Assel Kembay

Santa Cruz, California | akembay.github.io | kembayassel | akembay@ucsc.edu | +1 831 529-8390

EDUCATION

University of California, Santa Cruz — **Santa Cruz, CA, USA**
Ph.D. in Electrical and Computer Engineering | GPA: 3.95/4.00 — Jun 2027 (expected)
Area of Study: Brain-inspired AI/ML, energy-efficient AI systems
Advisor: Prof. Jason Eshraghian

University of Science and Technology — **Seoul, South Korea**
M.S. in AI - Robotics | GPA: 4.43/4.50
Thesis: "Inversion of Spiking Neural Networks, with application to Knowledge Distillation"

C-DAC's Advanced Computing Training School — **Pune, India**
Exchange Student, Advanced Computing

L.N. Gumilyov Eurasian National University — **Astana, Kazakhstan**
B.S. in Mathematical and Comp. Modeling (summa cum laude) | GPA: 3.86/4.00

AWARDS & HONORS

2025 **DAC 2025 Young Fellow, Design Automation Conference, San Francisco, USA**
Selected from a highly competitive international applicant pool to join the DAC Young Fellow Program at the premier conference for electronic design automation. Award includes full conference registration and a $250 travel grant.

2025 **IEEE WIE Student Scholarship, International Leadership Conference 2025, San Jose, USA**
Selected to attend the 2025 Women in Engineering International Leadership Conference with full registration support. Recognized for demonstrated leadership in advancing diversity and innovation in STEM fields.

2025 **DEI Research and Travel Award, UC Santa Cruz, USA**
Award supporting graduate students' research and travel expenses in recognition of contributions to DEI ($500)

2023 **Divisional MIP Fellowship, UC Santa Cruz, USA**
Merit-based fellowship awarded to first-year doctoral students ($18,800)

2023 **POSCO Asia Fellowship, South Korea**
Next Generation Global Leaders program fostering Asian-Korean STEM initiatives (Full funding)

2021 **KIST-KT&G Global Scholarship Foundation, South Korea**
Recognition for excellence in advancing global science and technology research (1M KRW)

2020 **II Place, XV International Scientific Conference for Students and Young Scientists**
Awarded for presenting the paper in applied mathematics and computational methods

2019 **Sur–Place Konrad Adenauer Foundation Scholarship, Germany**
Awarded to promising future leaders in academic excellence with societal impact (∼800 EUR)

2018 **ITEC Programme Scholarship, Government of India**
Selected for bilateral partnership program fostering India-Kazakhstan technical exchange (Full funding)

2018 **Merit-Based Scholarship, ENU, Kazakhstan**
Awarded 7 times to top-performing students in the Department of Mechanics and Mathematics

2017 **Foundation of the First President of Kazakhstan Scholarship**
Awarded for academic excellence and leadership in research/community activities

2017 **Award of High-quality Performance, NU, Kazakhstan**
Summer School on "Mathematical Methods in Science and Technology"

PUBLICATIONS

(* indicates equal contribution)

Under Review [I]

[I1] Zhu R.-J.*, Peng T.*, Cheng T.*, Qu X.*, ..., **Kembay A.**, ..., Eshraghian J. (2025). "A Survey on Latent Reasoning." Under review.

[I2] Tian Y., **Kembay A.**, Truong N.D., Eshraghian J.K., Kavehei O. (2025). "Beyond Pairwise Plasticity: Group-Level Spike Synchrony Facilitates Efficient Learning in Spiking Neural Networks." Under review.

[I3] Gunasekaran S., **Kembay A.**, et al. (2024). "Future-Guided Learning: A Predictive Approach to Enhance Time-Series Forecasting." Under major revision at ***Nature Communications***.

Conference and Workshop Papers [C]

[C1] **Kembay A.***, Aguilar K.*, Eshraghian J. (2025). "A Quantitative Analysis of Catastrophic Forgetting in Quantized Spiking Neural Networks." DAC Young Fellows Poster Presentation, 62nd ACM/IEEE Design Automation Conference (**DAC 2025**).

