

NICK KONZ

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EDUCATION

Duke University | Durham, NC

Expected December 2025

Ph.D. in Electrical and Computer Engineering (Machine Learning Specialty)

Cumulative GPA: 3.860/4.000

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 Dept. of Radiology | Durham, NC

2021 - PRESENT

Graduate Research Assistant

Ph.D. research in deep learning with a focus on medical image analysis. Specific fields include anomaly detection, domain adaptation and style transfer. Skills include model conception and development, codebase development and experimentation (Python/PyTorch), and paper publication.

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. Included the continued development and deployment of the TRK (Trotter-Reichart-Konz Regression) and RCR (Robust Chauvenet Rejection) statistical modeling suites. Skills included codebase development, end-to-end web interface development, and writing associated papers and documentation for publication.

Robert Shelton Award for Outstanding Research (2019)

NC Space Summer Research Grant (NASA) (2019)

REPRESENTATIVE PUBLICATIONS

Full publication list at scholar.google.com/citations?user=a9rXidMAAAAJ&hl=en.

1. **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**.
2. **Konz, N.** and Mazurowski, M. A. "Reverse Engineering Breast MRIs: Predicting Acquisition Parameters Directly from Images". *Medical Imaging with Deep Learning (MIDL)*, **2023**.
3. **Konz, N.**, et al. "A Competition, Benchmark, Code and Data for Using Artificial Intelligence to Detect Lesions in Digital Breast Tomosynthesis". *JAMA Network Open*, 6(2):e230524, **2023**.
4. Swiecicki, A., **Konz, N.**, et al. "A generative adversarial network-based abnormality detection using only normal images for model training with application to digital breast tomosynthesis". *Scientific Reports* 11.1: 1-13, **2021**.
5. Mazurowski, M. A., Dong, H., Gu, H., Yang, J., **Konz, N.** and Zhang, Y. "Segment Anything Model for Medical Image Analysis: an Experimental Study". *arXiv:2304.10517*, **2023**

TEACHING EXPERIENCE

Duke University | Durham, NC

Fall 2022

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
Educational Research in Radio Astronomy (ERIRA) 2022, 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.

GENERAL TECHNICAL SKILLS

Technological:	Machine Learning and Deep Learning, Algorithms, Numerical Methods, Monte Carlo Methods
Analytical:	Statistical Modeling, Data Analysis, Bayesian Analysis, Software Documentation and Publishing
Specific Computer Skills:	PyTorch, C++-to-Python Wrapping

SPECIFIC COMPUTER SKILLS

Proficient with:	Python (6 yrs.), C++/C (3 yrs.), \LaTeX (6 yrs.)
Experienced with:	JavaScript, HTML/CSS (2 yrs.), Vim, Unix, Microsoft Excel
Familiar with:	Wolfram/Mathematica Language

RELEVANT COURSEWORK

Duke University Machine Learning & Computer Science:	<i>Deep Learning, Advanced Topics in Deep Learning, Probabilistic Machine Learning, Engineering Deep Neural Networks, Vector Space Methods</i>
University of North Carolina Machine Learning & Computer Science: Mathematics:	<i>Numerical Techniques, Physical Modeling Multivariable and Vector Calculus, Ordinary Differential Equations, Partial Differential Equations, Linear Algebra, Real Analysis, Complex Analysis, Probability, Mathematical Methods I & II, Fourier Analysis</i>
Physics & Astronomy:	<i>Classical Mechanics, Electromagnetism I & II, Quantum Mechanics I & II, Quantum Computing, Cosmology, Astrophysics, Thermodynamics and Statistical Mechanics, Experimental Techniques, Observational Astronomy/Astronomical Data</i>

