Department of Computer Science
University of Liverpool
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BEI PENG

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RESEARCH INTERESTS

Deep Reinforcement Learning, Multi-Agent Systems, Interactive Machine Learning, and Curriculum Learning

EDUCATION

- **Doctor of Philosophy**, Computer Science. Aug. 2013 – Jul. 2018
  Washington State University, Pullman, WA, United States
  Advisor: *Matthew E. Taylor*
  Dissertation: Learning from Human Teachers: Supporting How People Want to Teach in Interactive Machine Learning

- **Bachelor of Science**, Computer Science. Sep. 2008 – Jun. 2012
  Huazhong University of Science & Technology, Wuhan, Hubei, China

ACADEMIC EMPLOYMENT

- **Lecturer (Assistant Professor)** in Artificial Intelligence Sep. 2021 – Present
  *University of Liverpool***,** Liverpool, United Kingdom

- **Non-Stipendiary Lecturer** in Computer Science Nov. 2019 – Aug. 2021
  University of Oxford, Oxford, United Kingdom

- **Postdoctoral Researcher**
  University of Oxford, Oxford, United Kingdom Jan. 2019 – Aug. 2021
  Research on deep reinforcement learning at the Whiteson Research Lab with *Prof. Shimon Whiteson*

- **Graduate Research Assistant**
  Washington State University, Pullman, WA, United States Jan. 2014 – Feb. 2018
  Research on interactive machine learning at the Intelligent Robot Learning Lab with *Prof. Matthew E. Taylor*

TEACHING EXPERIENCE

- **University of Liverpool**
  - COMP310: Multi-Agent Systems (a class of 250 undergraduate students), *Lecture*, Spring 2022
  - Taking the Postgraduate Certificate Academic Practice (PGCAP) program since April 2022, to improve teaching skills and gain professional recognition as a Fellow of the Higher Education Academy (FHEA)

- **University of Oxford**
  - Artificial Intelligence, *Tutor*, Spring 2020, Spring 2021
  - Machine Learning, *Tutor*, Fall 2019, Fall 2020
  - Reinforcement Learning, *Teaching Assistant*, Fall 2019, Fall 2020

- **Washington State University**
  - Reinforcement Learning, *Teaching Assistant,* Spring 2015
  - Introduction to Computer Architecture, *Teaching Assistant*, Fall 2013

SUPERVISION EXPERIENCE

- **University of Liverpool** Sep. 2021 – Present
  - I currently have 3 PhD students.
  - I currently supervise 11 undergraduate students in their final year projects for the academic year 2022-23.
  - I have supervised 4 undergraduate final year projects and 3 master theses in the academic year 2021-22.

- **University of Oxford** Jan. 2019 – Aug. 2021
  - (co-)Supervised 6 PhD students and 1 master student within/outside Oxford:
    - Tabish Rashid, Christian Schroeder de Witt, Tarun Gupta, Jacob Beck (University of Oxford)
    - Shariq Iqbal (University of Southern California)
    - Ling Pan, Tonghan Wang (Tsinghua University)
  - (co-)Supervised 4 undergrads in Oxford: Bozhida Vasilev, Kaloyan Aleksiev, Benjamin Slater, Leo Feng.
  - The supervision resulted in 2 ICML papers, 2 ICLR papers, 2 NeurIPS papers, and 3 workshop papers.

INDUSTRY EXPERIENCE

- **Microsoft Research,** Redmond, WA, United States Oct. 2018 – Dec. 2018
  Research Intern
  Focused on developing hierarchical deep reinforcement learning algorithms to learn interactive fiction games.

- **Borealis AI,** Edmonton, Alberta, Canada Mar. 2018 – Jun. 2018
  Research Intern
  Focused on developing algorithms to learn sequential decision-making tasks from online evaluative human feedback.

- **Tencent AI,** Seattle, WA, United States Aug. 2017 – Nov. 2017
  Research Intern
  Focused on training the agent to play MOBA game King of Glory using deep supervised learning and RL algorithms.

- **Tencent,** Wuhan, Hubei, China Jun. 2012 – May 2013
  Front-End Web Developer
  Implemented web extensions and web games in mobile platform by JavaScript.

PUBLICATIONS

Journal Articles

[**AI Commun'22**] Xiaowei Huang, **Bei Peng**, Xingyu Zhao. Dependable Learning-Enabled Multiagent Systems. *AI Communications, pages 1-14, 2022*.

