Xuan-Quoc Vo, Ph.D.

Current affiliation:
School of Medicine
University of Pittsburgh,
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Summary

- I have been a Research Instructor at School of Medicine, University of Pittsburgh since 2023, focusing on developing Next-Generation Personalized Lung-on-a-Chip devices using human pluripotent stem cells and applying them to model human lung's biology and pulmonary diseases *in vitro*.
- I obtained a Ph.D. degree in Mechanical Engineering in March 2019.
- I was a postdoctoral research fellow in Nanyang Technological University from 2019 to 2021, and University of Pittsburgh from 2021 to 2023.
- I published **20** peer-reviewed publications in top-ranked journals including *Physical Review Letter* and *Nature Communication*; **1** patent, **3** provision patents; and delivered **10** conferences papers and talks around the world.
- I obtained excellent experience in teaching and mentoring students with various levels from undergraduates to Ph.D. candidates.

Research experience

Research Instructor **Nov 2023 – Present**

Postdoctoral Research Associate **Dec 2021 – Nov 2023**
Institution: University of Pittsburgh, School of Medicine
Advisor: Dr. Kambez Benam

- Developing Next-Generation Personalized Lung-on-a-Chip device using human induced pluripotent stem cells (iPSCs) and applying the platform to model human lung biology and pulmonary diseases *in-vitro*.
- Successfully developed the **Next-Gen Small Airway-Chip** and the **ECM-MV-Chip** and **Next-Gen Stem-Cell-Based Small Airway-Chip**.
- **Three** manuscripts are published; one published in *Advanced Functional Materials* (IF 19.92); **1** under review; and **2** are in preparation for journal papers.
- Submitted **one book chapter** on Lung-on-a-Chip for cigarette smoke study.

- Submitted **three patent applications**: University of Pittsburgh Ref No: *06151* (2022), No. *06602* (2024), No *06670* (2024).

Postdoctoral Research Fellow **Dec 2018 – Dec 2021**

Institution: Nanyang Technological University (NTU), Singapore
Advisor: Dr. Anh Tuan Tran

- Project title: "*Elucidating interfacial events that underpin dynamic motion of three-phase contact lines*". Grant No. 1523700102 under Advance Surface Program (Pharos) funded by the Agency of Science and Technology (A*Star) Singapore.
- Designed and implemented a validated setup and knowhow for using laser interferometry to measure 4D profiles of dynamic surface layers (DSL). The design had been filed for patent (US Patent publication number: *US 2022/0373322A1*).
- Successfully provided experimental visualization and theoretical explanation of 4D evolution of DSL during surface wetting and solid-fluid displacement.
- Published **11** journal papers including **1** in *Nature Communication,* (IF 17.69)*;* **1** in *ACS Nano,* (IF 15.88) and **3** conference papers; **3** papers to be submitted/under reviewed.
- Substantially contributed to several other projects including:
    - Successfully utilized spatially periodic electric field to mediate air-films trapped beneath droplets impacting on solid substrates at high speed.
    - Designed and implemented an ultra-high-speed setup for in-situ visualization of microdroplets impacting on heated power bed during printing.
    - Proposed and validated solutions for a mechanistic prediction of heat transfer enhancement on complex surfaces using electric field.
    - Characterized surface properties of bio-inspired skin-attachable acoustic sensors using graphene for human-voice recognition systems.
- Effectively managed a laboratory at School of Physical and Mathematical Science (SPMS) NTU, and closely mentored two Ph.D. students graduated in 2021 and 2023, as well as a number of undergraduate students.

Ph.D. Candidate **Aug 2014 – Aug 2018**

Institution: Nanyang Technological University, Singapore
Advisor: Dr. Anh Tuan Tran

- *Thesis title*: Contact line dynamics of electrowetting actuated droplets.
    - Provided extensive experimental data and analytical analysis on the dynamics of droplets under electrowetting effect including contact line friction, droplet responses, droplet jumping conditions.
    - The results greatly enhance the current understanding on droplet spreading by electrowetting phenomenon and have a strong bearing in diverse applications such as droplet manipulations, liquid repellant surfaces, thermal diode, and dropwise condensation heat transfer.
- Published **3** peer-reviewed journal papers (**1** in *Physical Review Letter,* the top journal in Physics, IF 9.18) and presented at **2** conferences (one with full papers).

Research Associate **2012 – 2014**

Institution: National Key Laboratory of Digital Control and System Engineering, Vietnam
Supervisor: Dr. Huu Phu Bui
Role & achievements:

- Head of the digital control, electronics, and telecommunication team with 5 other researchers and multiple intern students.
- Awarded a 3-year research grant from the Department of Science and Technology, Ho Chi Minh City (worth **3.7B VND**) (co-principal investigator).
- Designed, fabricated, and tested a high-accuracy weigh-in-motion system that was applied for the highway weight tracking project of Ho Chi Minh city, Vietnam.

