Númi Sveinsson Cepero

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EDUCATION

University of California, Berkeley	2025 **Ph.D.**	Mechanical Engineering, GPA: 3.9 Major: Biomechanics Minor 1: Machine Learning Minor 2: Scientific Computing
	2023 **M.S.**	Mechanical Engineering
Boston University	2020	Ph.D. coursework in Biomedical Engineering (transferred to UC Berkeley)
University of Iceland	2019 **B.S.**	Mechanical Engineering, GPA: 9.7/10 Highest GPA in program history
Stanford University	2018	International Honors Program

RESEARCH EXPERIENCE

My research focuses on computational modeling and machine learning for cardiovascular imaging. I develop data-driven frameworks that integrate deep learning with physics-based modeling to automate vascular reconstruction and simulation. My work bridges biomedical engineering, scientific computing, and AI to advance precision cardiovascular diagnostics.

University of California, Berkeley Mechanical Engineering Department (Berkeley, CA, USA)	08/2020 – 08/2025	**Graduate Research** Advisor: Prof. Shawn C. Shadden
Kerecis Research and Development (Reykjavík, Iceland)	05/2020 – 08/2020	**Research Internship** Advisor: Prof. Sigurður Brynjólfsson
University of Iceland Department of Medicine (Reykjavík, Iceland)	05/2019 – 08/2019	**Undergraduate Research** Advisor: Prof. Thórarinn Guðjónsson

PUBLICATIONS

Papers with future venues are accepted to appear in them.

- SeqSeg: Learning Local Segments for Automatic Vascular Model Construction. N. Sveinsson Cepero and S. C. Shadden. *Annals of Biomedical Engineering*, 2025.
- Integrated Framework for Unified Cardiac and Vascular Mesh Construction from Medical Images. N. Sveinsson Cepero, A. Narayanan, and S. C. Shadden. *In Functional Imaging and Modeling of the Heart*, 2025.
- Automatic Vascular Model Construction from Medical Imaging Using Deep Learning. N. Sveinsson Cepero. University of California, Berkeley, 2025.

PRESENTATIONS AND WORKSHOPS

- *PhD Commencement Address*, UC Berkeley College of Engineering Commencement, Berkeley, CA, USA, May 2025.
- *SimVascular Tutorial for Cardiovascular Modeling and Simulation*, CMBBE 2025 (Computer Methods in Biomechanics and Biomedical Engineering), Barcelona, Spain, September 2025.
- *MeshGrow: Unified Cardiac and Vascular Mesh Construction from Medical Images* (Poster), FIMH 2025 (Functional Imaging and Modeling of the Heart), Dallas, TX, USA, June 2025.
- *Hands-On Workshop: SimVascular for Cardiovascular Modeling and Simulation*, ASME SB3C Summer Bioengineering Conference 2025, Santa Ana Pueblo, NM, USA, June 2025.
- *Automatic Construction of Patient-Specific Vascular Models of Diverse Anatomy* (Poster), ASME SB3C Summer Bioengineering Conference 2025, Santa Ana Pueblo, NM, USA, June 2025.
- *Automatic Vascular Model Construction from Medical Images*, CIM2 Symposium, Stanford University, CA, USA, August 2024.
- *Automatic Image-Based Vascular Model Construction Using Sequential Segmentations*, ASME SB3C Summer Bioengineering Conference 2024, Geneva, Wisconsin, USA, June 2024.
- *Automatic Image-Based Vascular Model Construction*, Cardiovascular Implant Durability Conference 2023, Monterrey, CA, USA, October 2023.

RESEARCH COLLABORATIONS

- Collaboration with the *Cardiovascular Biomechanics Computation Lab*, led by Prof. Alison Marsden, Stanford University — contributions to the *Vascular Model Repository (VMR)* project and development of core functionalities in the *SimVascular* software for cardiovascular modeling and simulation (2020–present).
- Collaboration with the *SimVascular Open-Source Community* — contributions to software development, documentation, and workshops on cardiovascular modeling and simulation (2022–present).
- Collaboration with the *Rubinsky Group*, University of California, Berkeley — evaluation and validation of cryobioprinting technology using computational models (2023-present).

- Collaboration with the *AI - Computer Vision Group*, University of California, Berkeley — application of deep learning-based trajectory-oriented vessel tracking for clinical coronary CT datasets (2024–present).