[**JMLR'20**] Sanmit Narvekar, **Bei Peng**, Matteo Leonetti, Jivko Sinapov, Matthew E. Taylor, Peter Stone. Curriculum Learning for Reinforcement Learning Domains: A Framework and Survey. *Journal of Machine Learning Research, 2020*.

[**TETCI'18**] **Bei Peng**, James MacGlashan, Robert Loftin, Michael L. Littman, David L. Roberts, and Matthew E. Taylor. Curriculum Design for Machine Learners in Sequential Decision Tasks. *IEEE Transactions on Emerging Topics in Computational Intelligence, 2018.*

[**JAAMAS'16**] Robert Loftin, **Bei Peng**, James MacGlashan, Michael L. Littman, Matthew E. Taylor, Jeff Huang, and David L. Roberts. Learning Behaviors via Human-Delivered Discrete Feedback: Modeling Implicit Feedback Strategies to Speed Up Learning. *Journal of Autonomous Agents and Multi-Agent Systems, 2016.*

Conference Papers

[**NeurIPS'21**] **Bei Peng***, Tabish Rashid*, Christian A. Schroeder de Witt*, Pierre-Alexandre Kamienny, Philip H. S. Torr, Wendelin Böhmer, and Shimon Whiteson. FACMAC: Factored Multi-Agent Centralised Policy Gradients. *In Proceedings of the 35th Conference on Neural Information Systems, 2021.*

[**NeurIPS'21**] Ling Pan, Tabish Rashid, **Bei Peng**, Longbo Huang, Shimon Whiteson. Regularized Softmax Deep Multi-Agent Q-Learning. *In Proceedings of the 35th Conference on Neural Information Systems, 2021.*

[**ICML'21**] Shariq Iqbal, Christian A. Schroeder de Witt, **Bei Peng**, Wendelin Böhmer, Shimon Whiteson, and Fei Sha. Randomized Entity-wise Factorization for Multi-Agent Reinforcement Learning. *In Proceedings of the 38th International Conference on Machine Learning, 2021.*

[**ICML'21**] Tarun Gupta, Anuj Mahajan, **Bei Peng**, Wendelin Böhmer, and Shimon Whiteson. UneVEn: Universal Value Exploration for Multi-Agent Reinforcement Learning. *In Proceedings of the 38th International Conference on Machine Learning, 2021.*

[**ICLR'21**] Tonghan Wang, Tarun Gupta, Anuj Mahajan, **Bei Peng**, Shimon Whiteson, and Chongjie Zhang. RODE: Learning Roles to Decompose Multi-Agent Tasks. *In Proceedings of the 9th International Conference on Learning Representations, 2021*.

[**NeurIPS'20**] Tabish Rashid, Gregory Farquhar, **Bei Peng**, Shimon Whiteson. Weighted QMIX: Expanding Monotonic Value Function Factorisation. *In the 34th Conference on Neural Information Systems, 2020*.

[**ICLR'20**] Tabish Rashid, **Bei Peng**, Wendelin Böhmer, Shimon Whiteson. Optimistic Exploration even with a Pessimistic Initialisation. *In Proceedings of the 8th International Conference on Learning Representations, 2020.*

[**ICML'17**] James MacGlashan, Mark Ho, Robert Loftin, **Bei Peng**, Guan Wang, David L. Roberts, Matthew E. Taylor, and Michael L. Littman. Interactive Learning from Policy-Dependent Human Feedback. *In Proceedings of the 34th International Conference on Machine Learning, 2017.*

[**AAMAS'17**] **Bei Peng**, James MacGlashan, Robert Loftin, Michael L. Littman, David L. Roberts, Matthew E. Taylor**.** Curriculum Design for Machine Learners in Sequential Decision Tasks. *In Proceedings of the 16th International Conference on Autonomous Agents and Multiagent Systems*, *2017.*

[**AAMAS'16**] **Bei Peng**, James MacGlashan, Robert Loftin, Michael L. Littman, David L. Roberts, Matthew E. Taylor. A Need for Speed: Adapting Agent Action Speed to Improve Task Learning from Non-Expert Humans. *In Proceedings of the 15th International Conference on Autonomous Agents and Multiagent Systems*, *2016.*

[**IUI'15**] Gabriel V. de la Cruz Jr., **Bei Peng**, Walter S. Lasecki, Matthew E. Taylor. Towards Integrating Real Time Crowd Advice with Reinforcement Learning. *In proceedings of the 20th ACM Conference on Intelligent User Interfaces, 2015*.