Publications

Google Scholar profile here

Peer-reviewed Publications (*co-first author)

1. Q. Vo and K. H. Benam, Protocol for characterizing airway epithelial ciliary beating and mucociliary transport using image processing and particle imaging velocimetry, **Star Protocols** 6, 103674, 2025.
2. B. F. Niemeyer*, Q. Vo*, T. Saleh, H. Mahvizani, D. Hu, E. M. Pietras, C. T. Jordan, K. H. Benam, On-Chip Reconstitution of Hematopoietic Niche for Real-time Leukocyte Mobilization Analysis, ***Nature Communication***, *under revision*, Sep 2024.
3. Q. Vo, M. Lin, and T. Tran, Soft Materials Deform Anisotropically at the Onset of Wetting, ***Nature Communication****, under revision,* Sep 2024.
4. Q. Vo*, S. Mitra*, M. Lin, and T. Tran, Unsteady Wetting of Soft Solids, ***Journal of Colloid and Interface Science 664****,* 478-486*,* 2024.
5. Q. Vo, and K. H. Benam, Advancements in Preclinical Human-Relevant Modeling of Pulmonary Vasculature On-Chip, ***European Journal of Pharmaceutical Sciences 195***, 106709*,* 2024.
6. Q. Vo, K. A. Carlson, P. M. Chiknas, C. N. Brocker, L. DaSilva, E. Clark, S. K. Park, A. S. Ajiboye, E. M. Wier, K. H. Benam, On-Chip Reconstitution of Uniformly Shear-Sensing 3D Matrix-embedded Multicellular Blood Microvessels, ***Advanced Functional Materials 34***, 2304630, 2024 (*Featured as Inside Front Cover*, DOI: 10.1002/adfm.202470054).
7. Q. Vo, and T. Tran, Droplet Jumping by Modulated Electrowetting, ***Journal of Fluid Mechanics*** **977**, A24, 2023.
8. TB Nguyen, Q. Vo, X Shang, F Buang, T Tran, Film Boiling Suppression and Boiling Heat Transfer Enhancement by Dielectrophoretic Effect, ***Thermal Science and Engineering Progress*** **40**, 101796, 2023.
9. M. Lin, Q. Vo, S. Mitra, and T. Tran, Viscous Droplets Impingement on Soft Substrates, ***Soft Matter*** **18**, 5474-5482, 2022.
10. TB Nguyen, Q. Vo, X Shang, F Buang, T Tran, Bypassing Film Boiling State for Maintaining High Boiling Heat Transfer Efficiency by Dielectrophoretic Effect, ***17th UK Heat Transfer Conference*** (UKHTC2021), Manchester, UK, 4-6 April 2022. Full paper available here.
11. Q. Vo, and T. Tran, Mediation of Lubricated Air Films using Spatially Periodic Dielectrophoretic Effect, ***Nature Communication*** **12**, 4289, 2021.

12. Q. Vo, and T. Tran, Dynamics of Droplets under Electrowetting Effect with Voltages Exceeding the Contact Angle Saturation Threshold, ***Journal of Fluid Mechanics*** **925**, A19, 2021, (*co-corresponding author*).
13. S. Mitra, Q. Vo, and T. Tran, Bouncing-To-Wetting Transition for Water Droplets Impacting Soft Solids, ***Soft Matter*** **17**, 5969, 2021, (*co-corresponding author*).
14. Q. Vo, and T. Tran, Droplet Ejection by Electrowetting Actuation, ***Applied Physics Letters*** **118**, 16160, 2021, (*co-corresponding author*).
15. Q. Vo, Y. Fujita, Y. Tagawa, and T. Tran, Anisotropic Behaviours of Droplets Impacting on Dielectrowetting Substrates, ***Soft Matter*** **16**, 2621-2628, 2020.
16. Q. Vo, and T. Tran, Critical Conditions for Jumping Droplets, ***Physical Review Letters*** **123**, 024502, 2019.
17. T.-S. D. Le, J. An, Y. Huang, Q. Vo, J. Boonruangkang, T. Tran, S.-W Kim, G. Sun, and Y.-J. Kim, Ultrasensitive Anti-Interference Voice Recognition by Bio-Inspired Skin-Attachable Self-Cleaning Acoustic Sensors, ***ACS Nano*** **13**, 13293-13303, 2019.
18. Q. Vo, and T. Tran, Contact Line Friction of Electrowetting Actuated Viscous Droplets, ***Physical Review E*** 97, 063101, 2018, ***Editor's Suggestion Award***.
19. Q. Vo, H. Su, and T. Tran, Universal Transient Dynamics of Electrowetting Droplets, ***Scientific Reports*** **8**, 836, 2018.
20. XQ. Vo, and T. Tran, Transient Electrowetting-On-Dielectric for Activating Droplets in Bioprinting Applications, ***Proc. of the 2nd Intl. Conf. on Progress in Additive Manufacturing***, 228-233, 2016. Full paper available here.

