

# NICK KONZ

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## EDUCATION

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<b>Duke University</b>   Durham, NC	Expected December 2025
Ph.D. in Electrical and Computer Engineering (Machine Learning Specialty)	Cumulative GPA: 3.860/4.000
<b>University of North Carolina</b>   Chapel Hill, NC	Graduated May 2020
B.S. in Astrophysics and B.A. in Mathematics	Cumulative GPA: 3.914/4.000
Honors: Highest Honors and Highest Distinction	Phi Beta Kappa
	Earl Nelson Mitchell Scholar in Physics
	Honors College Member

## RESEARCH EXPERIENCE

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<b>Mazurowski Lab</b>   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.	
<b>Reichart Lab/SkyNet Robotic Telescope Network</b>   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)

## SELECT PUBLICATIONS

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Full publication list at [scholar.google.com/citations?user=a9rXidMAAAAJ&hl=en](https://scholar.google.com/citations?user=a9rXidMAAAAJ&hl=en). I also have two additional first-author journal and conference papers in rebuttal/revision, as of 2/23/2023.

- Konz, N.**, et al. "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**.
- 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**.
- 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**.
- Maples, M. P., Reichart, D. E., **Konz, N. C.**, et al. "Robust Chauvenet Outlier Rejection". *The Astrophysical Journal Supplement Series* 238.1: 2, **2018**.

## TEACHING EXPERIENCE

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<b>Duke University</b>   Durham, NC	2022
Graduate Teaching Assistant	
ECE 685D/COMPSCI 675D: Introduction to Deep Learning.	
<b>UNC Chapel Hill</b>   Chapel Hill, NC	2017 - 2018
Undergraduate Teaching Assistant	
PHYS 119 (Introductory Electromagnetism), MATH 528 (Math. Methods for the Physical Sciences), and MATH 233 (Multivariable Calculus).	
<b>ERIRA (UNC Chapel Hill/Green Bank Radio Observatory)</b>   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.	

## GENERAL TECHNICAL SKILLS

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

## SPECIFIC COMPUTER SKILLS

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<b>Proficient with:</b>	Python (6 yrs.), C++/C (3 yrs.), L <sup>A</sup> T <sub>E</sub> X (6 yrs.)
<b>Experienced with:</b>	JavaScript, HTML/CSS (2 yrs.), Vim, Unix, Microsoft Excel
<b>Familiar with:</b>	Wolfram/Mathematica Language

## RELEVANT COURSEWORK

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<b>Duke University</b> Machine Learning & Computer Science:	<i>Deep Learning, Advanced Topics in Deep Learning, Probabilistic Machine Learning, Engineering Deep Neural Networks, Vector Space Methods</i>
<b>University of North Carolina</b> 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 &amp; II, Fourier Analysis</i>
Physics & Astronomy:	<i>Classical Mechanics, Electromagnetism I &amp; II, Quantum Mechanics I &amp; II, Quantum Computing, Cosmology, Astrophysics, Thermodynamics and Statistical Mechanics, Experimental Techniques, Observational Astronomy/Astronomical Data</i>

## TALKS AND TUTORIALS

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<b>The Intrinsic Manifolds of Radiological Images and their Role in Deep Learning</b>   Talk <i>The Pacific Northwest Seminar on Topology, Algebra, and Geometry in Data Science (TAG-DS), Univ. of Washington Math Dept.</i>	Oct. 2022
<b>What Actually is Artificial Intelligence, and How Does it Relate to Astronomy?</b>   Talk <i>Educational Research in Radio Astronomy (ERIRA) 2022, UNC Chapel Hill.</i>	Aug. 2022
<b>Train a Neural Network to Detect Breast MRI Tumors with PyTorch</b>   Online Tutorial <i>Parts 1 and 2; featured on the Editors' Picks of Towards Data Science.</i>	2022

## INDIVIDUAL RESEARCH GRANTS AND SCHOLARSHIPS

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<b>NC Space Summer Research Grant</b>   Chapel Hill, NC <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.)	2019
<b>Earl Nelson Mitchell Scholarship in Physics</b>   Chapel Hill, NC <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.	2018 - 2020
<b>NC Space Spring Research Grant</b>   Chapel Hill, NC <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).	2018

## AWARDS & HONORS

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<b>Judges' Choice Award</b>   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
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<b>Robert Shelton Award for Outstanding Research</b>   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
<b>Benjamin Swalin Orchestra Award</b>   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
<b>Most Innovative Hack</b>   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
<b>Dean's List</b>   Chapel Hill, NC <i>UNC Chapel Hill</i> Every semester of my undergraduate coursework.	2016-2020

## ORGANIZATIONAL MEMBERSHIP

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