Manasa Kaniselvan

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Education

ETH Zurich — Zurich, Switzerland
PhD (in progress), Information Tech. and Electrical Engineering — 2021–present

University of Waterloo — Waterloo, ON, Canada
Master of Applied Science (MASc), Electrical and Computer Engineering — 2019–2021

University of Waterloo — Waterloo, ON, Canada
Bachelor of Applied Science (BASc), Nanotechnology Engineering — 2014–2019

Graduate Record Examination (GRE) — September 2020
Verbal Reasoning: 164/170, Quantitative Reasoning: 167/170, Analytical Writing: 6/6.

Research Experience (Full-Time)

PhD Student - ETH Zürich — Zürich, Switzerland
Advisor: Dr. Mathieu Luisier, Professor — September 2021 - current

- Project: Ab-initio and multiscale modelling of synaptic memristor crossbar arrays
- Developing multi-physics models of crossbar arrays made of valence-change memories, using Density Functional Theory, quantum transport methods, and kinetic Monte Carlo simulations. Collaborating with groups at EPFL and IBM Zurich to realize, fabricate, and test devices.

MASc Student (Thesis-based) - University of Waterloo — Waterloo, ON, Canada
Advisor: Dr. Youngki Yoon, Associate Professor — September 2019 - July 2021

- Project: Modelling strain-engineered properties of Transition-Metal-Dichalcogenide (TMD) Devices
- Used Density Functional Theory, Wannierization, and Non-Equilibrium Green's Function-based transport codes to design and simulate devices made from 2D materials. Investigated defect and strain-engineering in FET and TFET structures. Collaborated with experimental group at Sungkyunkwan University, South Korea, to fabricate and test devices.

Research Assistant - Waterloo Institute for Nanotechnology (WIN) — Waterloo, ON, Canada
Supervisor: Dr. Dayan Ban, Professor — January 2018 - August 2018

- Project: Simulation and characterization of Resonant-Phonon Quantum Cascade Lasers (QCLs)
- Wrote a model (in MATLAB and C++) to simulate the operation of semiconductor heterostructure QCLs, based on self-consistently solved wavefunctions and charge distributions. Implemented Markov-Chain Monte-Carlo optimization methods to search for designs with higher-temperature lasing potential. Assisted in optical characterization of fabricated devices, and alignment of a Terahertz Time-Domain Spectroscopy (Thz-TDS) system.

Research Assistant - National Institute of Materials Science (NIMS) — Tsukuba, Ibaraki, Japan
Supervisor: Dr. Genki Yoshikawa, Associate Professor and Group Leader — January 2016 - April 2016

- Project: Optimizing the morphology of polymer films on a membrane-type olfactory nanosensor
- Optimized the coating of drop-casted polymer films on a membrane-type sensor which measures mechanical deflection upon gas absorption to perform 'olfactory' sensing. Designed and 3D printed parts to customize dispensing equipment. Set up COMSOL multiphysics modelling for sensor performance.

Research Assistant - Canadian Nuclear Laboratories (CNL) — Chalk River, Ontario, Canada
Supervisor: Dr. Syed Bukhari, Research Associate, Neutron Scattering Branch — May 2015 - August 2015

- Project: Optimizing sputtering parameters for metal-alloy thin films
- Minimized the interfacial roughness of metal alloy thin films to study their nano-scale corrosion mechanisms as part of a larger project to determine their suitability for nuclear waste storage. Used x-ray reflectometry (XRR), x-ray diffraction (XRD), and neutron reflectometry (NR) to characterize thin-films.

Work Experience (Full-Time)

Formulations Engineering Intern - Adaptive Surface Technologies (AST) Cambridge, MA, USA
Supervisor: Dr. Tehila Nahum, Principle Formulations Engineer August 2016 - April 2017

- Developing Slippery Liquid-Infused Porous Surface (SLIPS) nanotextured container coatings
- AST is a start-up company by the Aizenberg Lab, developing slippery coatings on the principle of infusing a nanoporous surface with a lubricant. Worked in a team of three engineers to formulate food-safe container coatings for a consumer packaging application. Performed Scanning Electron Microscopy (SEM) of porous surfaces, rheological optimization of spray-coating solutions, and goniometry to judge hydrophobicity of resulting coatings.

Research Experience (part-time)

Fourth-Year Design Project
Engineering design project done in groups of four (our version of a Bachelor's Thesis). September 2018 - March 2019

- Topic: "Developing a laser-induced optical temperature sensing system using DNA-probes (molecular beacons)".

Senior Term Project
Elective individual research project. January 2019 - April 2019

- Topic: "Developing k.p Hamiltonians for nanoelectronic device simulations" (course code 'NE459').

Undergraduate Research Assistantship
Done concurrently with my '3B' term of undergraduate studies. September 2017 - December 2017

- Topic: "Writing a rate-equation based simulation scheme for carrier transport in quantum cascade lasers".

