KEIVAN RAHMANI

Ph.D. Candidate in Nanoengineering & M.S. in Computer Science, UC San Diego
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EDUCATION

Ph.D. in Nanoengineering (GPA 4.0/4.0) | University of California San Diego | *Sep 2022–Present*
M.S. in Computer Science (GPA 4.0/4.0) | University of California San Diego | *Sep 2022–Present*
M.S. in Environmental Engineering (GPA 4.0/4.0) | University of Alberta | *2019–2021*
B.S. in Chemical Engineering (GPA 17.25/20) | Sharif University of Technology | *2013–2018*

TECHNICAL SKILLS

- **Languages/Tools**: Python, PyTorch, TensorFlow, SQL, Git, Docker, Azure, AWS
- **Machine Learning & AI**: Physics-Informed Deep Learning, Reinforcement Learning, Probabilistic Modeling, LLMs, Computer Vision
- **Computational**: CUDA & GPU Programming, HPC & Parallelization, Myokit (cardiac simulation), CMA-ES optimization
- **Data Engineering**: Data Pipelines (ETL), Web Scraping, APIs Integration, Cloud Deployment
- **Experimental:** Patch Clamp, NEA/MEA Platforms, GC-MS, BET, TGA, XPS

RESEARCH & WORK EXPERIENCE

Graduate Research Assistant, UC San Diego | *Mar 2024–Present*

- **Reinforcement Learning for Cardiac Digital Twins**
    - Architected a Myokit-powered environment to simulate ion channel parameters in hiPSC-CMs under dynamic voltage protocols.
    - Developed an RL pipeline (SAC + LSTM) with domain randomization for real-time parameter estimation, accelerating drug screening.
    - Integrated CMA-ES optimization to refine RL-driven parameter guesses, improving predictive accuracy on diverse electrophysiological conditions.
    - Employed multi-environment parallelization (Python, HPC) for faster convergence and robust observation distributions.
- **Label-Free Nano-Poration Detection**
    - Built a **high-throughput ML pipeline** to predict nuclear envelope poration events from cell morphology (no fluorescent labels).
    - Engineered an **orientation-invariant VAE** (64D latent space) to capture nuanced cell–nucleus embeddings.
    - Achieved **AUC = 0.86** on limited wet-lab data (~700 samples).
- **Physics-Informed Deep Learning for Electrophysiology**
    - Integrated PDE constraints (Aliev-Panfilov model) into a **UNET loss** to reconstruct intracellular action potentials from extracellular data.
    - Demonstrated $R^2 = 0.99$ generalization on nanoelectrode & microelectrode array signals.

Research Assistant, University of Alberta | *May–Sep 2022*

- Built a **sports trading card price predictor** (CNN + player stats APIs).
- Automated **web scraping** of player attributes from EA Sports databases.

Data Scientist, Energy Advantage | *May–Sep 2022*

- **Streamlined ESG reporting** using automated data pipelines.
- Optimized **SQL** workflows for large-scale reporting on energy consumption and carbon footprints.

Associate ML Developer, ALTAML | *Oct–Dec 2021*

- Developed **computer vision feature extraction** on limited datasets, improved the current method accuracy by 83%
- optimized data structures for faster image processing.

Graduate Research Assistant, Univ. of Alberta | *Jan 2019–Aug 2021*

- Built ML models to forecast **COVID-19** impacts on Canadian air pollution.
- Applied **deep learning** to VOC adsorption performance in industrial air treatment.

SELECTED ACHIEVEMENTS

- **Patent Pending**: *Reconstructing Intracellular Action Potentials from Extracellular Signals* (63/717,739)
- **Talk**: Cell Bio 2024, the joint meeting of the American Society for Cell Biology (ASCB) and European Molecular Biology Organization (EMBO), San Diego Convention Center, San Diego (Dec 2024) (Title: Intelligent sensing of electrical communication in cells using AI and Nanotechnology)

SELECTED PUBLICATIONS

1. **Rahmani, K.**, L. Sadr, E. Sarikhani, H. Naghsh-Nilchi, C. Onwuasoanya, Y. C. Wong, W. Wen, and Z. Jahed. 2025. *"Label-Free Detection of Nuclear Membrane Nano-Poration."* **Small**, *in press*.

