

# Haoliang Wang

Department of Psychology, UC San Diego, La Jolla, CA 92093 U.S.A.

email: [haw027@ucsd.edu](mailto:haw027@ucsd.edu), URL: <https://haoliangwang.github.io>

## Education

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

- 2022      Hoffman-Yee Research Scholarship.
- 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

- 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

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**

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

### **UC San Diego, Cognitive Tools Lab**

2019- *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.

### **MIT, Computational Cognitive Science Group**

2018 *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.

### **UC Los Angeles, Center for Vision, Cognition, Learning, and Autonomy**

2018 *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.
- Manuscript 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.
- Manuscript can be found [here](#), and supplementary 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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