

# 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 have been applied to microscopy in biological research.

## EDUCATION

**Doctor of Philosophy, 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 general computer vision algorithms for object detection/tracking, segmentation, etc. in PyTorch
- Designed diffusion models/score-based generative models, GANs, for modeling image datasets in super-resolution microscopy
- Deployed tracking algorithms for microscopy automation with real-time feedback
- Applied deep neural networks for three dimensional reconstruction of objects
- 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	<i>NIH Graduate Training Fellowship</i> University of Chicago, Chicago, IL	2020
	<i>Travel Award and Lightning Talk Invitation</i> Physical Sciences in Oncology - Minneapolis, MN	2019
	<i>Hudson and Holland Scholarship for Diversity and Inclusion</i> Indiana University, Bloomington, IN	2013-2017
	<i>Founders Scholar</i> Indiana University, Bloomington, IN	2013-2017
	<i>Cigital Scholarship</i> Indiana University, Bloomington, IN	2016-2017
PUBLICATIONS	<b>Clayton Seitz</b> <sup>†</sup> , Donghong Fu <sup>†</sup> , Mengyuan Liu, Hailan Ma, and Jing Liu. <i>BRD4 phosphorylation regulates the structure of chromatin nanodomains</i> . Physical Review Letters (In Review). <a href="https://doi.org/10.1101/2024.09.03.611057">https://doi.org/10.1101/2024.09.03.611057</a> . 2024	
	<b>Clayton Seitz</b> and Jing Liu. <i>Uncertainty-aware localization microscopy by variational diffusion</i> . In Review. 2024	
	<b>Clayton Seitz</b> and Jing Liu. <i>Quantum enhanced localization microscopy with a single photon avalanche diode array</i> . In Review. 2024	
	Maelle Locatelli <sup>†</sup> , Josh Lawrimore <sup>†</sup> , Hua Lin <sup>†</sup> , Sarvath Sanaullah, <b>Clayton Seitz</b> , 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. <i>DNA damage reduces heterogeneity and coherence of chromatin motions</i> . PNAS 12 July 2022; 119 (29): 1-11	
	Mengdi Zhang, <b>Clayton Seitz</b> , Garrick Chang, Fadil Iqbal, Hua Lin, and Jing Liu. <i>A guide for single-particle chromatin tracking in live cell nuclei</i> . 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, <b>Clayton Seitz</b> , Decio L. Eizirik, Raghavendra G. Mirmira, Yunlong Liu, Carmella Evans-Molina; <i>Impact of Proinflammatory Cytokines on Alternative Splicing Patterns in Human Islets</i> . Diabetes 25 October 2021; 71 (1): 116-127	
	<b>Clayton Seitz</b> , Hailan Ma, and Jing Liu. <i>Cytokine-induced transcriptional memory is evident in the kinetics of transcriptional bursts</i> . Biophysical Society Annual Conference 2022	
SOFTWARE SKILLS	<b>Clayton Seitz</b> , Hua Lin, Keith Bonin, Pierre-Alexandre Vidi, and Jing Liu. <i>Quantifying the spatiotemporal dynamics of dUTP labeled chromatin during the DNA damage response</i> . Biophysical Society Annual Conference 2020	
	Programming Languages & Software: Linux, Bash, Python, R, PyTorch, C/C++, SQL, LaTeX, Git, Docker, SLURM, AWS	