# Daiyao Yi

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## RESEARCH INTERESTS & SKILLS

- **Deep Learning& Computer vision& Computational neuroscience**: Research and application of deep learning and computer vision techniques in understanding animal behaviors.
- **Technical Skills**: Python, C/C++, Tensorflow, Pytorch, Computer vision, Large Language Model, Generative model, Graph Neural Network, Optimization, data modeling and evaluation.
- **Soft Skills**: Communication and presentation, writing and figure design, collaboration.

## EDUCATION

- **Yale University**                                                                                                   New Haven, CT
  *Ph.D. candidate, Electrical Engineering (previously at University of Florida)*                    *May 2021 - Present*
  **Thesis topic:** *Behavioral modeling from high-dimensional video data for multi-subject and social behavior*
  **Advisory committee:** *Shreya Saxena*

- **University of Michigan**                                                                                        Ann Arbor, MI
  *Master in Biomedical Engineering; Concentration: Computational neuroscience; GPA: 3.83*        *Aug 2019 - Dec 2020*
- **University of Nottingham**                                                                                     Ningbo, China
  *BEng Hons in Electrical and Electronic Engineering; First Class; GPA: 4.00*                        *Sep 2015 - May 2019*

## PUBLICATIONS

### Selected Journal Articles

- **Yi, D.**, Zhang, X., Behdad, S., Saxena, S. 2023. Unsupervised Human Activity Recognition Learning for Disassembly Tasks. *IEEE Transactions on Industrial Informatics (Early Access).* 10.1109/TII.2023.3264284

- **Yi, D.**, Musall S., Churchland A., Padilla-Coreano N., Saxena S. 2023. Disentangled multi-subject and social behavioral representations through a constrained subspace variational autoencoder (CS-VAE), *eLife.* https://doi.org/10.7554/eLife.88602.1

- **Yi, D.**, Zhang H., Guan Y. 2021. Timesias: A machine learning pipeline for predicting outcomes from time-series clinical records,*STAR protocols* https://doi.org/10.1016/j.xpro.2021.100639

- Berryman D., Barrett J., Liu C., Maugee C., Waldbaum J., **Yi D.**, Xing H., Yokoi F., Saxena S., Li Y. 2023 Motor deficit and lack of overt dystonia in Dlx conditional Dyt1 knockout mice,*Behavioral Brain Research* 10.1016/j.bbr.2022.114221

- Guan Y., Wang X., Chen X., **Yi D.**, Chen L., Jiang X. 2021. Assessment of the timeliness and robustness for predicting adult sepsis,*iScience* https://doi.org/10.1016/j.isci.2021.102106

- An X., Chen X., **Yi D.**, Li H., Guan Y., 2022. Representation of molecules for drug response prediction,*Briefings in Bioinformatics* https://doi.org/10.1093/bib/bbab393

- Guan Y., Li H., **Yi D.**, Zhang D., Yin X., Li K., Zhang P 2021. A survival model generalized to regression learning algorithms,*Nature Computational Science* https://doi.org/10.1038/s43588-021-00083-2

### Conference Proceedings

- **Yi, D.**, Saxena, S. 2023. Neural Correlations across Mice during Spontaneous and Task-Related Behaviors*11th International IEEE EMBS Conference on Neural Engineering*10.1109/NER52421.2023.10123873

- **Yi, D.**, Saxena, S. 2022. "Modeling the behavior of multiple subjects using a Cauchy-Schwarz regularized Partitioned Subspace Variational AutoEncoder (CS-PS-VAE) *44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC).* 10.1109/EMBC48229.2022.9871466

## Experience

- **Saxena Lab, Yale University**  New Haven, CT
  *Research Assistant*  *May 2021 - Present*
  - **Multimodal Contrastive learning for Learning representations**: Refined and developed a model employing contrastive learning techniques to effectively ascertain and delineate the inter-modal congruence between behavioral images and corresponding neural activity patterns.
  - **Understand animals social interaction using Graph Neural Network**: Developed a GCN-based transformer to predict which body parts of the animals are likely to have interactions during the specific social tasks.
  - **Social behavior representation learning using vision transformer**: Created a semi-supervised vision transformer-based autoencoder to generate interpretable behavior embedding for different social behaviors.
  - **Human Activity Recognition using CNN+BiLSTM based variational autoencoder**: Created an unsupervised CNN+BiLSTM based variational autoencoder for learning representations and a state space model for activity state division.
  - **Multi-subject behavior Embedding using constrained subspace variational autoencoder**: Created a semi-supervised variational autoencoder with different constraints on different latent dimensions, proposed a new algorithm on separating different subjects.
  - **Learning the link between the behavior and the corresponding neural activities using Recurrent Neural Network**: Processed neural activity data using Low Pass Filter and Principal component analysis. Applied Canonical-Correlation Analysis to align the neural activities. Created a Recurrent Neural Network-based autoencoder to decode the behavior from the corresponding neural activities.

- **Guan Lab, University of Michigan, Ann Arbor**  Ann Arbor, MI
  *Research Assistant*  *January 2020 - May 2021*
  - **Learning Representation for molecules using basic machine learning methods and Graph Neural Network.**: Reviewed the papers for molecules learning representations.
  - **Protein secondary structure prediction using U-Net**: Applied 1D U-Net algorithm for protein secondary structure prediction from its primary structure.
  - **Disk failure prediction using complete rank and Recurrent Neural Network**: Applied Recurrent Neural Network and SOTA ranking methods to predict disk failure.

- **Chengbo Wang Lab, University of Nottingham Ningbo**  Ningbo, China
  *Undergraduate Research Assistant*  *July 2018 - May 2019*
  - **Sleep Quality Monitoring Application Development using Java and MySQL**: Developed an Android application and a wearable device to monitor human's physiological data. Analysis of the sleep quality on the cloud using MySQL.

## Invited Talks

- Workshop on Multi-Agent Behavior, **CVPR (2023)**. Hierarchical Characterization of Social Behavior Motifs using Semi-Supervised Autoencoders *Multi-Agent Behavior*https://sites.google.com/view/mabe23/accepted-papers?authuser=0

- Workshop **neuromatch-5.0 (2022)**. Disentangled multi-subject and social behavioral representations through a constrained subspace variational autoencoder (CS-VAE) *Neuromatch*.https://www.world-wide.org/neuromatch-5.0/disentangled-multi-subject-social-behavioral-f5f5c76d/

## Services

- **Reviewer:** Cell Reports, Conference on Neural Information Processing Systems (Neurips) Workshop, International Conference on Learning Representations (ICRL) Workshop

## Awards

- Excellent Student Cadre, University of Nottingham  *2018*

- Undergraduate student summer research grant, University of Nottingham  *2018*

- College funded overseas summer school program, University of Nijmegen  *2017*