Clayton W. Seitz, Ph.D.

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PERSONAL STATEMENT

I have a background in computer vision, machine learning, and mathematical physics. Recently, I have researched novel image/video generation methods based on diffusion models. I also specialize in image/video processing, object detection, segmentation, and object tracking. These methods were applied to microscopy in biological research.

EDUCATION

Doctor of Philosopy, Physics 2024
Purdue University

Master of Science, Physics 2021
University of Chicago

Bachelor of Science, Physics, Magna Cum Laude 2019
Indiana University
Minor: Mathematics

Bachelor of Science, Informatics (Math Focus), Magna Cum Laude 2019
Indiana University

EXPERIENCE

Graduate Researcher 2021-2024
Purdue University, Indianapolis, IN

- Designed diffusion models/score-based generative models and general computer vision techniques (object detection, segmentation, etc.) in PyTorch for modeling image datasets in super-resolution microscopy
- Applied deep neural networks for three dimensional reconstruction of objects
- Explored text to video diffusion models for physically realistic video generation
- Applied general probabilistic models for high-dimensional imaging datasets and associated Bayesian methods for statistical inference tasks

Graduate Researcher 2020-2021
University of Chicago, Chicago, IL

- Investigated fundamental learning mechanisms in recurrent neural networks (RNNs) using dynamical models, mean-field theory, and time-series analysis.
- Designed and ran Monte Carlo simulations of spiking neural networks

Research Assistant 2018-2020
Purdue University, Indianapolis, IN

- Developed a scientific package in Python for high-throughput object detection and tracking
- Managed the package lifecycle and user training throughout the laboratory

AWARDS

NIH Graduate Training Fellowship 2020
University of Chicago, Chicago, IL

Travel Award and Lightning Talk Invitation 2019
Physical Sciences in Oncology - Minneapolis, MN

Hudson and Holland Scholarship for Diversity and Inclusion 2013-2017
Indiana University, Bloomington, IN

Founders Scholar 2013-2017
Indiana University, Bloomington, IN

Cigital Scholarship 2016-2017
Indiana University, Bloomington, IN

PUBLICATIONS

Clayton Seitz†, Donghong Fu†, Mengyuan Liu, Hailan Ma, and Jing Liu. *BRD4 phosphorylation regulates the structure of chromatin nanodomains.* Physical Review Letters (In Review). https://doi.org/10.1101/2024.09.03.611057. 2024

Clayton Seitz and Jing Liu. *Uncertainty-aware localization microscopy by variational diffusion.* In Review. 2024

Clayton Seitz and Jing Liu. *Quantum enhanced localization microscopy with a single photon avalanche diode array.* In Review. 2024

Maelle Locatelli†, Josh Lawrimore†, Hua Lin†, Sarvath Sanaullah, **Clayton Seitz**, Dave Segall, Paul Kefer, Salvador Moreno Naike, Benton Lietz, Rebecca Anderson, Julia Holmes, Chongli Yuan, George Holzwarth, Bloom Kerry, Jing Liu, Keith D Bonin, Pierre-Alexandre Vidi. *DNA damage reduces heterogeneity and coherence of chromatin motions.* PNAS 12 July 2022; 119 (29): 1-11

Mengdi Zhang, **Clayton Seitz**, Garrick Chang, Fadil Iqbal, Hua Lin, and Jing Liu *A guide for single-particle chromatin tracking in live cell nuclei.* Cell Biology International 15 January 2022; 46 (5): 683-700

Wenting Wu, Farooq Syed, Edward Simpson, Chih-Chun Lee, Jing Liu, Garrick Chang, Chuanpeng Dong, **Clayton Seitz**, Decio L. Eizirik, Raghavendra G. Mirmira, Yunlong Liu, Carmella Evans-Molina; *Impact of Proinflammatory Cytokines on Alternative Splicing Patterns in Human Islets.* Diabetes 25 October 2021; 71 (1): 116–127

Clayton Seitz, Hailan Ma, and Jing Liu. *Cytokine-induced transcriptional memory is evident in the kinetics of transcriptional bursts.* Biophysical Society Annual Conference 2022

Clayton Seitz, Hua Lin, Keith Bonin, Pierre-Alexandre Vidi, and Jing Liu. *Quantifying the spatiotemporal dynamics of dUTP labeled chromatin during the DNA damage response.* Biophysical Society Annual Conference 2020

SOFTWARE SKILLS

Programming Languages & Software: Linux, Bash, Python, R, PyTorch, C/C++, SQL, LaTeX, Git, Docker, SLURM, AWS