

# Assel Kembay

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## EDUCATION

<b>University of California, Santa Cruz</b> 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>	<b>Santa Cruz, CA, USA</b> Jun 2027 (expected)
<b>University of Science and Technology</b> M.S. in AI - Robotics   GPA: 4.43/4.50 <i>Thesis: "Inversion of Spiking Neural Networks, with application to Knowledge Distillation"</i>	<b>Seoul, South Korea</b>
<b>C-DAC's Advanced Computing Training School</b> Exchange Student, Advanced Computing	<b>Pune, India</b>
<b>L.N. Gumilyov Eurasian National University</b> B.S. in Mathematical and Comp. Modeling (summa cum laude)   GPA: 3.86/4.00	<b>Astana, Kazakhstan</b>

## AWARDS & HONORS

<b>2025</b>	<b>DAC 2025 Young Fellow, Design Automation Conference, San Francisco, USA</b> 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.
<b>2025</b>	<b>IEEE WIE Student Scholarship, International Leadership Conference 2025, San Jose, USA</b> 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.
<b>2025</b>	<b>DEI Research and Travel Award, UC Santa Cruz, USA</b> Award supporting graduate students' research and travel expenses in recognition of contributions to DEI (\$500)
<b>2023</b>	<b>Divisional MIP Fellowship, UC Santa Cruz, USA</b> Merit-based fellowship awarded to first-year doctoral students (\$18,800)
<b>2023</b>	<b>POSCO Asia Fellowship, South Korea</b> Next Generation Global Leaders program fostering Asian-Korean STEM initiatives (Full funding)
<b>2021</b>	<b>KIST-KT&amp;G Global Scholarship Foundation, South Korea</b> Recognition for excellence in advancing global science and technology research (1M KRW)
<b>2020</b>	<b>II Place, XV International Scientific Conference for Students and Young Scientists</b> Awarded for presenting the paper in applied mathematics and computational methods
<b>2019</b>	<b>Sur-Place Konrad Adenauer Foundation Scholarship, Germany</b> Awarded to promising future leaders in academic excellence with societal impact (~800 EUR)
<b>2018</b>	<b>ITEC Programme Scholarship, Government of India</b> Selected for bilateral partnership program fostering India-Kazakhstan technical exchange (Full funding)
<b>2018</b>	<b>Merit-Based Scholarship, ENU, Kazakhstan</b> Awarded 7 times to top-performing students in the Department of Mechanics and Mathematics
<b>2017</b>	<b>Foundation of the First President of Kazakhstan Scholarship</b> Awarded for academic excellence and leadership in research/community activities
<b>2017</b>	<b>Award of High-quality Performance, NU, Kazakhstan</b> 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

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- 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

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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)