In preparation for journal papers (*to be submitted*) (*co-first author)

1. Q. Vo and K. H. Benam, Stem-cell Based Personalized Lung-on-a-Chip.
2. Q. Vo and K. H. Benam, Microvasculature-on-a-Chip using Human Induced Pluripotent Stem Cells Enables *in-vitro* Investigation of Immunity and Physiological Responses in Down Syndrome.
3. Q. Vo*, TB Nguyen*, M. Lin, and T. Tran, Delaying Leidenfrost Temperature using Dielectrophoretic Effect.

Patents:

1. Kambez H. Benam and Xuan Quoc Vo, Non-PDMS Organs-on-Chips & Multi-Organ-Chip Microfluidically Linked Board w/ Integrated Biosensors, Provisional application No: 63/565,123, *Pitt Ref No (s), 06670*, 2024.
2. Kambez H. Benam, Brian Niemeyer, and Xuan Quoc Vo, Microphysiological Model of Bone Marrow Hematopoiesis and Leukocyte Mobilization, Provisional application No: *63/619,015, Pitt Ref No (s): 06602*, 2024.
3. Xuan Quoc Vo and Kambez H. Benam, Next-Generation Airway-on-a-Chip Living Microfluidic Device with Integrated Extracellular Matrix, Enhanced Structural and Cellular Complexity, and Matrix-Embedded Cross-Sectionally Rounded Microvasculature, *Provisional Patent No: 113100530, Pitt Ref No: 06151*, 2022.
4. Xuan Quoc Vo and Anh Tuan Tran, Surface Profile Inspection Methods and Systems. Filed patent, Singapore Ref *No. 10202105330W*; *US Patent number: US12018931B2*.

Book:

1. Q. Vo and K. H. Benam, Lung-on-a-Chip as a Model for Studying Effects of Cigarette Smoke, Chapter 14 in "Body-on-a-Chip: Essentials and Applications", Editor Anthony Atala and Y. Shrike Zhang, Elsevier, *to be published,* Feb 2025.

Conference Papers and Talks

1. TB Nguyen, Q. Vo, X Shang, F Buang, T Tran, Bypassing film boiling state for maintaining high boiling heat transfer efficiency by dielectrophoretic effect, *17th UK Heat Transfer Conference* (UKHTC2021), Manchester, UK, 4-6 April 2022. Full paper available here.
2. Q. Vo, and T. Tran, Conditions for droplet detachment under electrowetting actuation, *First Rencontre du Vietnam on Soft Matter Science*, International Centre for Interdisciplinary Science Education (ICISE), Quy Nhon, Vietnam, July 14-20, 2019.
3. S. Mitra, Q. Vo, and T. Tran, Transient Wetting on Soft Solids, *First Rencontre du Vietnam on Soft Matter Science*, International Centre for Interdisciplinary Science Education (ICISE), Quy Nhon, Vietnam, July 14-20, 2019.
4. Q. Vo, and T. Tran Contact line friction of viscous droplets spreading and retracting in ambient oils, *EMN Orlando Meeting on Droplets*, December 2017, Orlando, USA.
5. T. Tran & Q. Vo, Optimum responses of droplets under electro-wetting actuation, *APS Division of Fluid Dynamics Meeting Abstracts*, D37. 005, 2016.
6. X.Q. Vo, and T. Tran, Transient electrowetting-on-dielectric for activating droplets in bioprinting applications, *Proc. of the 2nd Intl. Conf. on Progress in Additive Manufacturing*, 228-233, 2016. Full paper available here.
7. X.Q. Vo and T.T. Nguyen, Development of air duct cleaning robot, *The 12th Conference on Science and Technology of Vietnam*, Ho Chi Minh City, Vietnam, Nov 2011.
8. X.Q. Vo, M.S Le, D.A Nguyen, and T.T. Nguyen, Development of data acquisition system for tri-axial testing equipment, *The 5th National Conference on Mechatronics of Vietnam*, Ho Chi Minh City, Vietnam, Oct 2010.
9. X.Q. Vo, S.B Kim and T.T. Nguyen, "Development of data acquisition system for testing equipment in geotechnical applications", *The 2010 International Technical Conference on Advanced Engineering*, KMU & PKNU, Pusan, South Korea, Nov 3-5, 2010.
10. P.T. Doan, D.K. Pham, X.Q. Vo, and T.T. Nguyen, "A solution to design and manage information for a newspaper vending machine network based on global system for mobile communications technology (GSM)", *The 11th Conference on Science and Technology of Vietnam*, Ho Chi Minh City, Vietnam 2009.

