Haoliang Wang

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Education

2019- *PhD*, Experimental Psychology, UC San Diego
Advisors: Judith E. Fan

Summer 2022 Neurosymbolic Programming Summer School

2019-2021 *MA*, Experimental Psychology, UC San Diego
Advisors: Judith E. Fan

2015-2019 *BS*, Computer Science, Xi'an Jiaotong University
Advisor: Pengju Ren
Thesis: Spiking neural network learning algorithms based on temporal modulation.

Selected Academic Honors

2018 PengKang Scholarship (top 1% students for academic excellence).

2017 Samsung Scholarship (top 2% students for academic excellence).
The First Prize of Alumni Scholarship of Xi'an Jiaotong University (top 2% student for academic excellence).

2016 Outstanding Students in Xi'an Jiaotong University (top 5% students for academic excellence).
The First Prize of Contemporary Undergraduate Mathematical Contest in Modeling (CUMCM).

Research Interests

Computational Cognitive Science: intuitive physics, theory acquisition, concept learning
Machine Learning: program synthesis, representation learning, neural-symbolic models

Publications

* indicates equal contribution

2022 **Wang, H.**, Allen, K., Vul, E., and Fan, J. (2022). Generalizing physical prediction by composing forces and objects. *Proceedings of the 44th Annual Meeting of the Cognitive Science Society.*

2022 **Wang, H.**, Yang, J., Tamari, R., and Fan, J. (2022). Communicating understanding of physical dynamics in natural language. *Proceedings of the 44th Annual Meeting of the Cognitive Science Society.*

2022

Brockbank*, E., **Wang*, H.**, Yang, J., Mirchandani, S., Bıyık, E., Sadigh, D., and Fan, J. (2022). How do people incorporate advice from artificial agents when making physical judgments? *Proceedings of the 44th Annual Meeting of the Cognitive Science Society.*

2021 **Wang, H.**, Polikarpova, N., and Fan, J. (2021). Learning part-based abstractions for visual object concepts. *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society.*

2021 **Wang, H.**, Vul, E., Polikarpova, N., and Fan, J. (2021). Theory acquisition as constraint-based program synthesis. *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society.*

2021 McCarthy*, W., Hawkins*, R., **Wang, H.**, Holdaway, C., and Fan, J. (2021). Learning to communicate about shared procedural abstractions. *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society.*

2020 **Wang, H.**, and Fan, J. (2020). Library learning for structured object concepts. *ICML Workshop on Object-Oriented Learning: Perception, Representation, and Reasoning.*

Conference Presentations

2022 How do people incorporate advice from artificial agents when making physical judgments: Talk presented at *44th Annual Meeting of the Cognitive Science Society.*

2022 Generalizing physical prediction by composing forces and objects: Poster presented at *44th Annual Meeting of the Cognitive Science Society.*

2022 Communicating understanding of physical dynamics in natural language: Poster presented at *44th Annual Meeting of the Cognitive Science Society.*

2021 Learning to communicate about shared procedural abstractions: Talk presented at *43rd Annual Meeting of the Cognitive Science Society.*

2021 Learning part-based abstractions for visual object concepts: Poster presented at *43rd Annual Meeting of the Cognitive Science Society.*

2021 Theory acquisition as constraint-based program synthesis: Poster presented at *43rd Annual Meeting of the Cognitive Science Society.*

2020 Library learning for structured object concepts: Poster presented at *ICML Workshop on Object-Oriented Learning: Perception, Representation, and Reasoning.*

Teaching Experience

UC San Diego, Department of Psychology

2022 PSYCH 102 Sensory Neuroscience

2021 PSYCH 105 Cognitive Psychology

PSYCH 104 Social Psychology

2020 PSYCH 3 Foundations of Cognitive Psychology

2019 PSYCH 100 Clinical Psychology

Responsibilities: Guest lecture a class session, assist with exam preparation and teaching, grade written assignments, and hold weekly office hours.

Research Experience

2019- **UC San Diego, Cognitive Tools Lab**
Graduate Student (Principal Investigator: Judith E. Fan)
- Developed web-based experiments where participants infer alien physics dynamics.
- Developed an algorithm for learning part-based structures of visual concepts represented as graphics programs; designed an efficient algorithm for learning latent physics theories from observations by augmenting traditional program synthesis techniques with constraints.

2018 **MIT, Computational Cognitive Science Group**
Research Assistant (Principal Investigator: Josh Tenenbaum)
- Studied the impact of stimulus strength on the speed and accuracy of perceptual decisions.
- Adopted both drift-diffusion model (DDM) and POMDP to explain reaction time in human's decision making and planning behavior in mazes under uncertainty.

2018 **UC Los Angeles, Center for Vision, Cognition, Learning, and Autonomy**
Research Assistant (Principal Investigator: Song-Chun Zhu)
- Collected a large-scale dataset from Grand Theft Auto (GTA), annotated with rich information including 3D mesh for dynamic environment, human skeleton and pose.
- Developed an EM-like algorithm to learn both the structure and the parameters of a probabilistic context-free grammar (PCFG) that models human-object interaction in the dataset.
- Manuascript can be found here.

2017 **The Chinese University of Hong Kong, Multimedia Laboratory**
Research Assistant (Principal Investigator: Dahua Lin)
- Collected a new sketch-photo dataset containing over 8k sketch-photo face pairs.
- Developed an ANN model for mapping examples in a weak modality (sketch) to examples in a stronger modality (photo) by inferring the conditional distribution of a semantic representation in the strong modality given an example from the weak modality using GANs.
- Manuascript can be found here, and suplementary materials can be found here.

2017 **Chinese Academy of Sciences, National Laboratory of Pattern Recognition**
Research Assistant (Principal Investigator: Ran He)
- Investigated the role of identity-preserving transformation in cross-modality face retrieval.
- Designed and implemented a human-like Artificial Neural Network (ANN) architecture where a global encoder-decoder network and four local patch networks work jointly to perceive both global structures and local details of faces.

Outreach

2021 Gave a talk on Bayesian reasoning and program synthesis to high school students in Pathways2AI.

Skills

Modelling and Analysis: Python, PyTorch, Julia, Gen, R, MATLAB, C++
Experimental Design: JavaScript, HTML, CSS
Software and Tools: git, Adobe CC, LaTeX

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