2. **Rahmani, K.**, Y. Yang, E. P. Foster, C.-T. Tsai, D. P. Meganathan, D. D. Alvarez, A. Gupta, *et al.* 2025. *"Intelligent in-Cell Electrophysiology: Reconstructing Intracellular Action Potentials Using a Physics-Informed Deep Learning Model Trained on Nanoelectrode Array Recordings."* **Nature Communications** 16(1): 657.

3. Sarikhani, E., V. Patel, Z. Li, D. P. Meganathan, **K. Rahmani**, L. Sadr, R. Hosseini, *et al.* 2024. *"Engineered Nanotopographies Induce Transient Openings in the Nuclear Membrane."* **Advanced Functional Materials**, 2410035.

4. Sarikhani, E., D. P. Meganathan, A.-K. Kure Larsen, **K. Rahmani**, C.-T. Tsai, C.-H. Lu, A. Marquez-Serrano, *et al.* 2024. *"Engineering the Cellular Microenvironment: Integrating Three-Dimensional Nontopographical and Two-Dimensional Biochemical Cues for Precise Control of Cellular Behavior."* **ACS Nano** 18(29): 19064–76.

5. **Rahmani, K.**, A. H. Mamaghani, Z. Hashisho, D. Crompton, and J. E. Anderson. 2022. *"Prediction of Heel Build-up on Activated Carbon Using Machine Learning."* **Journal of Hazardous Materials** 433 (July):128747.

6. **Rahmani, K.**, A. H. Mamaghani, A. Peyravi, Z. Hashisho, D. Crompton, and J. E. Anderson. 2024. *"Simultaneous Effect of Oxygen Impurity and Flow Rate of Purge Gas on Adsorption Capacity of and Heel Buildup on Activated Carbon during Cyclic Adsorption-Desorption of VOC."* **Journal of Hazardous Materials** 476 (September):135223.

7. Davarpanah, M., **K. Rahmani**, S. Kamravaei, Z. Hashisho, D. Crompton, and J. E. Anderson. 2022. *"Modeling the Effect of Humidity and Temperature on VOC Removal Efficiency in a Multistage Fluidized Bed Adsorber."* **Chemical Engineering Journal** 431 (March):133991.

8. Liu, Y., C. Li, A. Peyravi, Z. Sun, G. Zhang, **K. Rahmani**, S. Zheng, and Z. Hashisho. 2021. *"Mesoporous MCM-41 Derived from Natural Opoka and Its Application for Organic Vapors Removal."* **Journal of Hazardous Materials** 408 (April):124911.

9. Radmansouri, M., E. Bahmani, E. Sarikhani, **K. Rahmani**, F. Sharifianjazi, and M. Irani. 2018. *"Doxorubicin Hydrochloride–Loaded Electrospun Chitosan/Cobalt Ferrite/Titanium Oxide Nanofibers for Hyperthermic Tumor Cell Treatment and Controlled Drug Release."* **International Journal of Biological Macromolecules** 116 (September):378–84.

HONORS & AWARDS

- **KIBM Innovative Research Grant** (2024, $50,000)
- **Best Poster Nominee**, MRS Fall Meeting (2024)
- **1st Rank**, UCSD Nano Engineering Comprehensive Exam (2023)
- Multiple competitive **Graduate Scholarships** (Lehigh Hanson, Alberta Graduate Excellence, $60,000)
- **356th Rank** in Iranian Nationwide University Entrance Exam (*>250,000 participants*)

KEY SKILLS & COURSEWORK

- **Programming/Tools**: Python, PyTorch, TensorFlow, SQL, Git, Azure, AWS, Docker
- **Data Science & ML**: Reinforcement Learning, Probabilistic Modeling, Physics-informed DL, CUDA, GPU programing, LLMs
- **Experimental**: Patch Clamp, NEA, MEA, GC-MS, BET, TGA, XPS
- **Selected Courses**: Reinforcement Learning, Data Systems for LLMs, Advanced Optimization, Probabilistic Reasoning & Decision-Making, Statistical NLP, Data Science in Materials

LEADERSHIP & SERVICE

- **Teaching Assistant**, UC San Diego & Univ. of Alberta (2019–Present)
  - Courses: NanoEngineering System Design (NANO 120), Data Science in Material Engineering (NANO 281), Probability & Statistics (NANO 114), Intro to Nano (NANO 201), Chemistry 103, Chemistry 105
- **Mentorship**: Guided 40 undergrads (NANO 120B) in product design & nanoengineering projects.
- **Voluntary Service**: Fundraising lead for **MAHAK** (children's cancer charity); Sharif Green Society NGO.