

CHANGHAO TIAN

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EDUCATION

Nanyang Technological University

Singapore

Doctoral Candidate in Materials Science and Engineering

August 2021–September 2025

- Jointly supervised by Singapore Agency for Science, Technology and Research
- Award: A*Star Merit Award (AMA), Singapore International Graduate Award (SINGA)

Technical University of Munich

Munich, Germany

- Visiting PhD Student in Intelligent System

July 2024–October 2024

Nanjing University

Nanjing, China

Bachelor of Science (Physics)

September 2017 – June 2021

- Award: People's Scholarship Science and Technology Innovation Award

SELECTED PUBLICATIONS [FULL LIST](#)

- Tian, C, An, N, Et al. Deep Learning Based Topography Aware Gas Source Localization with Mobile Robot. International Conference on Robotics and Automation International Conference on Robotics and Automation (ICRA) 2025. [Preprint](#)
- Tian, C, Et al. Towards Universal E-nose: Powering Chemical Sensing with Multimodal Sensing and Artificial Intelligence. Advanced Intelligent Systems. Under Review. [Preprint](#)
- Tian, C., Zhang, J., Gu, J., Li, W., & Cao, Y. (2022). Light controlled biomaterials for regulating cell migration and differentiation. *Smart Materials in Medicine*, 3, 209-216.
- Wang, Z., Wang, Z., Li, J., Tian, C., & Wang, Y. (2020). Active colloidal molecules assembled via selective and directional bonds. *Nature communications*, 11(1), 2670.
- Wang, Z., Wang, Z., Li, J., Cheung, S. T. H., Tian, C., Kim, S. H., ... & Wang, Y. (2019). Active patchy colloids with shape-tunable dynamics. *Journal of the American Chemical Society*, 141(37), 14853-14863.

RESEARCH EXPERIENCE

Reliable Flow Reconstruction from Sparse Data with physics priori embedded Transformer

Singapore Agency for Science, Technology and Research (Supervisor: Dr. Le Yang)

January 2025 - Current

- Developed a transformer architecture that embeds prior physical rules directly into the model.
- Developed the PINN architecture with prior physical information, enhancing the training efficiency.

Area Gas Concentration Reconstruction from Ultra-sparse Observation with Physics-informed Neuron Network

Singapore Agency for Science, Technology and Research (Supervisor: Dr. Le Yang)

August 2024 - Current

- Developing a physics-informed model, reconstructing area gas distribution with limited sensor observation.
- Did CFD for pre-training dataset and fine-tuned the model with data from low-speed wind tunnel.

Deep Learning Based Topography Aware Gas Source Localization with Mobile Robot

Munich, Germany

Munich Institute of Robotics and Machine Intelligence, Technical University of Munich (Supervisor: Prof. Achim

Lilienthal)

July 2024 – October 2024

- Lead the design of a robot integrating visual, LIDAR, and gas sensors, leveraging reinforcement and transfer learning for multisensory data fusion.
- Train the system to pinpoint gas leak sources and autonomously plan efficient navigation routes.

DeepVNO: Dynamic Smart Gas Sensor Array

Singapore

Singapore Agency for Science, Technology and Research (Supervisor: Dr. Le Yang)

August 2021 - Current

- Developed an innovative MOX sensor array system, whose operational parameters are governed by a sophisticated neural network model, allowing for nuanced interactions with diverse environmental factors.
- Achieved significant advancements in rapid and precise detection of gas mixture components.

Novel Synthetic and Dynamic Analysis of Customized Janus Nano Particle

Hongkong, China

Complex Soft Materials Laboratory, HKU (Supervisor: Prof. Yufeng Wang)

August 2019 – November 2019

- Co-authored "Active colloidal molecules assembled via selective and directional bonds", where I introduced a novel cluster-encapsulation-dewetting method for the synthesis of Janus nanoparticles, enabling customization of particle size and potential application for similar particle synthesis.
- Co-authored "Active patchy colloids with shape-tunable dynamics", where I developed a computer vision program for tracking and analyzing the behavior of particles, especially under the influence of electric fields.

Development of Nano-hydrogel Particles with Specific Property

Nanjing, China

Institute of Biophysics, Nanjing University (Supervisor: Prof. Yi Cao)

December 2018 – June 2021

- Contributed to "Light controlled biomaterials for regulating cell migration and differentiation" by pioneering the design of self-assembled proteins for synthesizing hydrogels with unique internal tension structures.
- Established a robust protein system and innovated a self-assembled ParMRC mechanism driven by ATP within the hydrogel, enhancing its capability for sustained and repeatable drug delivery.