

# Ryan Zeyuan Chen

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🌐 <https://ryan-zeyuan-chen.github.io/>

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📍 Toronto, ON, Canada

## Education

Toronto, ON, Canada  
Sep 2017 – Apr 2022

**B.A.Sc in Engineering Science**, University of Toronto  
*Robotics Engineering Major; Artificial Intelligence Engineering Minor;  
Engineering Business Certificate*

## Research Experience

Toronto, ON, Canada  
May 2021 – Ongoing

**Robotics Institute, University of Toronto** | Research Assistant

*Supervised by Prof. Jessica Burgner-Kahrs, Continuum Robotics Laboratory*

- Investigating the approach to solve the forward and inverse kinematics of concentric tube continuum robots (CTCRs) utilizing machine learning, specifically artificial neural networks.
- Identified existing physics-based and data-driven CTCR modelling approaches through literature review.
- Implemented a feed-forward neural network (FNN) model to learn the direct mapping between task space and joint space for CTCRs using PyTorch.
- Validated the feasibility of the approach using data generated from simulation.
- Optimized the neural network architecture through layer reduction and neuron reduction.
- Constructed a software automation framework to improve the training efficient across different hyperparameters and settings.
- Tested the performance of the approach using data collected from a real CTCR prototype.
- Investigated the optimal combination of shape representations and joint space representations.
- Generated a manuscript of the experimental methodologies and results, which will be submitted to the *Frontiers in Robotics and AI* journal [1].

Toronto, ON, Canada  
May 2019 – Apr 2020

**Robotics Institute, University of Toronto** | Research Assistant

*Supervised by Prof. Xinyu Liu, Microfluidics and BioMEMS Laboratory*

- Development of an antifreezing, ambient-stable and highly stretchable ionic skin with strong surface adhesion for wearable sensing and soft robotics.
- Evaluated existing designs of hydrogel-based ionic skins through literature review.
- Fabricated the ionic skin including elastomer synthesis, material doping, and stretchable device integration.
- Tested the mechanical, electrical, antifreezing and surface adhesion properties of the ionic skin under different working conditions.
- Demonstrated the functionality of the hydrogel-based ionic skin utilizing its piezoresistive property as the input signal to independently control the fingers of a robotic hand via Arduino.
- Published the experimental procedures and results in the *Advanced Functional Materials* journal [2].

Toronto, ON, Canada  
May 2018 – Aug 2018

**Department of Civil Engineering, University of Toronto** | Research Assistant

*Supervised by Prof. Evan Bentz and Prof. Michael Collins, Structural Testing Laboratory*

- Experimental investigation of reinforced concrete members subjected to combined shear and torsion.
- Testing of Ultra High-Performance Fiber Reinforced Concrete shells under pure shear.
- Assisted in modelling the response of reinforced concrete structures using nonlinear finite element analysis software.

## Industry Experience

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San Jose, CA, USA Jun 2020 – May 2021	<b>Wired and Wireless Group, Xilinx</b>   SerDes Application Design Intern (Remote) <i>FPGA software development, SerDes System Engineering Team</i> <ul style="list-style-type: none"><li>• Development of SDK test cases across different test suites to validate the functionality of APIs designed for the Kintex UltraScale+ FPGA using C++.</li><li>• Verification of developed software test cases on both virtual machines and physical hardware prototypes constructed by the hardware team.</li><li>• Validation of developed software test cases under various network communication protocols utilizing different network testing devices.</li><li>• Regression testing of developed software test cases in response to hardware upgrades to ensure performance consistency.</li></ul>
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## Publications

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2021	<ol style="list-style-type: none"><li>1. Grassmann, R. M., <b>Chen, R. Z.</b>, Liang, N. &amp; Burgner-Kahrs, J. Shape Representation is All You Need: Learning the Kinematics of Concentric Tube Continuum Robots. <i>Manuscript in Preparation</i> (2021).</li><li>2. Ying, B., <b>Chen, R. Z.</b>, Zuo, R., Li, J. &amp; Liu, X. An Anti-freezing, Ambient-Stable and Highly Stretchable Ionic Skin with Strong Surface Adhesion for Wearable Sensing and Soft Robotics. <i>Advanced Functional Materials</i>, 2104665 (2021).</li></ol>
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## Honors and Awards

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2021	<b>Faculty of Applied Science and Engineering Dean's Innovation Fellowship</b> , University of Toronto The 2021 Dean's Innovation Fellowships support student research projects in the areas of "Smart Cities, Smart Health, and The Internet of Things".
2019	<b>Undergraduate Student Research Award</b> , Natural Sciences and Engineering Research Council of Canada (NSERC) The Undergraduate Student Research Awards (USRA) are meant to stimulate undergraduate students' interest in research in the natural sciences and engineering and to encourage them to pursue a research career in these fields. Awards are granted on the basis of academic record and research aptitude.
2017	<b>Albert and Rose Jong Entrance Scholarship</b> , University of Toronto Awarded to a student entering the first year of either Electrical Engineering or Engineering Science who demonstrates leadership in the Chinese-Canadian community.
2017	<b>Faculty of Applied Science and Engineering Admission Scholarship</b> , University of Toronto Awarded to students entering the first year of any Engineering program based on outstanding academic achievement in the prerequisite courses.
2017	<b>Halton Newcomer Recognition Award</b> , Halton Newcomer Strategy Honoured by the Halton Newcomer Strategy Steering Committee to residents who have had a positive impact on the community through their commitment to business, education, youth and volunteering.

## Technical Skills

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**Robotics:** ROS, Robot Modeling, Control Theory, Machine Learning, Computer Vision, Human-Robot Interaction

**Software Development:** Python, C, C++, MATLAB, Simulink, PyTorch, CMake, Git, GitHub, HTML

**Hardware Development:** Verilog, ModelSim, Assembly Language, ARM Architecture

**Electrical Engineering:** SPICE, Analog Circuit Design