

# Ziqing Wang

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Github | Last updated: 10/24/2023

## Education

### Sun Yat-sen University

*Bachelor of Engineering in Microelectronics*

Zhuhai, China

Sep. 2018 – Jun. 2023

- Major GPA: 3.9/4.0
- Main Courses: Machine Learning in Python, Advanced Programming, Embedded System, Digital Circuit, Analog Circuit, Analog Integrated Circuits Design,

## Publications

**Ziqing Wang\***, Yuetong Fang\*, et al., *Masked Spiking Transformer* (ICCV 2023)

Jiahang Cao\*, **Ziqing Wang\***, et al., *Spiking Denoising Diffusion Probabilistic Models* (WACV 2024 Spotlight)

**Ziqing Wang\***, Yuetong Fang\*, et al., *Bursting Spikes: Efficient and High-performance SNNs for Event-based Vision* (Under Review at ICRA 2024)

Jiahang Cao\*, Mingyuan Sun\*, **Ziqing Wang\***, et al., *BEEF: Building a Bridge from Event to Frame* (Under Review at ICLR 2024)

**Ziqing Wang**, et al., *AutoST: Training-free Spiking Transformer Architecture Search* (Under Review at ICASSP 2024)

**Ziqing Wang**, et al., *AMD-DBSCAN: An Adaptive Multi-density DBSCAN for datasets of extremely variable density*, IEEE International Conference on Data Science and Advanced Analytics (DSAA 2022)

## Professional Services

### Program Committee Member:

- AAAI 2024, KDD 2023, AAAI 2023

## Research Experience

### BrainDiffusion: Generating Brain Waves with Text

Sep. 2023 –

*Team Leader*

HKUST

- We introduce BrainDiffusion to generate synthesizing brain waves from textual inputs.
- We propose to simulate brain dynamics by introducing a stable diffusion-formation model into brain waves.

### ANN-to-BurstingSNN Conversion for Event-Driven Vision

Jun. 2023 – Sep. 2023

*Team Leader*

HKUST

- We introduce the burst-spike mechanism into the Spike Calibration process to achieve efficient and high-performance event-driven vision.
- We propose a Burst-Spike Reallocation (BSR) technique leveraging the Pareto frontier optimization method to automatically search for the ideal burst-spike patterns of different layers to further improve the performance under a given energy budget.
- To reduce the energy during conversion, we introduce a Sensitivity Spike Compression (SSR) technique to allocate the adaptive threshold of each layer.

### Building a Bridge from Event to Frame

Apr. 2023 – Sep. 2023

*Main Member*

HKUST

- We propose BEEF, a novel-designed event processing framework capable of splitting events stream to frames in an adaptive manner.
- We introduce SNN as an event trigger to determine the slicing time based on the spike generation.
- To guide the SNN in firing spikes at optimal time steps, we introduce the Spiking Position-aware Loss (SPA-Loss) to modulate the neuron's spiking state.

### Spiking Denoising Diffusion Probabilistic Models

May. 2023 – Aug. 2023

*Team Leader*

HKUST

- We propose SDDPM, which is the first work that employs a spiking neural network on diffusion models.
- We put forward threshold guidance, which can further improve the performance of SDDPM by changing the threshold in SNN neurons without any finetuning.

- Extensive experiments show that our model achieves state-of-the-art performance among SNN-based generative models in low latency.

## Neural Architecture Search for Spiking Transformer

Feb. 2023 – May 2023

*Team Leader*

*NCSU*

- We propose AutoST, a training-free NAS to search for superior Spiking Transformer architectures.
- We utilize FLOPs as a performance metric, effectively tackling the challenges inherent to SNNs, leading to a stronger correlation with performance.
- Extensive experiments show that our searched models outperform state-of-the-art SNNs on both static and neuromorphic datasets.
- To achieve a balance between performance and energy efficiency, we leverage activation patterns to estimate the energy consumption of Spiking Transformer architectures during initialization.

