by marked point process, with **Sadia Ahmed** and **Sebastian Nowozin**

Other internship experiences

- Microsoft R&D Shanghai, program manager **2013**
- MeritCo Services, due diligence consulting **2013**
- Swiftkey, research in natural language processing for non-whitespace languages, with **Caroline Gasperin** **2011**

Programming: Python (TensorFlow, PyTorch, Caffe), Julia, MatLab, C/C++, Ruby, HTML/CSS, JavaScript

Teaching experiences

NeuroMatch Academy Summer School, TA **Jul 2020**

- Teaching computational tools for analysing neural recordings, advice on career and research projects

Machine Learning Summer School (UCL), TA **July 2019**

- Helped students in all tutorials, organised by **Marc Deisenroth** and **Arthur Gretton**

UCL TAs: probabilistic and unsupervised learning, approximate inference, theoretical neuroscience **Sept 2016 – Jun 2017**

- Marked homework, led tutorials, responded to questions and managed annotated reference list

Publications (with contributions)

Referred journal papers

Li Wenliang, Aaron Seitz, *Deep neural network for modelling visual perceptual learning,* Journal of Neuroscience, 18

- Proposed using deep neural network to model behavioural and neural data, designed and conducted experiments, wrote paper

Referred conference proceedings

Tianlin Xu, Li K. Wenliang, Michael Munn, Beatrice Acciaio, *COT-GAN: Generating sequential data via causal optimal transport*, to appear at NeurIPS, 20

- Proposed and analysed a debiasing correction to the Sinkhorn divergence, proposed and conducted most experiments, wrote paper

Li K. Wenliang, Theodore Moskovitz, Heishiro Kanagawa, Maneesh Sahani, *Amortised learning by wake-sleep*, ICML, 20

- Proposed direct ML gradient approximation with kernel ridge regression and automatic differentiation, designed experiments, conducted all but matrix factorisation experiments, managed collaboration, wrote paper

Li K. Wenliang, Maneesh Sahani, *Plausible model for online recognition and postdiction in dynamic environment*, NeurIPS, 19

- Proposed filtering algorithm and temporal features for encoding memory, designed flash-lag effect and occluded tracing experiments, conducted all experiments, wrote paper

Li K. Wenliang*, Dougal Sutherland*, Heiko Strathmann, Arthur Gretton, *Learning deep kernels for exponential family densities*, ICML, 19

- Developed meta-learning algorithm for training deep network kernels, design and conducted experiments, discussed normalisability of kernel exponential family distributions and issues of score matching, wrote paper

Chunfang Liu, Wenliang Li, Funchun Sun, Jianwei Zhang, *Grasp planning by human experience on objects with complex geometry*, IROS, 15

- Proposed a framework to classify objects and identify of graspable part, conducted experiments related to computer vision, wrote paper

Referred workshop abstracts

Li K. Wenliang, Eszter Vértes, Maneesh Sahani, *Accurate and adaptive recognition in dynamic environment*, COSYNE, 19

- Proposed biological inference and learning algorithms, designed and conducted experiments, wrote abstract, scored within top 6%

Li K. Wenliang, Maneesh Sahani, *Neural network represents uncertainty by nonlinear moments*, COSYNE, 18

- Hypothesised that activations of RNN trained to perform inference represent uncertainty with distributed distributional code, designed and conducted experiments, wrote abstract