

# Jiayi Weng

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Trinkle23897

## Education

August 2016 **Tsinghua University**, Beijing, China

– July 2020 B.Eng. (Expected) in Computer Science and Technology

**GPA:** 3.8/4.0 (Major: 3.82, Overall: 3.75), **Rank:** 17/158 (~10%)

**Course Highlights:** Fundamentals of Computer Graphics ( $A^+$ ), Database Special Topic Training ( $A^+$ ), Data Structures ( $A$ ), Artificial Neural Networks ( $A$ ), Foundation of Object-Oriented Programming ( $A$ )

## Publications and/or Submitted Manuscripts

August 2019 **Playing FPS Game with Environment-aware Hierarchical Reinforcement Learning**

Shihong Song\*, **Jiayi Weng\***, Hang Su, Dong Yan, Haosheng Zou, and Jun Zhu

The 28th International Joint Conferences on Artificial Intelligence (IJCAI 2019). Oral Presentation. Acceptance rate: 17.9% (850/4752). [\* indicates equal contribution]

November 2018 **URBER: Ultrafast Rule-Based Escape Routing Method for Large-Scale Sample Delivery Biochips**

**Jiayi Weng**, Tsung-Yi Ho, Weiqing Ji, Peng Liu, Mengdi Bao, and Hailong Yao

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)

March 2019 **Model-based Credit Assignment for Model-free Deep Reinforcement Learning**

Dong Yan, **Jiayi Weng**, Shiyu Huang, Chongxuan Li, Yichi Zhou, Hang Su, and Jun Zhu

IEEE Transactions on Neural Networks and Learning Systems (TNNLS), Submitted

## Professional Experiences

July 2019 – **Montreal Institute for Learning Algorithms (MILA)** Université de Montréal (UdeM)

October 2019 Advisor: Professor [Yoshua Bengio](#)

Worked on Rule-Transformer based on the Consciousness Prior

- Proposed the Rule-Transformer model by integrating the Consciousness Prior and programming language into Transformer architecture for better disentanglement
- Implemented the Rule-Transformer by incorporating a novel self-attention mechanism *Rule-Attention* into both the encoder and decoder of Transformer model
- Validated the proposed model in various scenarios, including language modeling, machine translation, natural language inference, and multi-task imitation learning

March 2018 – **Statistical AI & Learning (TSAIL) Group**

Tsinghua University

– present Advisor: Professor [Jun Zhu](#)

Working on reinforcement learning algorithm

- Proposed an environment-aware hierarchical reinforcement learning algorithm. **We achieved the first place in [VizDoom AI Competition 2018](#), and our work is accepted by IJCAI 2019**
- Proposed an efficient model-based deep reinforcement learning algorithm which incorporates first-order logic and reward shaping leveraging on Relational Markov Decision Process. **Our work is under review by TNNLS**
- Improved the performance of reinforcement learning platform Tianshou by changing the structure of frame buffer and adding parallel training, which was 10x faster than previous version within DQN, A2C, DDPG, and PPO algorithms

- March 2018 **Front-end Interactive Computing Group** Sensetime Inc.  
– June 2018 Mentor: [Hongwei Qin](#)  
Worked on fast multi-frame noise reduction and AI-based ISP pipeline  
◦ Designed a temporal and spatial domain-based noise reduction network, which could output high-quality results in about 70ms given eight 12M pixel full-resolution images on a GTX1060
- May 2017 – **BioCAD Group** Tsinghua University  
October 2017 Advisor: Professor [Hailong Yao](#)  
Worked on large-scale microfluidic biochip automation design method  
◦ Proposed an ultrafast rule-based escape routing method, which was 600 to 340k times faster than previous proposals. **Our work is published in IEEE Trans. on CAD**

## Selected Awards and Honors

- November 2018 **Comprehensive Excellence Award** Tsinghua University  
Top 5% of 171 students
- August 2018 **Rank 1st**, VizDoom AI Competition 2018 Single Player Track(1)  
IEEE Computational Intelligence and Games (CIG) 2018  
VizDoom AI Competition is famous in the reinforcement learning community, and our team achieved the best score among 51 teams
- September 2017 **Highest Score**, 11th CCF Certified Software Professional (CSP)  
China Computer Federation (CCF)  
Top 0.02% of 6414 participants

## Selected Course Projects

For more information, please refer to this [GitHub link](#) (★404 by 11/11/2019)

- June 2018 **Realistic Image Rendering** Fundamentals of Computer Graphics  
Implemented Path Tracing (PT), Progressive Photon Mapping (PPM), and Stochastic Progressive Photon Mapping (SPPM) algorithms. Rendered 3D models with Bezier surface. Proposed a novel algorithm for solving the intersection of line and rotating Bezier curve. ★58 on [GitHub](#) by 11/11/2019
- January 2018 **Login Security** Network Security Engineering and Practice  
Measured the login security of all campus websites and found a serious security vulnerability for all sites. The campus network was therefore fully upgraded
- June 2017 **Escape Routing** Foundation of Object-Oriented Programming  
Designed and implemented a heuristic escape routing method which was fundamentally faster than previous network-flow-based proposals. Follow-up work has been published in IEEE Trans. on CAD

## Extracurricular Activities

- November 2016 **Volunteer Tutor** Student Learning and Development Center, Tsinghua University  
– June 2018 One night on duty per week to answer questions for students, including Calculus, Linear Algebra, Programming, etc. Accumulated volunteer time 131 hours, and rated as an excellent volunteer
- December 2016 **Propositional Person**  
– May 2018 Student Algorithm and Competition Association, Tsinghua University  
Do problem-setting in several competitions of informatics (7 problems in total), including Chinese National Team Training (CNTT), Tsinghua University Informatics Summer Camp for Excellent High School Student (THUSC), Tsinghua University Programming Competition and College Invitational Tournament (THUPC), etc.

## Skills

**Programming Languages:** Python, C/C++, Java, JavaScript, Bash, HTML/CSS, MATLAB

**Tools and Frameworks:** Git,  $\text{\LaTeX}$ , PyTorch, TensorFlow, Keras, OpenCV, django, Bootstrap