Deepthi Bannai

Education

2022 – Present | Ph.D. in Neuroscience, University of California, Berkeley

2017 – 2021 | M.S. in Medical Sciences, Boston University
Research Thesis: *Retinal Cytoarchitectural Changes in Schizophrenia and Bipolar Disorder: A Meta-Analysis and Exploratory Study*

2013 – 2017 | B.S. in Biomedical Engineering and B.S.A. in Chemistry, The University of Texas at Austin
Minor: Philosophy

Relevant Skills

Programming Languages:
Proficient: MATLAB, R, Python/Pytorch
Familiar: C++

Clinical Software:
Proficient: REDCap, EPIC

Other Software:
Proficient: FMRIB Software Library (FSL), 3D Slicer, ImageJ, FreeSurfer
Familiar: Solidworks/COMSOL

Research Experience

June 2019 – July 2022 **Lizano Lab**

Clinical Research Assistant II, Lab Manager

Department of Psychiatry, Beth Israel Deaconess Medical Center, Harvard Medical School

- Train research students in programming languages (R, MATLAB) needed for projects
- Mentor graduate students during their master's thesis projects
- Coordinate recruitment, scheduling, data organization and analysis for 3 clinical studies

Project: Choroid plexus volume changes in individuals with genetic high-risk for psychosis

- Implemented Gaussian Mixture Model (Python) segmentation to compare to FreeSurfer calculations
- Established and trained team on manual segmentation protocol for choroid plexus maps (3D Slicer)
- Utilized manual segmentation maps to enhance algorithmic segmentation

Project: Retinal structural-vascular-functional relationships in schizophrenia

- Implementation of network analysis and canonical correspondence analysis (CCA) to analyze relationships between retinal structure and visuo-cortical pathway
- Expanded in-house image analysis pipeline to include choroidal vasculature processing

Project: Retinal layer, microvascular, and electroretinographic determinants of early-course schizophrenia

- Developed study protocols; set up and lead trainings for team of five research assistants/students
- Managed recruitment, scheduling, and running of study participants

08/18 – Present **Keshavan Neuroimaging Lab**

Graduate Student Research Intern

Department of Psychiatry, Beth Israel Deaconess Medical Center, Harvard Medical School

Project: Retinal biomarkers in schizophrenia and bipolar disorder

- Analyzed retinal structural differences across diagnostic groups
- Correlated retinal cytoarchitecture to clinical and cortical measures

Project: Meta-analysis of retinal cytoarchitectural changes in psychosis

- Demonstrated retinal differences across various studies in patients vs. controls
- Developed R Studio script for meta-analysis and meta-regression
- Collected and analyzed research articles

08/16 – 06/17 **Preston Neuroscience of Memory Lab**

Undergraduate Research Assistant

Department of Neuroscience and Psychology, The University of Texas at Austin

Project: Computational modelling of categorical learning with unsupervised machine learning

- Implemented SUSTAIN supervised learning model (Python) as an unsupervised learning task
- Set up and ran spatial categorization and cluster learning studies with participants

01/14 – 03/15 **Pierce-Shimomura Lab**

Undergraduate Research Assistant

Department of Neuroscience, The University of Texas at Austin

Project: Expressional changes of the big-potassium (BK Slo1) channel in *C. elegans* during varied alcohol environments

- Collected confocal microscope data and processed images via ImageJ
- Maintained and propagated *C. elegans* lines

Publications

* denotes co-first authorship

Pre-prints

[17] Lizano, P., Pong, S., Santarriaga, S., **Bannai, D.,** & Karmacharya, R. (2022). TNFα and MMP1 in brain microvascular endothelial cells regulate blood-brain barrier dysfunction in psychotic disorders.

Submitted Manuscripts

[19] **Bannai, D.,** Reuter, M., Hegde, R., Hoang, D., Adhan, I., Gandu, S., Pong, S., Zeng, A., Raymond, N., Zeng, V., Chung, Y., He, G., Sun, D., van Erp, T.G.M., Addington, J., Bearden, C.E., Cadenhead, K., Cornblatt, B., Mathalon, D.H., McGlashan, T., Jeffries, C., Stone, W., Tsuang, M., Walker, E., Woods, S.W., Cannon, T.D., Perkins, D., Keshavan, M., & Lizano, P. (2022). Linking Choroid Plexus Enlargement with

Plasma Analyte and Structural Phenotypes in Clinical High Risk for Psychosis: A Multisite Neuroimaging Study. ***Biological Psychiatry.***

