

# < Alexander Christian DeRieux />

Scientist + Engineer + Developer

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Objectives	Ph.D. student and industry professional with research experience in software engineering, machine learning, and communications. Interested in the applications of cognitive learning algorithms in their relation to smart cities, wireless communication networks, quantum communications, and quantum machine learning.
Security Clearance	Cleared for Top Secret Information and granted access to Sensitive Compartmented Information based on a Tier 5 Investigation completed in 07/2024.
Education	<div><div><b>Doctor of Philosophy in Electrical Engineering</b> [ 8/2022 – Present ] Virginia Polytechnic Institute and State University, Blacksburg, Virginia GPA: 3.91</div><div><b>Master of Science in Electrical Engineering</b> [ 1/2021 – 8/2022 ] Virginia Polytechnic Institute and State University, Blacksburg, Virginia GPA: 3.91</div><div><b>Bachelor of Science in Electrical Engineering, Minor in Mathematics – cum laud</b> [ 8/2012 – 5/2016 ] Virginia Polytechnic Institute and State University, Blacksburg, Virginia In Major GPA: 3.437, University GPA: 3.407</div><div><b>Bachelor of Science in Computer Science – cum laud</b> [ 8/2012 – 12/2016 ] Virginia Polytechnic Institute and State University, Blacksburg, Virginia In Major GPA: 3.793, University GPA: 3.456</div></div>
Employment Experience	<div><div><b>Graduate Research Assistant (GRA)</b> [ 8/2021 – Present ] <i>Wireless@VT, Virginia Polytechnic Institute and State University</i> Machine Learning research with applications to areas of smart cities, wireless communications, optimization, game theory, and quantum information theory. Developing architectures and techniques to facilitate heterogeneous multi-task learning (HMTL) in smart garden alleys with diverse data sources. Designing time-series forecasting models in TensorFlow using the Transformer “attention” architecture to predict plant growth as a function of meteorological data.</div><div><b>Graduate Teaching Assistant (GTA)</b> [ 1/2021 – 12/2021, 08/2022 – 05/2023 ] <i>Bradley Department of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University</i> Professional mentor and graduate administrator for the Electrical Engineering Major Design Experience (MDE) undergraduate capstone course. Manage grading student individual project notebooks (IPN), designing new course assignments relative to industry experience, and developing software for automating course administration tasks with integration of Canvas LMS REST API.</div><div><b>Electronics Engineer</b> [ 2/2017 – 9/2024 ] <i>U.S. Naval Research Laboratory (NRL), Washington DC, TS/SCI clearance</i> Research, design, and develop space-system technologies for the U.S. Navy in the areas of rocketry, communications, optics, software engineering, networking, tactical network modeling, surveillance and tracking, Positioning, Navigation, and Timing (PNT), and Precise Time and Time Interval (PTTI) theory and applications.</div><div><b>Electrical Engineering Co-op</b> [ 7/2012 – 2/2017 ] <i>U.S. Naval Research Laboratory (NRL), Washington DC, Secret clearance</i> Created an off-the-shelf system for high altitude naval vessel tracking. Designed image processing algorithms to identify naval vessels and their location using Python and OpenCV. Wrote technical documentation and how-to guides for various projects. Developed alternative modes of satellite propulsion using natural and induced magnetic fields. Created custom payload deployment systems for small satellites. Designed an off-the-shelf system for controlling robotic arms used in spacecraft docking and other tele-operation applications.</div><div><b>Resident Advisor</b> [ 8/2016 – 12/2016 ] <i>Virginia Polytechnic Institute and State University</i> Managed a residence hall floor of 37 undergraduate students. Scheduled and coordinated weekly events among residential staff and residents of multiple hall communities. Resolved conflicts amongst residents and residential staff. Documented nightly hall inspections and important student conduct information.</div><div><b>Academic Tutor</b> [ 1/2012 – 5/2012 ] <i>Tutoring Services, Germanna Community College, Fredericksburg, VA</i> Developed bookkeeping and interpersonal skills by working in a tutoring office at the community college. Tutored all academic levels in the subjects of Math, English, Physics, Chemistry, Computer Programming, French, and Economics.</div></div>
Publications	<ol style="list-style-type: none"><li>1. A. DeRieux and W. Saad, “eQMARL: Entangled Quantum Multi-Agent Reinforcement Learning for Distributed Cooperation over Quantum Channels”, arXiv [quant-ph]. 2024. Available: <a href="https://arxiv.org/abs/2405.17486">https://arxiv.org/abs/2405.17486</a></li><li>2. M. Kim, A. DeRieux, and W. Saad, “A Bargaining Game for Personalized, Energy Efficient Split Learning over Wireless Networks”, arXiv [cs.GT]. 2022. Available: <a href="https://arxiv.org/abs/2212.06107">https://arxiv.org/abs/2212.06107</a></li><li>3. A. C. DeRieux, W. Saad, W. Zuo, R. Budiarto, M. D. Koerniawan, and D. Novitasari, “A Transformer Framework for Data Fusion and Multi-Task Learning in Smart Cities”, arXiv [cs.LG]. 2022. Available: <a href="https://arxiv.org/abs/2211.10506">https://arxiv.org/abs/2211.10506</a></li><li>4. A. C. DeRieux, “Transformer Networks for Smart Cities: Framework and Application to Makassar Smart Garden Alleys”, M.S. Thesis, Virginia Tech, Aug. 2022. [Online]. Available: <a href="http://hdl.handle.net/10919/111788">http://hdl.handle.net/10919/111788</a></li></ol>
Research & Projects	<div><div><b>Smart Garden Alleys</b> [ 1/2021 – 8/2022 ] Joint effort with Virginia Tech and University of Colorado Boulder. Designed machine learning frameworks with data fusion to grow “smart” garden alleys in Makassar City, Indonesia in effort to bolster city health, food production, economics, tourism, and urban planning.</div></div>