[**RO-MAN'14**] Robert Loftin, **Bei Peng**, James MacGlashan, Michael L. Littman, Matthew E. Taylor, David Roberts, and Jeff Huang. Learning Something from Nothing: Leveraging Implicit Human Feedback Strategies. *In IEEE International Symposium on Robot and Human Interactive Communication, 2014.*

[**AAAI'14**] Robert Loftin, James MacGlashan, **Bei Peng**, Michael L. Littman, Matthew E. Taylor, Jeff Huang, and David L. Roberts**.** A Strategy-Aware Technique for Learning Behaviors from Discrete Human Feedback. *In Proceedings of the 28th AAAI Conference on Artificial Intelligence, 2014.*

Workshop and Symposium Papers

Bozhidar Vasilev, Tarun Gupta, **Bei Peng**, Shimon Whiteson. Semi-On-Policy Training for Sample Efficient Multi-Agent Policy Gradients. *In Proceedings of the Adaptive and Learning Agents Workshop (at AAMAS), 2021*.

Leo Feng, Luisa Zintgraf, **Bei Peng**, Shimon Whiteson. VIABLE: Fast Adaptation via Backpropagating Learned Loss. *In Proceedings of the 3rd Workshop on Meta-Learning (at NeurIPS), 2019*.

Tabish Rashid, **Bei Peng**, Wendelin Bohmer, and Shimon Whiteson. Optimistic Exploration with Pessimistic Initialization. *In Proceedings of the Exploration in Reinforcement Learning Workshop (at ICML), 2019.*

Bei Peng, James MacGlashan, Robert Loftin, Michael L. Littman, David L. Roberts, and Matthew E. Taylor. Curriculum Design for Machine Learners in Sequential Decision Tasks. *In Proceedings of the Adaptive Learning Agents Workshop (at AAMAS), 2017.*

Robert Loftin, James MacGlashan, **Bei Peng**, Matthew E. Taylor, Michael L. Littman, and David L. Roberts. Towards Behavior-Aware Model Learning from Human-Generated Trajectories. *In AAAI Fall Symposium on Artificial Intelligence for Human-Robot Interaction, 2016.*

James MacGlashan, Michael L. Littman, David L. Roberts, Robert Loftin, **Bei Peng**, and Matthew E. Taylor. Convergent Actor Critic by Humans. *In Workshop on Human-Robot Collaboration: Towards Co-Adaptive Learning Through Semi-Autonomy and Shared Control (at IRO*S), 2016.

Bei Peng, James MacGlashan, Robert Loftin, Michael L. Littman, David L. Roberts, and Matthew E. Taylor. An Empirical Study of Non-Expert Curriculum Design for Machine Learners. *In Proceedings of the Interactive Machine Learning Workshop (at IJCAI), 2016.*

Mitchell Scott, **Bei Peng**, Madeline Chili, Tanay Nigam, Francis Pascual, Cynthia Matuszek, and Matthew E. Taylor. On the Ability to Provide Demonstrations on a UAS: Observing 90 Untrained Participants Abusing a Flying Robot. *In Proceedings of the AAAI Fall Symposium on Artificial Intelligence and Human Robot Interaction AI-HRI, 2015.*

Bei Peng, Robert Loftin, James MacGlashan, Michael L. Littman, Matthew E. Taylor, and David L. Roberts. Language and Policy Learning from Human-delivered Feedback. *In proceedings of the Machine Learning for Social Robotics Workshop (at ICRA), 2015.*

Gabriel V. de la Cruz Jr., **Bei Peng**, Walter S. Lasecki, and Matthew E. Taylor. Generating Real-Time Crowd Advice to Improve Reinforcement Learning Agents. *In Proceedings of the Learning for General Competency in Video Games workshop (at AAAI), 2015.*

James Macglashan, Michael L. Littman, Robert Loftin, **Bei Peng**, David Roberts, and Matthew E. Taylor. Training an Agent to Ground Commands with Reward and Punishment. *In Proceedings of the Machine Learning for Interactive Systems workshop (at AAAI), 2014.*

SELECTED TALKS

- Introduction to Reinforcement Learning
  Tutorial at the Centre for Doctoral Training in Distributed Algorithms at Liverpool, November 2022.
- Introduction to Multi-Agent Reinforcement Learning
  Lecture at the CIFAR 2022 Deep Learning + Reinforcement Learning (DLRL) Summer School, July 2022.
- Cooperative Multi-Agent Reinforcement Learning
  Invited Keynote Talk at the Adaptive Learning Agents (ALA) Workshop at AAMAS, May 2022.
- Cooperative Deep Multi-Agent Reinforcement Learning
  Invited Talk at the Centre for Mathematical Imaging Techniques Seminar, University of Liverpool, March 2022.