[18] Sheehan, N., **Bannai, D.,** Silverstein, S.M., & Lizano, P. (2022) Neuroretinal Alterations in Schizophrenia and Bipolar Disorder: A Meta-Analysis. ***Biological Psychiatry.***

Accepted Manuscripts

[16] Zeng, R., Garg, I., **Bannai, D.,** Kasetty, M., Katz, R., Park, J.Y., Lizano, P., & Miller, J.B. (2022). Retinal microvasculature and vasoreactivity changes in hypertension using optical coherence tomography-angiography. *Graefe's Archive for Clinical and Experimental Ophthalmology 260 (11), 3505-3515. https://doi.org/10.1007/s00417-022-05706-6*

[15] Turkozer, H.B., Lizano, P., Adhan, I., Ivleva, E.I., Lutz, O., Zeng, V., Zeng, A., Raymond, N., **Bannai, D.,** Lee, A., Bishop, J.R., Clementz, B.A., Pearlson, G.D., Sweeney, J.A., Gershon, E.S., Keshavan, M.S., & Tamminga, C.A. (2022). Regional and Sex-Specific Alterations in the Visual Cortex of Individuals With Psychosis Spectrum Disorders. *Biological psychiatry 92 (5), 396-406. https://doi.org/10.1016/j.biopsych.2022.03.023*

[14] Hoang, D., Xu, Y., Lutz, O., **Bannai, D.,** Zeng, V., Bishop, J.R., Keshavan, M., & Lizano, P. (2022). Inflammatory subtypes in antipsychotic-naïve first-episode schizophrenia are associated with altered brain morphology and topological organization. *Brain, Behavior, and Immunity 100, 297-308. https://doi.org/10.1016/j.bbi.2021.11.019*

[13] Li, C.Y., Garg, I., **Bannai, D.,** Kasetty, M., Katz, R., Adhan, I., Douglas, K.A.A., Wang, J.C., Kim, L.A., Keshavan, M., Lizano, P., & Miller, J.B. (2022). Sex-Specific Changes in Choroid Vasculature Among Patients with Schizophrenia and Bipolar Disorder. *Clinical Ophthalmology, 2363-2371. https://doi.org/10.2147/OPTH.S352731*

[12] **Bannai, D.,** Adhan, I., Katz, R., Kim, L.A., Keshavan, M., Miller, J.B., & Lizano, P. (2022). Quantifying retinal microvascular morphology in schizophrenia using swept-source optical coherence tomography angiography. *Schizophrenia Bulletin 48 (1), 80-89. https://doi.org/10.1093/schbul/sbab111*

[11] Lai, M., Kelly, S., Hegde, R., **Bannai, D.**, Lizano, P., & Keshavan, M. Investigating sleep spindle density and schizophrenia: A meta-analysis. *Psychiatry Research 307, 114265. https://doi.org/10.1016/j.psychres.2021.114265*

[10] Gandu, S., **Bannai, D.,** Adhan, I., Kasetty, M., Katz, R., Zang, R., Lutz, O., Kim, L.A., Keshavan, M., Miller, J.B.*, & Lizano, P.* (2021). Inter-device reliability of swept source and spectral domain optical coherence tomography and retinal layer differences in schizophrenia. *Biomarkers in Neuropsychiatry 5, 100036. https://doi.org/10.1016/j.bionps.2021.100036*.

[9] Hegde, R.R., Guimond, S., **Bannai, D.**, Zeng, V., Padani, S., Thermenos, H.W., Eack, S.M., & Keshavan, M (2021). Theory of Mind Impairments in Schizophrenia: An fMRI Study. *Journal of Psychiatric Research 136, 236-243. https://doi.org/10.1016/j.jpsychires.2021.02.010*

[8] **Bannai, D.**, Lutz, O., & Lizano, P. (2020). Neuroimaging considerations when investigation choroid plexus morphology in idiopathic psychosis. *Schizophrenia Research. doi:10.1016/j.schres.2020.07.013*

[7] **Bannai, D.** & Lizano, P. (2020). Commentary: Identifying Retinal Layer Endophenotypes for Schizophrenia. *Schizophrenia Research, 220, 25-26. doi:10.1016/j.schres.2020.03.055*

[6] Adhan, I*., Lizano, P.*, **Bannai D.**, Lutz, O., Dhaliwal, K., Zeng, V., Miewald, J., Montrose D., & Keshavan M. (2020). Visual Cortical Alterations and their Association with Negative Symptoms in Antipsychotic-Naïve First Episode Psychosis. *Psychiatry Research, 288, 112957. doi:10.1016/j.psychres.2020.112957.*