## Masked Spiking Transformer

Oct. 2022 – Feb. 2022

*Team Leader*

*HKUST*

- Implemented self-attention in Spiking Neural Networks (SNNs) to leverage both self-attention capability and biological properties of SNNs to achieve high performance with low power consumption.
- Inspired by the missing information mechanisms in the nervous system, I proposed a masked spiking Transformer (MST) enabled by partial information, which uses only part of the input information.
- Our MST can outperform the state-of-the-art SNN model in terms of accuracy and the number of time steps on static and neuromorphic datasets. In particular, the proposed MST model achieves 78.5% top-1 accuracy on the ImageNet dataset.
- As the first author, *Masked Spiking Transformer* is accepted to ICCV2023.

## Bug Injection in Cloud System

Jun. 2022 – Sep. 2022

*Research Intern*

*Purdue University*

- Joined Purdue University's summer research team to study natural language processing and bug injection algorithms.
- Converted the buggy source code into Abstract syntax tree (AST), and use GNN algorithm to implement data representation on AST.
- Finetuned the CodeBERT(MLM) to generate buggy source code that can be used to evaluate the performance of the famous automated program repair tools in cloud system.

## Multi-density DBSCAN Clustering

Jan. 2022 – May 2022

*Team Leader*

*SYSU*

- Improved the existing DBSCAN parameter adaptive algorithm so that it can adapt two parameters at the same time and speed up this adaptive process.
- Proposed a new multi-density DBSCAN (AMD-DBSCAN) algorithm, which adapts multiple pairs of parameters for multi-density datasets, so that the algorithm can achieve excellent performance.
- Our AMD-DBSCAN improves accuracy by 24.7% on average over the state-of-the-art algorithm on Multi-density datasets, while having no performance loss in Single-density scenarios.
- As the first author, *AMD-DBSCAN: An Adaptive Multi-density DBSCAN for datasets of extremely variable density* is published in DSAA 2022 (CCF-C).

## Brain Inspired LSTM

Nov. 2021 – May 2022

*Research Intern*

*HKUST*

- Joined the HKUST brain-inspired research team to study SNN-related algorithms.
- In-depth study of the LSTM and SNN algorithms, mainly focusing on using individual LIF neurons to simulate LSTM neurons.
- Proposed the BioLSTM model, which leverages the high performance of LSTM and the biological plausibility of SNN.

## Self-supervised Object Detection

Sep. 2020 – Sep. 2021

*Main Member*

*SYSU*

- Learned the self-supervised object detection task and the contrastive learning model.
- Independently designed a new data augmentation method suitable for extracting features for self-supervised object detection tasks.
- Proposed a novel DBSCAN clustering algorithm based on a k-dimensional tree, which makes it possible to cluster billions of feature data by dividing small partitions.

## Professional Experience

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### Allwinner Technology

Jul. 2021 – Sep. 2021

*Software Develop Engineer Intern*

*Zhuhai*

- Realized a network streaming media system that can adjust video encoder parameters in real-time by effectively combining multimedia software modules.
- Developed an automated software testing system to realize automated parameter testing of video encoding.
- Built a network transmission video decoding system using the UDP, RTP, and RTCP protocols to meet the company's decoding time requirements.

### Guangzhou Shengkai Haojin Investment Management Co., Ltd

Jul. 2020 – Sep. 2020

*Data Analysis Intern*

*Guangzhou*

- Skillfully used Python to clean data, perform abnormal value processing on millions of project data, and complete visual analysis.
- Used Python script to perform rapid data analysis and processing of nearly one million pieces of data from over 2000 projects.
- Optimized the company's ERP system UI interface and interactive logic using JavaScript.

## Honors

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Outstanding Graduate of Sun Yat-sen University (**Top3%**)

Sun Yat-sen University Scholarship for Academic Excellence Student (2020 & 2021 & 2022)

Second prize in the 2021 MathorCup Mathematical Modeling Competition

Second prize in the 2021 Mathematical Contest In Modeling (MCM)

## Technical Skills

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

## Language

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TOEFL (104), GRE (327), French (B2)