TEACHING EXPERIENCE

University of California, Berkeley
Mechanical Engineering Department
(Berkeley, CA, USA)

2024 **Graduate Teaching Assistant**
Intro. to Finite Element Method
Instructor: Prof. Shawn C. Shadden
Delivered two full guest lectures on *Linear Solvers*.

University of Iceland
Department of Physical Sciences
(Reykjavík, Iceland)

2019 **Undergraduate Teaching Assistant**
Numerical Analysis
Instructor: Prof. Sigurður Freyr Hafstein

University of Iceland
Department of Physical Sciences
(Reykjavík, Iceland)

2018 **Undergraduate Teaching Assistant**
Differential Equations and Complex Analysis
Instructor: Prof. Sigurður Örn Stefánsson

DATASETS AND TOOLS

Publicly released tools and datasets in cardiovascular modeling and medical image analysis.

- **SeqSeg** — Deep learning–based framework for automated segmentation of coronary arteries from CT images. Includes preprocessing pipeline, vessel segment extraction method, and publicly released pretrained model weights. github.com/numisveinsson/SeqSeg
- **MeshGrow** — Integrated framework for unified cardiac and vascular mesh construction from medical images, enabling automatic generation of anatomically consistent, simulation-ready 3D cardiovascular models.
- **SimVascular** — Open-source cardiovascular modeling and simulation software. Contributed to feature development and testing in collaboration with the Marsden Lab at Stanford University. simvascular.github.io
- **MIROS (Medical Image to Reduced Order Simulation)** — Toolkit for linking patient-specific medical imaging data to reduced-order hemodynamic simulations, facilitating efficient cardiovascular modeling and parameter estimation. github.com/BryannGan/MIROS
- **Vascular Model Repository** — Collaborative online platform for sharing, visualizing, and comparing vascular geometries and simulation data; developed in partnership with the Marsden Lab to promote open science in cardiovascular modeling. vascularmodel.com

MENTORSHIP

- Mentored undergraduate researchers in the Departments of Mechanical Engineering and Bioengineering, University of California, Berkeley, guiding projects on medical image segmentation and vascular

modeling (2022–2025). Students mentored include: Boyang Gan (now PhD student, Columbia University), Stanley Wong (undergraduate, UC Berkeley), and Sung Joo Lim (undergraduate, UC Berkeley).

- Supervised Master of Engineering (*MEng*) capstone teams in the Mechanical Engineering and Bioengineering programs at the University of California, Berkeley:
  - **2024–2025 Team:** Jordan Snyder, Aryan Somashekhar Pammar, and Phung Hoang Thanh Le — project on automated and fast annotation of medical image data using deep learning.
  - **2023–2024 Team:** Markus Bauer, Riddhi Sera, Shivam Gupta, Sofia Haile, and Yihong (Ian) Liu — project on automated segmentation of coronary arteries.
- Contributed as a mentor in the *Education Initiative for Development (EID)* program, supporting students from developing regions pursuing STEM pathways (2020–2021).

PROFESSIONAL SERVICE

Leadership roles, reviewer duties, committee participation, and community outreach.

- Reviewer for MICCAI (Medical Image Computing and Computer Assisted Intervention) Conference submissions (2022–2025).
- Co-organizer and instructor for SimVascular tutorials and workshops at international conferences including CMBBE 2025 and ASME SB3C 2025.
- Volunteer contributor to the SimVascular open-source community — software development, documentation, and user support (2022–present).
- Member of departmental panels at University of California, Berkeley, advising on curriculum and research initiatives (2021–2025).
- Board Member, SINE – Association of Icelandic Students Abroad, 2021–2025.
- Vice President, SINE – Association of Icelandic Students Abroad, 2022–2023.
- University of Iceland Student Council, 2018–2019.
- Board Member, School of Engineering and Natural Sciences, University of Iceland, 2018–2019.
- NORDTEK Student Board, 2018–2019.
- Amnesty International Youth Council, 2016–2019.
- Promotional and outreach work for University of Iceland, 2018–2019.

AWARDS AND FELLOWSHIPS

- UC Berkeley Engineering Ph.D. Commencement Speech, 2025.
- UC Berkeley Mechanical Engineering Department Spring Scholarship, University of California, Berkeley, 2025.

