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: 3.860/4.000*

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

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

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 `https://scholar.google.com/citations?hl=en&user=a9rXidMAAAAJ&view_op=list_works&sortby=pubdate`.

1. **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**.
2. **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**.
3. **Konz, N.** and Mazurowski, M. A. "Reverse Engineering Breast MRIs: Predicting Acquisition Parameters Directly from Images". *Medical Imaging with Deep Learning (MIDL)*, **2023**.
4. **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**.

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*
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:	*Deep Learning, Advanced Topics in Deep Learning, Probabilistic Machine Learning, Engineering Deep Neural Networks, Vector Space Methods*

University of North Carolina

Machine Learning & 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*

PAPER REVIEWING EXPERIENCE

Conferences

- WACV *(IEEE CVF Winter Conference on Applications of Computer Vision)*

Journals

- IEEE JBHI *(Journal of Biomedical and Health Informatics)*
- JDIM *(Journal of Digital Imaging)*

INDIVIDUAL RESEARCH GRANTS AND SCHOLARSHIPS

NC Space Summer Research Grant | Chapel Hill, NC *2019*
NASA/NC State
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*
UNC Department of Physics and Astronomy
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*
NASA/NC State
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 *2022*
Pratt School of Engineering, Duke University
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.

Robert Shelton Award for Outstanding Research | Chapel Hill, NC *2019*
UNC Department of Physics and Astronomy
This award recognizes outstanding academic performance as a major in the department, and is the highest level research award given by the department.

Benjamin Swalin Orchestra Award | Chapel Hill, NC *2020*
UNC Department of Music
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.

Most Innovative Hack | Chapel Hill, NC *2018*
HackNC Hackathon (UNC Chapel Hill)
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").

Dean's List | Chapel Hill, NC *2016-2020*
UNC Chapel Hill
Every semester of my undergraduate coursework.

ORGANIZATIONAL MEMBERSHIP

Effective Altruism (Arete Fellowship) | Chapel Hill, NC *2020 - PRESENT*
Member (UNC Chapel Hill)

Phi Beta Kappa Academic Honor Society | Chapel Hill, NC *2018 - PRESENT*
Member (UNC Chapel Hill)

UNC Math Help Center | Chapel Hill, NC *2018 - 2020*
Volunteer Tutor

Annual Math Counts Competition | Chapel Hill, NC *2018 - 2020*
Volunteer Grader

American Physical Society *2018 - PRESENT*
Member

Society of Physics Students (ΣΠΣ) | Chapel Hill, NC *2017 - PRESENT*
Member (UNC Chapel Hill)

UNC Honors College | Chapel Hill, NC *2016 - 2020*
Member

UNC Symphony Orchestra | Chapel Hill, NC *2016 - 2020*
Co-principal French Horn

UNC Wind Ensemble | Chapel Hill, NC *2016 - 2017*
Co-principal French Horn

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).