NICK KONZ

Email: nicholas (dot) konz (at) duke (dot) edu

Website: nickk124.github.io *Github:* github.com/nickk124 *Linkedin:* nick-konz-247988168

EDUCATION

Duke University | Durham, NC *Expected December 2025*
Ph.D. in Electrical and Computer Engineering (Machine Learning Specialty) *Cumulative GPA: 3.875/4.000*

University of North Carolina | Chapel Hill, NC *Graduated May 2020*
B.S. in Astrophysics and B.A. in Mathematics *Cumulative GPA: 3.914/4.000* *Earl Nelson Mitchell Scholar in Physics*
Honors: *Highest Honors and Highest Distinction* *Phi Beta Kappa* *Honors College Member*

RESEARCH EXPERIENCE

Mazurowski Lab | Duke University | Durham, NC *2021 - PRESENT*
Graduate Research Assistant
Ph.D. research in deep learning with a focus on medical image analysis. Specific fields include domain adaptation, image-to-image translation and generative models, anomaly detection, and others.

Math, Stats and Data Science Group | Pacific Northwest National Lab | Richland, WA *2023*
Summer Research Intern
Research in ML robustness and interpretability.

Reichart Lab/Skynet Robotic Telescope Network | UNC Dept. of Physics and Astronomy | Chapel Hill, NC *2017 - 2020*
Research Assistant
Undergraduate research and thesis work of statistical computational methods for astronomy.
Robert Shelton Award for Outstanding Research (2019) *NC Space Summer Research Grant (NASA) (2019)*

PUBLICATIONS

Conferences and Workshops

1. **Konz, N.**, Mazurowski, M. A. "Pre-processing and Compression: Understanding Hidden Representation Refinement Across Imaging Domains via Intrinsic Dimension". *Advances in Neural Information Processing Systems* ***(NeurIPS): Workshop on Scientific Methods for Understanding Deep Learning***, **2024**.
2. **Konz, N.**, Chen, Y., Gu, H., Dong, H., Mazurowski, M. A. "Anatomically-Controllable Medical Image Generation with Segmentation-Guided Diffusion Models". *The International Conference of Medical Image Computing and Computer Assisted Intervention* ***(MICCAI)***, **2024**.
3. Dong, H., **Konz, N.**, Gu, H., Mazurowski, M. A. "Medical Image Segmentation with InTEnt: Integrated Entropy Weighting for Single Image Test-Time Adaptation". *IEEE/CVF Conference on Computer Vision and Pattern Recognition* ***(CVPR): Workshop on Domain Adaptation, Explainability, Fairness in AI for Medical Image Analysis (oral)***, **2024**.
4. **Konz, N.**, Mazurowski, M. A. "The Effect of Intrinsic Dataset Properties on Generalization: Unraveling Learning Differences Between Natural and Medical Images". *The International Conference on Learning Representations* ***(ICLR)***, **2024**.
5. **Konz, N.**, Chen, Y., Gu, H., Dong, H., Mazurowski, M. A. "Rethinking Perceptual Metrics for Medical Image Translation". *Medical Imaging with Deep Learning* ***(MIDL) (short paper)***, **2024**.
6. **Konz, N.**, Godfrey, C., Shapiro, M., Tu, J., Kvinge, H., Brown, D. "Attributing Learned Concepts in Neural Networks to Training Data". *Advances in Neural Information Processing Systems* ***(NeurIPS): Attributing Model Behavior at Scale (oral)***, **2023**.
7. Brown, D., Godfrey, C., **Konz, N.**, Tu, J., Kvinge, H. "Understanding the Inner-workings of Language Models Through Representation Dissimilarity". *Conference on Empirical Methods in Natural Language Processing* ***(EMNLP)***, **2023**.
8. **Konz, N.** and Mazurowski, M. A. "Reverse Engineering Breast MRIs: Predicting Acquisition Parameters Directly from Images". *Medical Imaging with Deep Learning* ***(MIDL)***, **2023**.
9. **Konz, N.**, Gu, H., Dong, H., Mazurowski, M. A. "The Intrinsic Manifolds of Radiological Images and their Role in Deep Learning". *The International Conference of Medical Image Computing and Computer Assisted Intervention* ***(MICCAI)***, **2022**.
10. Zhang, Y., Dong, H., **Konz, N.**, Gu, H., Mazurowski, M. A. "Lightweight transformer backbone for medical object detection". *The International Conference of Medical Image Computing and Computer Assisted Intervention* ***(MICCAI): Workshop on Cancer Prevention through Early Detection***, **2022**.