- Landsbankinn Graduate Scholarship, Reykjavik, Iceland, 2024.
- UC Berkeley Mechanical Engineering Department Summer Fellowship, University of California, Berkeley, 2024.
- CVID Award, Student Presenter, 2023.
- UC Berkeley Graduate Division Block Grant, University of California, Berkeley, 2023.
- Landsbankinn Graduate Scholarship, Reykjavik, Iceland, 2023.
- Hearts To Humanity Award, 2022.
- Leif Eiriksson Fellowship, 2021.
- Boston University Fellowship, 2019.
- Baccalaureate Commencement Speech, University of Iceland, 2019.
- Scholarship to Attend Stanford University, 2018.
- Íslandsbanki Undergraduate Scholarship, 2018.
- Landsbanki Undergraduate Scholarship, 2017.
- University of Iceland Student Achievement & Incentive Fund, 2016.

TECHNICAL SKILLS

Core competencies in medical image analysis, computational modeling, and data-driven research.

- **Programming and Scripting:** Python (NumPy, PyTorch, TensorFlow, scikit-image, SimpleITK), C++, MATLAB, Bash.
- **Medical Image Processing:** Segmentation, registration, and vessel tracking; experience with 2D/3D CT, MRI, and ultrasound data; libraries including ITK, VTK, and MONAI.
- **Deep Learning and Computer Vision:** U-Net architectures, Gaussian heatmap regression, trajectory prediction models, and transfer learning for biomedical applications.
- **Computational Modeling and Simulation:** Mesh generation, CFD and FSI simulations; proficient with *SimVascular*, ParaView, ANSYS, and custom vascular modeling pipelines.
- **Software Development and Collaboration:** Git, GitHub, Docker, Linux environments, and continuous integration for research reproducibility.
- **Scientific Visualization and Data Analysis:** Matplotlib, Paraview and advanced visualization of 3D medical and simulation data (VTK).
- **General Tools and Workflow:** LaTeX, Overleaf, Linux shell scripting, high-performance computing (HPC), and Slurm-based job scheduling.

MEDIA COVERAGE

- *“Berkeley Engineering celebrates class of 2025”*, Berkeley Engineering News, May 27, 2025 — featured as the doctoral student speaker at the 2025 Commencement. https://engineering.berkeley.edu/news/2025/05/berkeley-engineering-celebrates-class-of-2025/
- *“2025 Commencement Speakers”*, Berkeley Engineering Events, May 2025 — listed as a featured speaker at the 2025 Doctoral Commencement. https://engineering.berkeley.edu/events/engineering-commencement/spring-2025/2025-speakers/
- *“Órói og óvissa í bandarískum háskólum”*, RÚV, April 16, 2025 — discussed international student experiences amid U.S. university uncertainties. https://www.ruv.is/frettir/erlent/2025-04-16-oroi-og-ovissa-i-bandariskum-haskolum-441705
- *“Það er verið að gera rannsóknir pólitískar”*, Morgunblaðið, May 28, 2025 — addressed political influences on academic research. https://www.mbl.is/frettir/innlent/2025/05/28/thad_er_verid_ad_gera_rannsoknir_politiskar/
- *“Nota líf nemenda til að ná sínu fram”*, Morgunblaðið, July 9, 2020 — highlighted experiences as an international PhD student. https://www.mbl.is/frettir/innlent/2020/07/09/nota_lif_nemenda_til_ad_na_sinu_fram/
- *“Tekur við sem formaður SINE”*, Vísir, May 2021 — announced appointment as board member of SINE, the Association of Icelandic Students Abroad. https://www.visir.is/g/20212143698d/tekur-vid-sem-for-madur-sine
- *“Rúmlega 2600 kandídatar útskrifast í dag”*, RÚV, June 2025 — reported on being the bachelor commencement speaker. https://www.ruv.is/frettir/innlent/rumlega-2600-kandidatar-utskrifast-i-dag
- *“Sextán framúrskarandi námsmenn hljóta styrk”*, Landsbankinn News, June 22, 2023 — scholarship award naming Númi Sveinsson Cepero as a recipient. https://www.landsbankinn.is/frettir/2023/06/22/sextan-framurskarandi-namsmenn-hljota-styrk