[5] **Bannai, D.***, Lizano, P.*, Kasetty, M., Lutz, O., Zeng, V., Mothi, S., Kim, L.A., Hill, S., Tamminga, C., Clementz, B., Gershon, E., Pearlson, G., Miller, J.B., & Keshavan, M. (2020). Retinal layer abnormalities and their association with clinical and brain measures in psychotic disorders: A preliminary study. *Psychiatry Research: Neuroimaging, 299, 111061. doi:10.1016/j.pscychresns.2020.111061*

[4] Adhan, I., **Bannai, D.**, & Lizano, P. (2020). Commentary: Can Retinal Imaging Biomarkers Inform Psychosis Pathophysiology? *Schizophrenia Research, 215, 3-5. doi:10.1016/j.schres.2019.10.020*

[3] Alliey-Rodriguez, N., Grey, T.A., Shafee, R., Asif, H., Lutz, O., Bolo, N.R., Padmanabhan, J., Tandon, N., Klinger, M., Reis, K., Spring, J., Coppes, L., Zeng, V., Hegde, R.R., Hoang, D.T., **Bannai, D.**, Nawaz, U., Henson, P., Liu S., Gage, D., McCarroll, S., Bishop, J.R., Hill, S., Reilly, J.L., Lencer, R., Clementz, B.A., Buckley, P., Glahn, D.C., Meda, S.A., Narayan, B., Pearlson, G., Keshavan, M.S., Ivleva, E.I., Tamminga, C., Sweeney, J.A., Curtis, D., Badner, J.A., Keedy, S., Rapoport, J., Liu, C., & Gershon, E.S. (2019). NRXN1 is associated with enlargement of the temporal horns of the lateral ventricles in psychosis. *Translational Psychiatry*, *9(1), 230. doi:10.1038/s41398-019-0564-9*

[2] Lizano, P.*, **Bannai, D.***, Lutz O., Kim, L.A., Miller, J.B., & Keshavan M. (2019). A Meta-analysis of Retinal Cytoarchitectural Abnormalities in Schizophrenia and Bipolar Disorder. *Schizophrenia Bulletin, 46(1), 43-45. doi:10.1093/schbul/sbz029*

[1] Scott, L.L., Davis S.J., Yen, R.C., Ordemann, G.J., Nordquist, S.K., **Bannai, D.**, & Pierce, J.T. (2017). Behavioral Deficits in Following Withdrawal from Chronic Ethanol Are Influenced by SLO Channel Function in *Caenorhabditis elegans*. *Genetics, 206(3), 1445-1458*.

Posters and Presentations

[8] Turkozer, H.B., Lizano, P., **Bannai, D.,** & Silverstein, S.S. (2021). Window to the Mind: Clinical Implications of Visual System Impairment in Psychosis. *2021 American Psychological Association Virtual Conference.* ***Presentation***

[7] Shedding Light on Pathophysiologic Mechanisms in Schizophrenia and Bipolar Disorder Through Analysis of Retinal Structural-Vascular-Functional Relationships. *75th Society of Biological Psychiatry Conference.* New York City, NY, April 2020. ***Poster***

[6] Shedding Light on Pathophysiologic Mechanisms in Schizophrenia and Bipolar Disorder Through Analysis of Retinal Structural-Vascular-Functional Relationships. *Harvard Psychiatry Mysell Research Symposium*, Harvard Medical School. Boston, MA, April 2020. ***Poster***

[5] Retinal Cytoarchitectural Differences in Schizophrenia and Bipolar Disorder: A Meta-Analysis. *74th Society of Biological Society Conference.* Chicago, IL, May 2019. ***Poster***

[4] Examining Retinal Nerve Fiber Layer Thickness and Microvascular Abnormalities in Psychosis. *Harvard Catalyst Research Day*, Harvard Medical School, Boston. MA, May 2019. ***Poster***

[3] Retinal Cytoarchitectural Differences in Schizophrenia and Bipolar Disorder: A Meta-Analysis. *Harvard Psychiatry Mysell Research Symposium,* Harvard Medical School. Boston, MA, April 2019. ***Poster***

[2] Selective Attentional Effects on Hippocampal Categorical Representation. *Texas Biomedical Engineering Research Symposium*, The University of Texas at Austin. Austin, TX, May 2017. ***Poster***

[1] Selective Attentional Effects on Hippocampal Categorical Representation. *Texas Leadership Scholars Society Luncheon*, The University of Texas at Austin. Austin, TX, April 2017. ***Presentation***