Noor Nakhaei

Computer Vision Research • Segmentation & Boundary Refinement • Ph.D., UCLA
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Professional Summary

Computer vision researcher (Ph.D. in Computer Science, UCLA, 2025; advisor Demetri Terzopoulos) specializing in segmentation and boundary refinement across anatomies and imaging modalities. Current work: a class-agnostic 3D boundary-refinement network that adapts segmentation foundation models from 1–20 labeled scans; its joint-aware variant exceeds nnU-Net fine-tuning on joint-region boundary accuracy. Prior work: active-contour refinement of the Segment Anything Model (first-author, SPIE 2024) and co-authored weakly supervised vessel segmentation (WACV 2022).

Education

University of California, Los Angeles (UCLA) 2019–2025
Ph.D. (2025) and M.S. (2022) in Computer Science, Advisor: Professor Demetri Terzopoulos
Ph.D. thesis: Novel Techniques for Automated Medical Image Segmentation Spanning Diverse Anatomical Structures and Imaging Modalities

Amirkabir University of Technology (Tehran Polytechnic) 2013–2017
B.Sc. in Computer Engineering, Advisor: Professor Ehsan Nazerfard

Research Experience

- **Harvard Medical School - Boston Children's Hospital** 2025–present
  Postdoctoral Research Fellow
  Musculoskeletal Digital Innovation & Informatics Program (MDI^2), *Advisor* : *Prof. KiaAtapour*
  - Designed and built a class-agnostic 3D boundary-refinement network that adapts foundation-model CT bone segmentations from only 1–20 labeled scans.
  - Developed a joint-aware boundary loss with band-limited blending: passed a pre-registered acceptance test with significant paired gains in Dice, NSD, and HD95 over the previous best configuration, and exceeded nnU-Net fine-tuning on joint-region NSD.
  - Ran a few-shot scaling study benchmarking four 3D segmentation foundation models, zero-shot and adapted, against nnU-Net fine-tuning on hip CT; the adaptor failed on far fewer structures than fine-tuning, though fine-tuning had lower median error. Now extending to two knee MRI datasets.
  - Diagnosed failure modes with per-label error analysis and visualization (e.g., traced a systematic sacrum error to a label-ontology mismatch between model and annotations) and redesigned connected-component post-processing to cut spurious structures.
  - Built an interpretable hip osteoarthritis classifier from pelvic radiographs and externally validated on an independent hospital cohort.

- **The Hsu Lab - UCLA** 2019–2025
  Ph.D. Researcher
  - Refined Segment Anything Model (SAM) boundaries with an active contour model (first-author, SPIE Medical Imaging 2024); investigated test-time domain adaptation of large vision models.
  - Incorporated human gaze data into the training of segmentation and classification models (multimodal learning); developed spatial matching of magnified mammograms to specimen radiographs with landmark finding (first-author, SPIE 2021).
  - Contributed to the external evaluation of 11 AI algorithms for screening mammography toward clinical translation; co-authored the external validation of an AI ensemble model (*JAMA Network Open*, 2022).

Skills

Research Areas: deep learning, 2D/3D segmentation, boundary and shape-aware refinement, active contours, landmark detection, image spatial matching, classification, few-shot and test-time domain adaptation, vision foundation models, LLMs and VLMs
Evaluation: Dice, NSD, HD95, ASSD; ablation design, paired confidence intervals, external validation
Frameworks & Compute: Python, C++, C, MATLAB, R; PyTorch, TensorFlow, scikit-learn; multi-GPU training, Slurm GPU clusters
Models & Imaging: nnU-Net, 2D/3D Foundation Models, CNNs (ResNet, DenseNet); CT, MRI, X-ray (radiographs, mammography), digital breast tomosynthesis, 2D color digital retinal fundus photographs

Publications

7. "Refining boundaries of the segment anything model in medical images using an active contour model," **N. Nakhaei**, T. Zhang, D. Terzopoulos, and W. Hsu, *Proc. SPIE 12927, Medical Imaging 2024: Computer-Aided Diagnosis*, April 2024, Online, pgs. 749-758.
6. "A Competition, Benchmark, Code, and Data for Using Artificial Intelligence to Detect Lesions in Digital Breast Tomosynthesis," N. Konz, et al., **N. Nakhaei**, et al., and Maciej A Mazurowski, in *JAMA Network Open*, 6.2 (2023): e230524.
5. "External Validation of an Ensemble Model for Automated Mammography Interpretation by Artificial Intelligence," W. Hsu, D. S. Hippe, **N. Nakhaei**, et al., and Christoph I Lee, in *JAMA Network Open*, 5.11 (2022): e2242343.
4. "Weakly-Supervised Convolutional Neural Networks for Vessel Segmentation in Cerebral Angiography," A. Vepa, A. Choi, **N. Nakhaei**, et al., and Fabien Scalzo, in *Proc. IEEE/CVF Winter Conference on Applications of Computer Vision (WACV 2022)*, January 2022, Waikoloa, Hawaii, pgs. 585–594.
3. "Automated quantitative assessment of amorphous calcifications: Towards improved malignancy risk stratification," K. Marathe, C. Marasinou, B. Li, **N. Nakhaei**, et al., and W. Hsu, in *Computers in Biology and Medicine (2022), 105504, ISSN 0010-4825.*
2. "Spatial Matching of Magnified 2D Mammography Images and Specimen Radiographs: Towards Improved Characterization of Suspicious Microcalcifications," **N. Nakhaei**, C. Marasinou, A. Omigbodun, N. Capiro, B. Li, A. Hoyt, and W. Hsu, *Proc. SPIE 11597, Medical Imaging 2021: Computer-Aided Diagnosis*, February 2021, Online, pgs. 511-516.
1. "Segmentation of Breast Microcalcifications: A Multi-Scale Approach," C. Marasinou, B. Li, J. Paige, A. Omigbodun, **N. Nakhaei**, et al., and W. Hsu, *arXiv preprint (arXiv:2102.00754)*, pgs. 1–10.

Leadership, Teaching & Awards

- President, **UCLA Graduate Students Association (GSA)**, 3 consecutive elected terms representing 14,000 graduate and professional students: managed an annual budget of $300,000, negotiated funding and policy changes with university administration, and initiated the BruinGrad Pass Transportation Referendum. Also Chair, **GRAD Coalition**; Co-Chair, **University of California, Council of Presidents (UC COP)**; Co-President, **Computer Science Graduate Student Associations (CS-GSA)**.
- Teaching Fellow, UCLA Computer Science, 2020–2023: Introduction to Algorithms (CS 180, 3 terms), Introduction to Computer Graphics (CS 174A, 4 terms), Current Topics in Data Structure (CS 249); Head Teaching Fellow and Instructor, TA Training Seminar (CS 495), Fall 2023.
- Mentor to a junior researcher (vertebral landmark detection for Cobb angle measurement).
- Awards: Engineering Achievement Award in Student Welfare (**UCLA Samueli School of Engineering**, 2025); Outstanding Mentorship Award (**UCLA Computer Science**, 2022)