[C2] **Kembay A.***, Aguilar K.*, Eshraghian J. (2025). "A Quantitative Analysis of Catastrophic Forgetting in Quantized Spiking Neural Networks." IEEE International Symposium on Circuits and Systems (**ISCAS 2025**). [paper] [poster]

[C3] **Kembay A.**, Zhu R.-J., Kuipers N., Eshraghian J., Josephson C. (2024). "Leveraging Spiking Neural Networks for Solar Energy Prediction in Agriculture." Bay Area Machine Learning Symposium (**BayLearn 2024**). [paper] [code] [poster]

[C4] Kim Sch., Lee Ch., Lee B., Seol D., Kim D., **Kembay A.**, Yun K., Jang S., Lee J. (2021). "Simulation Web Platform for the Electro-Chemical Oxygen Reduction Reaction." International Workshop on Computational Nanotechnology (**IWCN 2021**), Oral. [paper] [Project Page] [Platform Showcase] [video]

[C5] Kim Sch., Kim D., **Kembay A.**, Kim S., Yun K., et al. (2021). "Web Platforms for Conventional Simulations of Matters." Korean Physical Society Spring Meeting (**KPS**), Oral. [paper] [video]

[C6] Kim S., **Kembay A.**, Lee J., et al. (2021). "A Simulation Web Platform for Analyzing Electronic Structures of Semiconductors." Korean Physical Society Spring Meeting (**KPS**). [paper] [video]

[C7] **Kembay A.**, Mukanova B. (2020). "The Study of the Properties of the Reflected Signals According to the GPR ZOND-12e." International Scientific Conference on Theoretical and Applied Questions of Mathematics, Mechanics and Computer Science, **Best Presentation Award**.

Journal Articles [J]

[J1] **Kembay A.**, Kim S. (2022). "Frameworks that Integrate Spiking Neural Networks: A Review." *The Journal of Korean Institute of Next Generation Computing*, vol. 18, no. 6, pp. 93–105.

[J2] Mukanova B., Iskakov K., **Kembay A.**, Boranbaev S. (2020). "Inverse Source Identification Problem for the Wave Equation: An Application for Interpreting GPR Data." *Eurasian Journal of Mathematical and Computer Applications*, pp. 78–91.

PATENTS

Electronic Structure Calculation Web-Program, Korea Institute of Science and Technology.
Inventors: Kim Sch., **Kembay A.**, Kim S. (20% share each)
[Project Page] [Platform Showcase]

RESEARCH EXPERIENCE

Graduate Student Researcher — **Santa Cruz, CA**
University of California, Santa Cruz — Oct 2023 - Present

- Developed new Knowledge Distillation techniques with top-K guided transfer, achieving +5.44% on CIFAR-100, +3.57% on ImageNet-1K, and surpassing state-of-the-art KD methods by +1.47%.
- Analyzed Quantized Spiking Neural Networks' role in mitigating catastrophic forgetting through sparse activations.
- Designed Adaptive Threshold Integrate-and-Fire neuron in silicon through TinyTapeout 05.

Research Scientist Intern — **Seoul, South Korea**
Korea University Medicine — Apr 2023 - Sep 2023

- Improved wireless brain chip with optimized data transfer algorithms
- Developed signal processing unit and communication module

Research Assistant — **Seoul, South Korea**
Artificial Intelligence Research Group, Korea Institute of Science and Technology (KIST) — Sep 2020 - Mar 2023

- Developed inversion techniques for Spiking Neural Network models to enable data-free knowledge transfer using batch normalization statistics, facilitating efficient training of neuromorphic systems without original datasets.

Research Intern — **Seoul, South Korea**
Computational Science Research Center, KIST — Mar 2020 - Aug 2020

- Developed a thematic web platform for quantum dots that provides functionalities to simulate photo-luminescence, electronic and atomic structures, and chemical stability.
- Designed algorithm for determining dimensions of materials & middle point of vacuum, positional map (LDOS-map) calculation.

TEACHING EXPERIENCE

Teaching Assistant, ECE 173: High-Speed Digital Design, UC Santa Cruz — **Spring 2025**

PROFESSIONAL SERVICES

Reviewer for the following venues:

2024 NeuroAI @ Neural Information Processing System (NeurIPS)
2024/25 APL Machine Learning
2024/25 IEEE International Symposium on Circuits and Systems (ISCAS)
2025 IEEE Transactions on Cognitive and Developmental Systems (TCDS)

MENTORSHIP

Mentored 2 undergraduate research students at UCSC.

Mentored Kazakh/Central Asian students (15+) by raising awareness and providing information about grad school in the US /Europe. Mentees have successfully secured prestigious multi-year awards, such as the Graduate Presidential Fellowship (4yr) and the DAAD Scholarship, and gained admission to fully-funded Ph.D. programs at institutions such as Columbia University.

SKILLS

Programming Python, Matlab, SQL (MongoDB), Maple, JavaScript, HTML, PyTorch, scikit-learn, pandas, numpy, etc.
Frameworks snnTorch, SpikingJelly, Norse, Brian2
Languages Kazakh (native), English (fluent), Russian (advanced), Korean (TOPIK-II)