

EDUCATION

University of California, San Diego

PhD Candidate, Biochemistry and Molecular Biophysics; GPA: 4.00/4.00

La Jolla, CA

Aug. 2022 – Present

- Master of Science awarded en route to PhD, Mar. 2024

Pomona College

Bachelor of Arts in Chemistry, *magna cum laude*; GPA: 3.99/4.00

Claremont, CA

Aug. 2018 – May 2022

RESEARCH EXPERIENCE

University of California, San Diego

Graduate Student Researcher; Advised by Wei Wang

La Jolla, CA

Jan. 2023 – Present

- Developing **forge**, a 531M parameter latent-flow matching model for sequence-based binder design. Trained on ~10M protein interactions, rather than complex structures, to learn from diverse interactions.
- Applied **Raygun**, a generative model for protein design, to design an EGFR-binding protein with **67% stronger affinity** than native EGF in the Adaptyv Bio binder design competition.
- Developed **TUnA**, a transformer-based model for state-of-the-art sequence-based protein-protein interaction prediction. Incorporates uncertainty-awareness to help rank candidates for experimental validation.
- Conducted a large-scale evaluation of six protein language models across six tasks (**1,980 trained models**). Highlighted the limits of current representation transfer and proposed a scalable strategy for embedding fusion.

Pomona College

Undergraduate Researcher; Advised by Roberto Garza-Lopez

Claremont, CA

Sept. 2019 – May 2022

- Investigated natural product candidates as SARS-CoV-2 main protease inhibitors using molecular docking and molecular dynamics simulations; identified several promising molecules for further experimental evaluation.

PUBLICATIONS AND PREPRINTS

K. Devkota, D. Shonai, J. Mao, **Y.S. Ko**, W. Wang, S. Soderling, R. Singh. *Miniaturizing, Modifying, and Magnifying Nature's Proteins with Raygun*. **bioRxiv preprint**, 2025.

J. Parkinson, R. Hard, **Y.S. Ko**, W. Wang. *RESP2: An uncertainty-aware multi-target multi-property optimization AI pipeline for antibody discovery*. **Advanced Science**, 2025.

L. Zhang, H. Guo, L. Schaffer, **Y.S. Ko**, D. Singh, H. Rahmani, D. Grotjahn, E. Villa, M. Gilson, W. Wang, T. Ideker, E. Xing, P. Xie. *ProteinAligner: A Multi-modal Pretraining Framework for Protein Foundation Models*. **bioRxiv preprint**, 2024.

Y.S. Ko, J. Parkinson, W. Wang. *Benchmarking text-integrated protein language model embeddings and embedding fusion on diverse downstream tasks*. **bioRxiv preprint**, 2024.

Y.S. Ko, J. Parkinson, C. Liu, W. Wang. *TUnA: an uncertainty-aware transformer model for sequence-based protein-protein interaction prediction*. **Briefings in Bioinformatics**, 2024.

PRESENTATIONS

Poster (Upcoming): *forge: sequence-based binder design with latent flow matching*. **Machine Learning in Structural Biology (MLSB)**, San Diego, USA, December 2025.

Poster and Lightning Talk: *Advancing the embedding transfer paradigm: benchmarking text-integrated protein language models and embedding fusion*. **RECOMB**, Seoul, South Korea, April 2025.

Poster: *Benchmarking text-integrated protein language model embeddings and embedding fusion on diverse downstream tasks*. **Machine Learning in Structural Biology (MLSB) Workshop at NeurIPS**, Vancouver, Canada, December 2024.

AWARDS

- 2024-2025 Distinguished Graduate Student Fellowship**, University of California, San Diego 2025
– Awarded for research excellence; includes full fellowship support for one quarter and a \$3,000 research stipend.
- The John Stauffer Scholarship for Academic Merit**, Pomona College 2022
– \$12,000 scholarship awarded to one senior annually in the natural sciences who exhibits the highest academic promise.
- The Frank Parkhurst Brackett, Jr., and Davida Wark Brackett Prize**, Pomona College 2022
– Awarded to a student as an incentive to excellence in advancing the study of chemistry.
- Undergraduate Award in Physical Chemistry**, American Chemical Society 2022
– To recognize outstanding achievement by undergraduate students in physical chemistry and to encourage further pursuits in the field.
- Phi Beta Kappa Award**, Pomona College 2022
– \$2,750 award endowed by the Pomona Chapter of Phi Beta Kappa to a senior who is selected for high quality of scholarship and promise of future distinction.

TEACHING

- Teaching Assistant** Applied Bioinformatics (CHEM280), UC San Diego Winter 2024
– Delivered lectures on deep learning for protein–drug interaction prediction, and designed hands-on programming assignments for graduate students.
- Teaching Assistant** General Chemistry Laboratory (CHEM7L), UC San Diego Winter 2023, Spring 2023
– Led weekly lab sections for 20 undergraduates, emphasizing lab safety, experimental design, data analysis, and scientific writing; guided students through five foundational chemistry experiments.
- Teaching Assistant** Chemical Thinking (CHEM4), UC San Diego Fall 2022
– Facilitated three 50-minute discussion sections per week; reinforced conceptual understanding and graded assessments.
- Mentor/Grader** General Chemistry (CHEM1A/B), Pomona College Spring 2020 - Spring 2022
– Led weekly problem-solving sessions for 20–30 students; created tailored review materials, graded assignments, and provided individualized exam prep based on student feedback.
- Teaching Assistant** Pomona College Academy for Youth Success Summer 2020; Summer 2021
– Instructed 6 high school students from underrepresented backgrounds during an intensive 4-week summer program; introduced the fundamentals of computational chemistry research and guided students to complete a capstone research poster presentation.

ACADEMIC SERVICE

- Reviewer:** NeurIPS Workshop on Machine Learning for Structural Biology (MLSB), OUP Bioinformatics