

Daoyi Li

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EDUCATION

Uppsala University

Uppsala, Sweden

B.S. in Program of Biology

2016-2017

- Cumulative GPA 4/5

Shandong University

Jinan, China

B.S. in Biological Science (Honor Class of Taishan college)

2014-2018

- Cumulative GPA 3.93/4 (WES), 88.99/100

Purdue University

West Lafayette, USA

Ph.D. Candidate in the branch of Structural and Computational biology

2019 -present

Research experience

Research assistant (PHD research)

2019-present

Department of Biological Science, Purdue University

supervisor: Wen Jiang

Designing the deep learning method to resolve the heterogeneity of the helical cryoEM image

- Apply different language models (transformer, n-gram) to cluster different helical cryoEM image after 2D classification.
- Using contrast learning scheme to utilize the prior information of helical image.

Designing the methods to reconstruct helical structures and estimating the helical parameters

- Incorporating the neural field and linear regression model to reconstruct the helical structures from single 2D helical image
- Exploring the positional data to estimate the helical parameters of the helical structure.

Curating the parameter in the EMDB database

- Designing a systematic pipeline to estimate the helical parameters on the EMDB database

Help building CryoVR—a virtual reality training system for hands-on operation.

- Building 3D model for the VR environment.
- Designing the algorithm for detecting the wrong steps in the process of VR operation.

Resolving the amyloid structure

- Developed a pipeline for estimating the prior information for helical reconstruction
- Familiar with the process of helical reconstruction in the Relion and cryosparc
- Understand the process of amyloid structure determination.

CryoEM machine learning intern

2023 summer

Genentech

supervisor: Dmitry Tegunov

Designing the deep learning method to generate the 3D density from few 2D class average

- Use contrastive learning to train in plane rotation invariant neural network.
- Train the 3D VAE and 2D VAE to encode the 3D density in the EMDB
- Use the transformer to align the 3D VAE network and 2D VAE network

Research assistant

2018-2019

Department of Biological Science, Purdue University

supervisor: Mohamed N. Seleem

Drug discovery for the antimicrobial resistance bacteria

- Conducted systematic testing of compounds from the drug bank to identify top candidate molecules for therapeutic applications.

Undergraduate research assistant

2014-2018

Department of Biological Science, Shandong University

Department of Biology, Uppsala University

- Designing the mRNA probe to target the migration of the mRNA for the embryo
- Conducted point mutations on proteins, expressed and purified functional proteins, and analyzed their activity the effect of certain amino acid on the protein pocket

Publication since PhD

In preparation:

Li, D., Zhang, X., Jiang, W. Helicon: Estimating the initial density and helical parameter for helical reconstruction from the image and position information of the 2D classification. (Finish writing, doing proofreading)

Li, D., Munoz Perez, M., Zhang, X., Li, J., Jiang, W. Curating the helical parameter of the structure in EMDB (Writing)

Publication:

Hoq, M.R., Fernandez, A., Vago, F.S., Hallinan, G.I., Bharath, S.R., **Li, D.**, Ozcan, K.A., Garringer, H.J., Jiang, W., Vidal, R. and Ghetti, B., 2024. Cryo-EM structures of cotton wool plaques' amyloid β and of tau filaments in dominantly inherited Alzheimer disease. *Acta Neuropathologica*, 148(1), p.20.

Fernandez, A., Hoq, M.R., Hallinan, G.I., **Li, D.**, Bharath, S.R., Vago, F.S., Zhang, X., Ozcan, K.A., Newell, K.L., Garringer, H.J. and Jiang, W., 2024. Cryo-EM structures of amyloid- β and tau filaments in Down syndrome. *Nature Structural & Molecular Biology*, pp.1-7.

Li, D., & Jiang, W. (2023). Classification of helical polymers with deep-learning language models. *Journal of Structural Biology*, 108041.

Zhang, X., Bharath, S. R., **Li, D.**, & Jiang, W. (2023). Maximize Access to Cryo-EM Learning and Research Tools with Web Apps.

Hoq, M.R., Bharath, S.R., Hallinan, G.I., Fernandez, A., Vago, F.S., Ozcan, K.A., **Li, D.**, Garringer, H.J., Vidal, R., Ghetti, B. and Jiang, W., 2023. Cross- β helical filaments of Tau and TMEM106B in Gray and White Matter of Multiple System Tauopathy with presenile Dementia. *Acta Neuropathologica*, 145(5), pp.707-710.

Hallinan, G.I., Ozcan, K.A., Hoq, M.R., Cracco, L., Vago, F.S., Bharath, S.R., **Li, D.**, Jacobsen, M., Doud, E.H., Mosley, A.L. and Fernandez, A., 2022. Cryo-EM structures of prion protein filaments from Gerstmann–Sträussler–Scheinker disease. *Acta Neuropathologica*, 144(3), pp.509-520.

Dong, J., **Li, D.**, Ozcan, K., Wan, D., Jiang, W., & Chen, Y. (2022). Development of CryoVR, a virtual reality training system for hands-on cryoEM operations. *Acta Crystallographica Section D: Structural Biology*, 78(7).

González, B., Li, D., Li, K., Wright, E.T., Hardies, S.C., Thomas, J.A., Serwer, P. and Jiang, W., 2021. Structural studies of the phage G tail demonstrate an atypical tail contraction. *Viruses*, 13(10), p.2094.

LANGUAGES/SKILLS

- Languages: Chinese (Native), English (Fluent)
- Programming skills: Python, Pytorch, latex, C++ (intermediate, mostly in the unreal engine), R (intermediate)
- Software: Relion, cryosparc, EMAN, Wrap, Maya, Blender, Unreal Engine
- Wet lab skills: Protein engineering, Molecular Cloning, Protein Expression and Purification, molecular