Zack Carson, PhD

zackrcarson@gmail.com | zackrcarson.github.io | scholar.google.com | (801) 369-1970

Astrophysicist and data scientist with 10 years of academic and industry experience eager to leverage my varied skill set to drive innovative and impactful contributions to space exploration and technology. My background combines astrophysics research, education, and data science/machine learning (ML) to uniquely position me as an adaptable, fast-learning, and highly motivated transplant into the aerospace field.

Experience

Data Scientist III (Machine Learning), Dataminr – New York City, NY 2021 – Present
- Established 2,000+ net new ML-generated alerts to clients daily by designing and implementing 5 new text/image ML models (Python) running live on 1 billion inputs per day from 100,000 data sources
- Led the AI cybersecurity team to enrich client alerts with relevant information by designing and implementing a self-ingesting knowledge graph (Neo4j, Cypher, Airflow) containing 1 million+ entities
- Achieved sub-5 minute latency on a live data streaming and reduction pipeline (Databricks, Spark), enabling social media anomaly detection by filtering and aggregating 1 billion raw messages per day

Gravitational Wave Outreach Scientist (NSF Funded), University of Virginia – Charlottesville, VA 2021 – Present
- Leads a team of undergraduates in developing a new educational general relativity (GR) game by providing astrophysics expertise and project management and direction
- Designed and implemented an outreach game (Unity, C#) used in classrooms – "Gravitational Wave Surfer" – by translating complex principles of GR into digestible and engaging game mechanics

Data Scientist (Machine Learning), TruU – Boulder, CO 2020 – 2021
- Enabled net new biometric authentication features on 100% of customer devices by designing and implementing 3 new ML models (Python) running on live gait and typing cadence data

Astrophysics Graduate Research Scientist, University of Virginia – Charlottesville, VA 2015 – 2020
- Published 17 astrophysics articles (LaTeX, XMGrace) – 13 as the lead author – with 638 citations in leading peer-reviewed journals by collaborating with LISA (future space-based), LIGO (ground), and other observatories to use gravitational and electromagnetic signals to test GR and study the neutron star interior (Matlab, Mathematica)
- Presented my research at 6 astrophysics conference proceedings – 2 as an invited speaker – representing the discoveries made after combining observational data with theoretical and analytical work
- Single recipient of the 2020 University of Virginia Distinguished Research Fellowship Award for leading innovative theoretical and observational astrophysics research resulting in limits placed on theoretical physics parameters
- Achieved a record-holding 3.2 dB of quantum noise reduction in entangled photons used for quantum computing by designing and building an optical parametric oscillator (OPO) cavity housing a custom frequency-doubling crystal
- Produced code (C++) used among the CERN community by using decision trees to profile the Higgs boson decay signal

Lead Graduate Teaching Assistant, University of Virginia – Charlottesville, VA 2014 – 2019
- Designed and implemented 24 new undergraduate physics labs to foster innovation, creativity, and engagement by transforming old instruction-based labs into exploration-based mechanics and electromagnetism experiments
- Developed a new graduate teaching assistant (TA) training program to train 15-20 incoming students yearly by implementing a 2-week bootcamp filled with think tanks, lectures, and mock-teaching simulations
- Single recipient of the 2019 University of Virginia Distinguished Graduate STEM Teaching Award for 4 years of teaching labs and lectures with a 98% student approval rating, innovative curriculum redesign, and graduate TA leadership

Skills

Technical: NASA General Mission analysis Tool (GMAT), Scientific laboratory equipment, electronics, optics, telescope operation/maintenance, machining, Git, Unity
Programming Languages: Python, SQL, Cypher, Matlab, Mathematica, Scala, LaTeX, XMgrace, C#, C++, HTML, R
Data: Databricks, Spark, Amazon Web Services (AWS), Neo4j, Snowflake, Airflow

Education

University of Virginia 2020
Doctor of Philosophy in Physics, Thesis: Probing Fundamental Physics with Gravitational Waves, Advisor: Prof. Kento Yagi

University of Utah 2014
Bachelor of Science in Pre-Professional Physics, minor in astrophysics

University of Utah 2014
Bachelor of Science in Applied Mathematics