Teaching Experience

- **Teaching Assistant - Linear Circuits (NE140), University of Waterloo** January 2021 - April 2021
  Prepared and taught all remote (synchronous) tutorials.
- **Teaching Assistant - Nanoelectronics (NE471), University of Waterloo** September 2020 - December 2020
  Held office hours for student questions, prepared assignments, and marked exams.
- **Teaching Assistant - Electronic Circuits (NE344), University of Waterloo** May 2020 - August 2020
  Prepared and taught all remote (synchronous) tutorials.
- **Teaching Assistant - Linear Circuits (NE140), University of Waterloo** January 2020 - April 2020
  Prepared and taught all tutorials.

Other Activities

Technical Director - UW Nano Robotics Group (UWNRG) Waterloo, ON, Canada
Advisor: Dr. Mustafa Yavuz, Associate Professor January 2015 - July 2019

- UWNRG designs microbotic actuation systems to compete at the annual IEEE ICRA Microbotics Challenges.
- Led the development of a microbot which we call SAM (Solenoid Actuated Microbot). Managed funding applications for lab expenses, equipment, cleanroom usage, and conference travel costs. We are the only undergraduate-level team to have qualified for this competition since its inception. This position includes time as a junior member, team lead, and technical director.
- Competition Record: 3rd place (at ICRA 2015), 1st place (at ICRA 2016), 2nd place (at ICRA 2018).

Skills

- **Languages:** Python (advanced), MATLAB (advanced), C++, Julia (working knowledge)
- **Materials Modelling Codes:** Quantum Espresso (DFT), CP2K (DFT), LAMMPS (MD), Quantum ATK (device simulations)

Journal Articles

1. **M. Kaniselvan** and Y. Yoon, "Strain-tuning $PtSe_2$ for high ON-current lateral tunnel field-effect transistors," *Applied Physics Letters*, vol. 119, no. 7, p. 073102, Aug. 2021. doi:10.1063%2F5.0053789

2. G. Han, **M. Kaniselvan**, and Y. Yoon, "Photoresponse of $MoSe_2$ Transistors: A Fully Numerical Quantum Transport Simulation Study," *ACS Applied Electronic Materials*, vol. 2, no. 11, pp. 3765–3772, Nov. 2020. doi:10.1021/acsaelm.0c00795

3. M. Naqi*, **M. Kaniselvan***, S. Choo*, G. Han, S. Kang, J. Kim, Y. Yoon, and S. Kim, "Ultrasensitive Multilayer MoS_2-Based Photodetector with Permanently Grounded Gate Effect," Advanced Electronic Materials, vol. 6, no. 4, p. 1901256, Feb. 2020. doi: 10.1002/aelm.201901256.

Posters & Presentations

1. **Manasa Kaniselvan**. *Engineering the Performance of 2D Transition Metal Dichalcogenide Nanotransistors through Quantum Transport Simulations.* Nanotechnology MASc Seminar delivered at the University of Waterloo, June 2021

2. Boyu Wen, Chao Xu, Siyi Wang, Sm Shazzad Rassel, **Manasa Kaniselvan**, Chris Deimert, Zbigniew Wasilewski and Dayan Ban *Novel 4-well THz QCL with hybrid injection/extraction channels.* ITQW2019: Infrared Terahertz Quantum Workshop

3. Mary Chen*, **Manasa Kaniselvan***, Corin Seeleman*, Danielle Smith*. *A Real-Time Non-Invasive Sensor for Monitoring Laser-Induced Temperature in Medical Applications.* Waterloo Engineering Design Symposium 2019. Waterloo, ON, Canada

4. **UW Nano Robotics Group**. *Solenoid Actuated Microbot (SAM).* 2018 IEEE IEEE International Conference on Robotics and Automation (ICRA). Brisbane, Australia

5. **UW Nano Robotics Group**. *ElectroMagnetic Micro Actuation (EMMA): Version 2.* 2016 IEEE International Conference on Robotics and Automation (ICRA). Stockholm, Sweden

6. **UW Nano Robotics Group**. *ElectroMagnetic Micro Actuation (EMMA)* 2015 IEEE International Conference on Robotics and Automation (ICRA). Seattle, Washington, USA

Scholarships & Awards (Totalled values in CAD)

- NSERC PGSD Doctoral Award - **$63,000** 2021
- Waterloo Faculty of Engineering Awards (x2) - **$3,000** 2020
- Sanford Fleming Foundation (SFF) Teaching Assistant Excellence Award - **$500** 2021
- Waterloo Teaching Assistantship (with MASc offer) - **$17,000** 2019–2021
- Waterloo Graduate Research Studentship (with MASc offer) - **$35,000** 2019–2021
- Waterloo Dean's Entrance Award (Graduate) - **$5,000** 2019
- Presentation Award, Waterloo Nanotechnology Symposium - **$1,000** 2019
- Waterloo Undergraduate Research Assistantship Awards (x2) - **$1,400** 2017–2018
- Waterloo Undergraduate Research Internship Awards (x2) - **$2,800** 2017–2018
- NSERC Undergraduate Student Research Awards (USRA) (x2) - **$9,000** 2017–2018
- Waterloo International Internship Award - **$1,000** 2016
- NIMS (Japan) Internship Program Fellowship - **$5,700** 2016
- Waterloo President's (Entrance) Scholarship - **$2,000** 2014

Languages

- **English** (native fluency), **German** (B1), **French** (B1), **Tamil** (native but not fluent), **Japanese** (rudimentary)