

Assel Kembay

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EDUCATION

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| University of California, Santa Cruz Ph.D. in Electrical and Computer Engineering GPA: 3.95/4.00 Area of Study: Brain-inspired AI/ML, energy-efficient AI systems <i>Advisor: Prof. Jason Eshraghian</i> | Santa Cruz, CA, USA Jun 2027 (expected) |
| University of Science and Technology M.S. in AI - Robotics GPA: 4.43/4.50 <i>Thesis: "Inversion of Spiking Neural Networks, with application to Knowledge Distillation"</i> | Seoul, South Korea |
| C-DAC's Advanced Computing Training School Postgraduate Diploma in Advanced Computing | Pune, India |
| L.N. Gumilyov Eurasian National University B.S. in Mathematical and Comp. Modeling (summa cum laude) GPA: 3.86/4.00 | Astana, Kazakhstan |

AWARDS & HONORS

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| 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**).

[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**).

[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.

[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.

[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**).

[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

The electronic structure calculation web-program Kim Sch., **Kembay A.**, Kim S. share 20%, applied, [Link to the Project](#).

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:

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| 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

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|--------------------|--|
| 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) |