CHI CONG NGUYEN

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EDUCATION

- **University of New South Wales, Sydney, Australia** *from Sep 2021*
  Biomedical Engineering – Ph.D. Candidate
  Thesis: Extend The Reach of Teleoperated Flexible Surgical Robotic Systems for Cardiac and Gastrointestinal Disorders.
- **Hanoi University of Science and Technology (HUST) – Hanoi, Vietnam** *2014-2019*
  Mechatronics Engineering – Degree of Engineer
  GPA: 3.64/4 – Valedictorian
  Thesis: Climbing and Cleaning Silo's Wall Robot Using Vacuum Principle and Wireless Control Technology.
- **Shibaura Institute of Technology (SIT) – Saitama, Japan** *Aug 2018 - Feb 2019*
  Engineering and Science – Certificate of Matriculation
  Field of study: Mechanical, Control Engineering, Robotics.

PUBLICATIONS & PATENTS

First-Author Publications

- **Nguyen CC**, Wong S, Thai MT, Hoang TT, Phan PT, Davies J, Wu L, Tsai D, Phan HP, Lovell NH, Do TN. Advanced user interfaces for teleoperated surgical robotic systems. *Advanced Sensor Research*. 2023 Apr;2(4):2200036. doi.org/10.1002/adsr.202200036.
- **Nguyen CC**, Teh T, Thai MT, Phan PT, Hoang TT, Davies J, Phan HP, Wang CH, Lovell NH, Do TN. A handheld hydraulic soft robotic device with bidirectional bending end-effectors for minimally invasive surgery. *IEEE Transactions on Medical Robotics and Bionics*. Early Access. doi: 10.1109/TMRB.2023.3291014
- **Nguyen CC**, Thai MT, Hoang TT, Davies J, Phan PT, Zhu K, Wu L, Brodie MA, Tsai D, Ha QP, Phan HP. Development of a soft robotic catheter for vascular intervention surgery. *Sensors and Actuators A: Physical*. 2023 Aug 1;357:114380. doi.org/10.1016/j.sna.2023.114380.
- **Nguyen CC**, Davies J, Thai MT, Hoang TT, Phan PT, Zhu K, Tran DBN, Ho VA, La HM, Phan HP, Lovell NH, Do TN. A Handheld Hydraulic Cardiac Catheter with Omnidirectional Manipulator and Touch Sensing. *In2023 International Conference on Robotics and Automation (ICRA)* 2023 June 23 (pp. 4682-4688). IEEE. ***(Ranked #1 in Robotics)***
- **Nguyen CC**, Teh T, Thai MT, Phan PT, Hoang TT, Low H, Davies J, Nicotra E, Lovell NH, Do TN. Bidirectional Soft Robotic Catheter for Arrhythmia Treatment. *In2022 International Conference on Robotics and Automation (ICRA)* 2022 May 23 (pp. 9579-9585). IEEE.

❖ Patents

- T.N. Do, M.T. Thai. P.T. Phan, N.H. Lovell, J. Davies, **C.C. Nguyen** "Advanced Soft Robotic System for Minimally Invasive Surgery and In Situ 3D Bioprinting". *AU provisional Patent*, AU2023900151A0, 2023.

SKILLS

- Possess extensive experience in robotic designing, modeling, analyzing, prototyping (hands-on), and system identification.
- Possess solid knowledge in **Soft Robotics**, **Surgical Robots**, and **Haptics**.
- Expertise with CAD software (Solidworks and Autocad); simulation software (Ansys and COMSOL Multiphysics); programming software (MATLAB, Wolfram Mathematica, and Visual Studio); and office software (MS Word, Powerpoint, Excel).
- Have a solid grasp of Python and C ++ programming languages.

HONOURS & AWARDS

- The Vingroup Science and Technology Scholarship Program for Overseas Study for Master's and Doctoral Degrees. (https://scholarships.vinuni.edu.vn/cohort-2021/)
- HUSTValedictorian Award.
- HUST Excellence Scholarship for Outstanding Performance.
- Lawrence S.Ting Scholarship.
- Student Research Competition Award.
- Global Project-Based Learning (GPBL) Program in Hust Certificate.
- SIT Exchange Scholarship.
- SIT Certificate of Matriculation.
- GBPL Program in SIT Certificate.