Scholarships, Grants, and Awards

- Nanyang Technological University Ph.D. Research Scholarship from 2014 to 2018.
- Best paper awards:
  - *Physical Review E* 97, 063101, 2018 (Editor suggestion's).
  - *17th UK Heat Transfer Conference* (UKHTC2021), Manchester, UK, 4-6 April 2022.
- Awarded a 3-years research grant (3.7B VND) by Ho Chi Minh City Department of Science and Technology, Ministry of Science and Technology, Vietnam, 2013.
- Awarded first class honors upon graduation of the Master of Engineering Program at Ho Chi Minh City University of Technology, Vietnam, 2013.

Education

Doctor of Philosophy in Mechanical Engineering **2019**
School of Mechanical and Aerospace Engineering,
Nanyang Technological University, Singapore
Advisor: Dr. Anh Tuan Tran

- *Field of study*: Physics of fluids
- *Thesis title*: Contact line dynamics of electrowetting droplets
- *Publication*: 4 journal papers, 1 conference paper, and 3 talks delivered at conferences.

Master of Engineering in Mechanical Engineering **2013**
Ho Chi Minh City University of Technology, Vietnam
Faculty of Mechanical Engineering,
Advisor: Dr. Tan Tien Nguyen

- *Field of study*: Mechatronics
- *Thesis title*: Research and development of air-duct cleaning mobile robot
- *Publication:* 3 conference papers (together with oral presentations).
- *Rank*: First Class Honors upon graduation

Bachelor of Engineering in Mechanical Engineering **2010**
Ho Chi Minh City University of Technology, Vietnam
Faculty of Mechanical Engineering,
Advisor: Dr. Tan Tien Nguyen

- *Field of study*: Mechatronics
- *Thesis title*: Research and development on vending machine network
- *Publication:* 1 conference paper (together with oral presentation).

Teaching and mentoring experience

Teaching experience

Teaching assistant **2015 –2018**
Institution: School of Mechanical & Aerospace Engineering, Nanyang Technological University, Singapore.
Coordinator: Prof. Fei Duan
Courses: Fluid Dynamics (MA4002), Solid Mechanics and Vibration (MA3002), Heat Transfer (MA3003), and Fluid Mechanics (MA3006).

- Preparing lectures, tutorials, instructing lab experiments, and marking.

Lecturer **2013 - 2014**

- *Institution:* National Key Laboratory of Digital Control and System Engineering, DCSELAB, Vietnam.
- Courses: 1) Microcontroller Programming; 2) Electronic Circuit Design and Fabrication.

- Designing teaching programs for the courses, preparing lectures and materials, and teaching.

Mentoring experience

Nanyang Technological University, Singapore **2014 – Dec 2021**

- Ph.D. candidates: Marcus Lin (School of Mechanical & Aerospace Engineering, MAE, graduated 2023); and Mitra Surjyasish (School of Physical & Mathematical Science, SPMS, graduated 2021).
- Undergraduate students: Amalina Lai (CN Yang scholar, SPMS, 2018 & 2019), Kar Fai Lai (EURCA scholar, SPMS, 2018), and 12 final-year-project students in MAE, NTU.

HCMC University of Technology, Vietnam **2010 - 2012**

- Mentoring 4 undergraduate students who all graduated with excellent grades. Two of them later obtained Ph.D. degrees and are now in their postdoctoral training.

Professional skillsets

- **Experimental**:
  - *Experimental bioengineering*: Primary cell and human pluripotent stem cell culture, organ-on-chip device development, experimental biology techniques including flow cytometry, immunostaining, qPCR.
  - *Micromachining*: photolithography, plasma bonding, chemical vapor deposition, wet-bench processes.
  - *Robotic Design and Fabrication*: mechanical components, electrical circuits, microfluidics devices, 3D printing, surface coatings.
  - *Optic and Imaging*: optics, laser, high-speed imaging, particles tracking velocimetry (PIV), phase-shifting interferometry, fluorescence microscopy.
  - *Material Characterization*: rheological measurements, and dynamic mechanical analysis (DMA), scanning electron microscopy (SEM), atomic force microscopy (AFM).
- **Analytical**: development of theories and analytical explanations for physical phenomena in fluid mechanics, droplet-solid interactions, heat transfer, and electromagnetic field.
- **Simulation**: simulation of fluid dynamics and electromagnetic field using COMSOL and SolidWorks.
- **Analysis and Programming**: Image processing, digital signal processing, and data analysis with MATLAB and Python.