Journals

1. Mazurowski, M. A., Dong, H., Gu, H., Yang, J., **Konz, N.**, Zhang, Y. "Segment anything model for medical image analysis: an experimental study". ***Medical Image Analysis***, **2023**.
2. Dong, H., Zhang, Y., Gu, H., **Konz, N.**, Zhang, Y., Mazurowski, M. A. (2023). "SWSSL: Sliding window-based self-supervised learning for anomaly detection in high-resolution images". ***IEEE Transactions on Medical Imaging***, **2023**.
3. **Konz, N.**, Dong, H. and Mazurowski, M. A. "Unsupervised anomaly localization in high-resolution breast scans using deep pluralistic image completion". ***Medical Image Analysis***, **2023**.
4. **Konz, N.***, Buda M.*, et al. "A Competition, Benchmark, Code and Data for Using Artificial Intelligence to Detect Lesions in Digital Breast Tomosynthesis". ***JAMA Network Open***, **2023**.
5. Cao, S., **Konz, N.**, Duncan, J., Mazurowski, M. A. "Deep learning for breast mri style transfer with limited training data". ***Journal of Digital Imaging***, **2023**.
6. Zhou, L., Zhang, L., **Konz, N.**. "Computer vision techniques in manufacturing". ***IEEE Transactions on Systems, Man, and Cybernetics: Systems***, **2022**.
7. Swiecicki, A., **Konz, N.**, Buda, M., Mazurowski, M. A. "A generative adversarial network-based abnormality detection using only normal images for model training with application to digital breast tomosynthesis". ***Scientific Reports***, **2021**.
8. Maples, M. P., Reichart, D. E., **Konz, N. C.**, Berger, T. A., Trotter, A. S., Martin, J. R., ... Salemi, C. P. "Robust chauvenet outlier rejection". ***The Astrophysical Journal Supplement Series***, **2018**.

PAPER REVIEWING EXPERIENCE

Conferences & Workshops

- ICLR *(International Conference on Learning Representations)*, 2025
- CVPR *(IEEE/CVF Conference on Computer Vision and Pattern Recognition)*, 2025
- ECCV *(European Conference on Computer Vision)*, 2024
- MICCAI *(Medical Image Computing and Computer Assisted Intervention)*, 2024
- MIDL *(Medical Imaging with Deep Learning)*, 2025
- WACV *(IEEE CVF Winter Conference on Applications of Computer Vision)*, 2023, 2024
- NeurIPS *(Conference on Neural Information Processing Systems)*: Workshop on Scientific Methods for Understanding Deep Learning, 2024

Journals

- IEEE TMI (*Transactions on Medical Imaging)*
- IEEE TNNLS (*Transactions on Neural Networks and Learning Systems)*
- IEEE JBHI *(Journal of Biomedical and Health Informatics)*
- Computers in Biology and Medicine
- MELBA (*Machine Learning for Biomedical Imaging)*
- Scientific Data
- JDIM *(Journal of Digital Imaging)*
- Mathematics and Computers in Simulation

TEACHING EXPERIENCE

Duke University | Durham, NC *Fall 2022 & 2023*
Graduate Teaching Assistant
ECE 685D/COMPSCI 675D: Introduction to Deep Learning.

UNC Chapel Hill | Chapel Hill, NC *Fall 2017 - Spring 2018*
Undergraduate Teaching Assistant
PHYS 119 (Introductory Electromagnetism), MATH 528 (Math. Methods for the Physical Sciences), and MATH 233 (Multivariable Calculus).

ERIRA (UNC Chapel Hill/Green Bank Radio Observatory) | Chapel Hill, NC *2017 - PRESENT*
Educator/Coordinator

One of the educators of participants in ERIRA, a yearly week-long intensive radio astronomy research program led by Dr. Daniel Reichart of UNC Chapel Hill. Participant of the 2017 session.

TALKS AND TUTORIALS

The Intrinsic Manifolds of Radiological Images and their Role in Deep Learning | Talk *Oct. 2022*
The Pacific Northwest Seminar on Topology, Algebra, and Geometry in Data Science (TAG-DS), Univ. of Washington Math Dept.

What Actually is Artificial Intelligence, and How Does it Relate to Astronomy? | Talk *Aug. 2022 and 2024*
Educational Research in Radio Astronomy (ERIRA) 2022 and 2024, UNC Chapel Hill.

Train a Neural Network to Detect Breast MRI Tumors with PyTorch | Online Tutorial *2022*
Parts 1 and 2; featured on the Editors' Picks of Towards Data Science.

RELEVANT COURSEWORK

Duke University

Machine Learning & Computer Science:	*Deep Learning, Advanced Topics in Deep Learning, Probabilistic Machine Learning, Generative Models, Adversarial Machine Learning, Natural Language Processing, Engineering Deep Neural Networks, Vector Space Methods*

University of North Carolina

Computer Science:	*Numerical Techniques, Physical Modeling*
Mathematics:	*Multivariable and Vector Calculus, Ordinary Differential Equations, Partial Differential Equations, Linear Algebra, Real Analysis, Complex Analysis, Probability, Mathematical Methods I & II, Fourier Analysis*
Physics & Astronomy:	*Classical Mechanics, Electromagnetism I & II, Quantum Mechanics I & II, Quantum Computing, Cosmology, Astrophysics, Thermodynamics and Statistical Mechanics, Experimental Techniques, Observational Astronomy/Astronomical Data*

REFERENCES

Prof. Maciej A. Mazurowski | Duke University
Graduate research advisor (deep learning and medical image analysis).

Prof. Vahid Tarokh | Duke University
Professor for my deep learning teaching assistantship and coursework.

Prof. Daniel E. Reichart | UNC Chapel Hill
Undergraduate research advisor (statistical methods for astrophysics).