JOURNAL/CONFERENCE PAPER REVIEWING EXPERIENCE

- *JDIM (Journal of Digital Imaging)*

INDIVIDUAL RESEARCH GRANTS AND SCHOLARSHIPS

NC Space Summer Research Grant Chapel Hill, NC 2019 <i>NASA/NC State</i> Each year, NC Space Grant awards Undergraduate Research Scholarships to students who are pursuing careers in science, technology, engineering and mathematics (STEM) fields that support NASA's Mission Directorates. This competitively awarded program engages the future STEM workforce in basic and/or applied aerospace-related research projects and facilitates the development of mentor relationships between students, faculty and the NASA community. (For my work with Prof. Daniel Reichart.)
Earl Nelson Mitchell Scholarship in Physics Chapel Hill, NC 2018 - 2020 <i>UNC Department of Physics and Astronomy</i> Recommended for this scholarship by faculty in the department in recognition of outstanding academic record; The Earl Nelson Mitchell Scholarship was an estate gift to the University, with a provision to establish a scholarship to an outstanding junior or senior majoring in Physics or Astronomy.
NC Space Spring Research Grant Chapel Hill, NC 2018 <i>NASA/NC State</i> The NC Space Grant Undergraduate Scholarship Program is a competitive scholarship program funded by NASA with the goals of: increasing participation in STEM-related research and careers by students, establishing relationships with a faculty member and a NC Space Grant Undergraduate Research Scholar or Graduate Fellow, and interacting with faculty/other scholars to learn more about the STEM discipline and current research projects and opportunities. (For my work with Dr. Daniel Reichart.)

AWARDS & HONORS

Judges' Choice Award Durham, NC <i>Pratt School of Engineering, Duke University</i> For my research poster "The Intrinsic Manifolds of Radiological Images and their Role in Deep Learning" at the Pratt School of Engineering Fall 2022 poster session.	2022
Robert Shelton Award for Outstanding Research Chapel Hill, NC <i>UNC Department of Physics and Astronomy</i> This award recognizes outstanding academic performance as a major in the department, and is the highest level research award given by the department.	2019
Benjamin Swalin Orchestra Award Chapel Hill, NC <i>UNC Department of Music</i> This award was established in 2000 in honor of Maestro Swalin, former conductor of the UNC Symphony Orchestra and subsequently Music Director of the North Carolina Symphony for 33 years. The award is given to graduating seniors who have made significant contributions in artistry and leadership to the UNC orchestra program during their undergraduate years. The recipients are determined by the orchestra director.	2020
Most Innovative Hack Chapel Hill, NC <i>HackNC Hackathon (UNC Chapel Hill)</i> A member of the five-person team that created the project "Simulating the Spread of Ideas with Epidemiology" in 24 hours at the 2018 HackNC Hackathon, for which we won the award of "Most Innovative Hack" (see "Other Projects").	2018
Dean's List Chapel Hill, NC <i>UNC Chapel Hill</i> Every semester of my undergraduate coursework.	2016-2020

ORGANIZATIONAL MEMBERSHIP

Effective Altruism (Arete Fellowship) Chapel Hill, NC <i>Member (UNC Chapel Hill)</i>	2020 - PRESENT
Phi Beta Kappa Academic Honor Society Chapel Hill, NC <i>Member (UNC Chapel Hill)</i>	2018 - PRESENT
UNC Math Help Center Chapel Hill, NC <i>Volunteer Tutor</i>	2018 - 2020
Annual Math Counts Competition Chapel Hill, NC <i>Volunteer Grader</i>	2018 - 2020
American Physical Society <i>Member</i>	2018 - PRESENT
Society of Physics Students ($\Sigma\Pi\Sigma$) Chapel Hill, NC <i>Member (UNC Chapel Hill)</i>	2017 - PRESENT
UNC Honors College Chapel Hill, NC <i>Member</i>	2016 - 2020
UNC Symphony Orchestra Chapel Hill, NC <i>Co-principal French Horn</i>	2016 - 2020
UNC Wind Ensemble Chapel Hill, NC <i>Co-principal French Horn</i>	2016 - 2017

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).