- Learning from Evaluative Human Feedback
  Invited Keynote Talk at the Transparent Agency and Learning Workshop, September 2021.

- FACMAC: Factored Multi-Agent Centralised Policy Gradients
  Paper presentation in 35th Conference on Neural Information Processing Systems (NeurIPS), December 2021.

- Analytic Multi-Agent Actor-Critic Algorithms
  Talk at the Whiteson Research Lab, University of Oxford, April 2020.

- Learning Behaviors via Human-Delivered Discrete Feedback
  Talk at the Whiteson Research Lab, University of Oxford, February 2019.

- Learning from Human Teachers: Supporting How People Want to Teach in Interactive Machine Learning
  Invited Talk at Microsoft Research, Redmond, WA, United States, July 2018.

- Curriculum Design for Machine Learners in Sequential Decision Tasks
  Paper presentation in the Conference on Autonomous Agents and Multi-agent Systems (AAMAS), May 2017.

- A Need for Speed: Adapting Agent Action Speed to Improve Task Learning from Non-Expert Humans
  Paper presentation in the Conference on Autonomous Agents and Multi-agent Systems (AAMAS), May 2016.

AWARDS AND HONORS

- WSU EECS Scholarship for Grace Hopper Celebration Conference, 2017
- AAMAS NSF Scholarship, 2016
- RSJ/KROS Distinguished Interdisciplinary Research Award Finalist for our paper "Learning something from nothing: Leveraging implicit human feedback strategies" at RO-MAN 2014
- Travel Award:
  - Conference on Autonomous Agents and Multi-agent Systems (AAMAS) 2016, 2017
  - International Joint Conferences on Artificial Intelligence (IJCAI) 2016
  - Grad Cohort Workshop for Women 2014, 2015
  - AAAI Conference on Human Computation and Crowdsourcing (HCOMP) 2014
- National Encouragement Scholarship (1%), Huazhong University of Science and Technology, China, 2011
- Model Student of Academic Records (1%), Huazhong University of Science and Technology, China, 2010
- Individual Scholarship (5%), Huazhong University of Science and Technology, China, 2009

ACADEMIC SERVICE

- Currently the IPAP (Independent Progress Assessment Panel) member for **11 PhDs** at University of Liverpool
  - Responsible for assessing the PhD student's research progress at the end of each year
- Currently the Academic Advisor for **30 undergraduate and graduate students** at University of Liverpool
- Currently the Search Committee Member for Lecturers (Assistant Professors) in Computer Science, University of Liverpool, 2022
- External Panel Member for Postdoc Interviews at the Chemistry Department, University of Liverpool, 2022

- PhD Thesis Internal Examiner for James Butterworth, CS Department, University of Liverpool, 2022
- Panel Member for PhD Interviews at the Whiteson Research Lab, University of Oxford, 2020, 2021
- Panel Member for Undergraduate Admission Interviews at the St Catherine's College, University of Oxford, 2019, 2020
- Co-organizer (with Patrick MacAlpine, Patrick Mannion, and Roxana Radulescu), Adaptive Learning Agents (ALA) Workshop at AAMAS 2019
- Co-organizer (with Anna Harutyunyan, Patrick Mannion, and Kaushik Subramanian), Adaptive Learning Agents (ALA) Workshop at AAMAS 2018
- Conference and Journal Reviewing:
  - International Conference on Learning Representations (ICLR) 2022, 2023
  - IEEE Transactions on Pattern Analysis and Machine Learning, 2022
  - Conference on Neural Information Processing Systems (NeurIPS) 2020, 2021
  - Journal of Machine Learning Research (JMLR) 2021
  - Journal of Artificial Intelligence Research (JAIR) 2020
  - AAAI Conference on Artificial Intelligence (AAAI) 2020
  - International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2019
  - Adaptive Learning Agents Workshop (ALA) at AAAMAS 2017, 2018, 2019, 2021
  - Scaling-Up Reinforcement Learning Workshop (SURL) at ECML PKDD, 2017, 2019
  - IEEE Geoscience Remote Sensing Letters, 2017
  - Workshop on the Future of Interactive Learning Machines (FILM) at NeurIPS, 2016