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## Research & Projects Continued

### SmartStockRL: Intelligent Stock Trading using Traditional and Deep Q-Learning

[ 10/2021 – 12/2021 ]

Research effort exploring the application of traditional and deep Q-learning Reinforcement Learning (RL) algorithms in dynamic stock trading environments. Developed both model-based and model-free Q-learning algorithms in conjunction with a custom stock simulation environment in OpenAI Gym.

### LyricAI: Using LSTMs to Write Religious Music

[ 4/2021 – 5/2021 ]

Joint research effort exploring the ethical implications of AI-generated religious song lyrics. Developed two Recurrent Neural Network (RNN) architectures fusing Long Short-Term Memory (LSTM) and Encoder/Decoder models for pure next-word prediction and syllable-count next-word prediction natural language processing (NLP) tasks.

### Capstone: MITRE

[ 8/2016 – 12/2016 ]

Created 'ERIS', a wearable emergency responder information system for first responders in the field. Developed companion applications for Android mobile, Android Wear-powered Moto 360 smartwatch, and Android-powered Recon Jet heads-up display. Collaborated in a 5-person team using face-to-face and virtual meetings. Employed use of GitHub for version control. Learned ethnography and project demonstration techniques towards both technical and non-technical audiences.

### Capstone: General Motors & VTTI

[ 8/2015 – 5/2016 ]

Created a wireless off-the-shelf device for interfacing with vehicle OBDII system. Developed companion Linux and mobile application software for wireless data acquisition and interaction. Learned project management, project documentation such as request for proposal, and customer relations from instructors that have extensive backgrounds in the corporate world.

### Communication Systems

[ 1/2015 – 5/2015 ]

Developed a RTL-SDR receiver system called 'RadioPi' to process local FM transmissions. Signal processing algorithms are written in Python using GNURadio API and custom signal blocks. Design elements include the Raspberry Pi, USB RTL-SDR antenna, and breadboard circuitry for user interface.

### Mobile Application Development

[ 7/2015 – 08/2015 ]

Developed 'Velo', an Android mobile and wearable application that navigates exclusively using onboard GPS modules, thus bypassing the need for wireless data. Users can logon using Facebook and store their routes to local SQLite and online SQL databases using AWS. Crash detection is implemented using onboard gyroscope and accelerometer sensors, notifying a set of emergency contacts of your situation upon detection of the crash.

## Skills & Abilities

### Programming Languages

- Python
- C / C++ / C#
- MATLAB
- JavaScript / TypeScript / HTML / CSS
- Java
- Rust
- Go
- Fortran
- LaTeX

### APIs / Frameworks / Packages / Tools

- **Python packages:** Qiskit / Cirq / PennyLane / TensorFlow / PyTorch / Gymnasium / NumPy / Pandas / SciPy / Scikit-Learn / Matplotlib / Seaborn / Flask / NetworkX / BeautifulSoup / OpenCV / Pillow / PyQt / Pytest / Pipenv / Pyenv / Requests / etc.
- **Webapp packages:** React.js / Electron.js / Cesium.js / Bootstrap
- Grafana
- Canvas LMS

### Software Skills

- **Microservices:** Docker / Singularity / Podman / Kubernetes
- Continuous Integration and Continuous Delivery (CI/CD)
- **Version control:** Git / GitHub / GitLab / SVN
- **Databases:** InfluxDB / MongoDB / MySQL / SQLite / GraphQL / Redis
- Networking
- **Operating Systems:** Linux / macOS / Windows
- **Apps:** iOS / Android

### Electronics

- Soldering
- Breadboarding
- Eagle PCB design
- Digital signal processing (DSP)
- Software-defined radio (SDR)
- **Microcontrollers:** Raspberry Pi / Arduino / STM32 / PIC32

## Professional Organizations

Eta Kappa Nu (Electrical Engineering Honor Society) [ 2021 – Present ]

IEEE [ 2021 – Present ]

## Honors & Awards

Bradley Fellowship [ 2022 – Present ]

### Dean's List

- Virginia Tech: Fall 2013, Spring 2014, Spring 2015\*, Fall 2015, Spring 2016\*, Fall 2016\*, where (\*) = with distinction
- Germanna Community College: Fall 2011, Spring 2011, Spring 2012

### Academic Honors

- Virginia Tech: Spring 2016, Fall 2016
- Germanna Community College: Fall 2010

## Activities & Leadership

### Chi Alpha Campus Ministries

[ 2012 – Present ]

Co-lead Life Groups of 8+ students. Organized and coordinated meetings and events with other Life Groups within Chi Alpha.

### Church AV & IT Team

[ 2020 – Present ]

Serve on the audio/visual (AV) and information technology (IT) team at my local church.

### Virginia Tech Fencing Club

[ 2013 – 2014 ]

Trained in the Epee fencing style and competed in tournaments.

## Hobbies & Interests

**World Travel:** Belgium, Canada, France, Germany, Mexico, Netherlands, U.S. & Hawaii

**Porsche Enthusiast:** Lover of Porsche sports cars and mechanics