RESEARCH & WORK EXPERIENCE

❖ UNSW Medical Robotic Lab, *from Sep 2021*
Graduate School of Biomedical Engineering

Ph.D. Candidate

- Project 1: Human-Machine Interaction and Emerging Technologies for Advanced User Interfaces in Teleoperated Surgical Robotic Systems:

  I conducted my inaugural project under the guidance of **Dr. Thanh Nho Do** and **Prof. Nigel Lovell**, focusing on user interfaces in emerging teleoperated surgical robotic systems (TSRSs). This involved examining the surgical robot market, assessing recent developments in human-machine interaction, and exploring advanced technologies such as sensing, haptic feedback, smart garments, and medical image (AI) for integration into TSRS master consoles. Collaboration with **Dr. Shing Wong** from the Colorectal Unit at **Prince of Wales Hospital** provided valuable insights into clinical challenges and needs.

- Project 2: Hydraulic Soft Robotic Device with Bidirectional Bending End-Effector for Minimally Invasive Surgery (MIS):

  I initiated my hands-on experience at the **UNSW Medical Robotic Lab** by designing, modeling, and fabricating a miniature soft catheter. This versatile catheter, suitable for cardiac and gastrointestinal ablation, offers bidirectional bending control through a designated handheld controller. Notably, its unique capability to bend over 360 degrees in a spiral shape makes it potentially valuable for blood clot removal, potentially replacing existing stent devices.

- Project 3: Novel Cardiac Ablation Catheter with Variable Stiffness Stabilizing Mechanism and Contact Force Sensing:

  In this project, I developed an innovative soft robotic catheter tailored for ablation procedures in the heart's Right Atrium (RA). The catheter boasts an omnidirectional manipulator for navigation and bending, a stabilizing mechanism with variable stiffness for mechanical stability in the inferior vena cava (IVC), and a novel soft force sensor for monitoring tool-tissue contact. This device addresses key issues in existing robotic catheter systems, including limited workspace, flexibility, instability, and a lack of force feedback.

- Project 4: Soft Robotic Gripper for (Unmanned underwater vehicle) UUV Collaborated with a Defense Company:

  I was involved in a distinctive project focused on applying technology to real-world challenges—using soft robots, inspired by manta rays, to grip heavy objects like a UUV. My responsibility was to design and construct a large gripper featuring two wings, each equipped with four innovative positive suction cups. This gripper can effectively hold a cylindrical object with a diameter exceeding 160 mm and a weight surpassing 10 kilograms.

- Project 5: Motor-free Soft Syringe Architecture for Soft Robotic Applications

  As part of my main thesis, I am developing an architecture called Soft Syringe (SSA) to control my robotic catheters; and a new teleoperated surgical robotic system (TSRS) based on it. The most notable innovation of this user interface is that it uses SSAs instead of any electrical motors to actuate the robotic catheter's manipulator. Technically speaking, the SSA's operating principle is based on the linear relationship between two muscles; when the master muscle is stretched, the slave muscle is mechanically actuated, causing the catheter manipulator to move. This idea allows for rendering the haptic feedback force in the opposite direction. The ultimate goal of this project is to give the surgeon more ergonomics and comfort than the currently available complex surgical systems, in addition to a straightforward system improving human-machine interaction.

❖ **Viettel High Technology Industries Corporation – Viettel Group, Vietnam.** *Jun 2019 – Jul 2021*

Mechanical Engineer

- Conducted analysis and optimization of Heatsink models, implementing innovative cooling methods for operating chips on the Radio Remote Unit (RRU), a 5G product.
- Managed communication with suppliers and fabrication partners, facilitating product orders, and overseeing the production progress.

Publications:

- **C. C. Nguyen**, M. D. Bui, N. K. Nguyen, V. T. Nguyen (2022). "Optimal Design of V-Shaped Fin Heat Sink for Active Antenna Unit of 5G Base Station". *Journal of Engineering & Technological Sciences*, 54(3).

❖ **Mechatronics Laboratory CIMLAB, Hanoi University of Science and Technology, Vietnam.** *Jan 2016 – May 2019*

Undergraduate Publications:

- **C.C. Nguyen**, Nguyen, V.T., Tao, N.L., Nguyen, T.T., Nguyen, N.K. and Bui, N.T., 2021, May. Design and Fabrication of Silo Cleaning Robot Using Vacuum Principle. In *Journal of Physics: Conference Series* (Vol. 1922, No. 1, p. 012009). IOP Publishing.

MEDIA

- My catheter devices were filmed by Thomson Reuters (Bidirectional and Omnidirectional).

REFERENCES

❖ **Prof. NIGEL LOVELL**

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❖ **Dr. THANH NHO DO**

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❖ **Dr. HOANG-PHUONG PHAN**

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