Ajeet Krishnasamy

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Mechanical engineering graduate specializing in CFD, FEA, and autonomous flight dynamics, with hands-on experience developing high-performance C++ physics solvers, Python simulation tools, and control systems.

Experience

Systems Engineer, Medical Equipment (Intern) Oct 2020 – Sept 2021
CenTrak *Newtown, PA, United States*

- Engineered automated reliability analysis pipelines for medical device telemetry, processing real-time performance data from 10,000+ RTLS tags to quantify failure rates and improve system monitoring precision.
- Developed automated performance dashboards for the Connect Pulse™RTLS platform, enabling engineering teams to identify device degradation trends and reduce unplanned maintenance events.
- Conducted battery discharge and device health analysis across 5,000+ medical-grade IoT devices, identifying failure precursors and enabling predictive replacement scheduling that prevented equipment outages.
- Standardized structured query and analysis workflows for multi-terabyte RTLS datasets, reducing troubleshooting cycle time through automated anomaly detection and root-cause analysis scripts.

Systems Engineer, Medical Equipment (Intern) July 2019 – Sept 2019
CenTrak *Newtown, PA, United States*

- Performed system-level characterization of RTLS localization algorithms using statistical regression analysis, identifying coverage gaps and refining location accuracy through receiver parameter tuning.
- Designed and executed validation test protocols for RTLS hardware deployment, correlating laboratory calibration data with field performance metrics to close the lab-to-field validation gap.
- Synthesized system performance data into technical recommendations for hardware upgrades and feature rollouts, supporting engineering decisions with quantitative evidence.

Projects

AK-Vortex: High-Performance C++ Lattice Boltzmann CFD Solver | *C++, Python, CFD*

- Engineered a 2D Lattice Boltzmann Method (D2Q9) CFD solver in C++20 from first principles, utilizing a cache-optimized flat vector layout and OpenMP parallelization for multi-core streaming performance.
- Implemented Multi-Relaxation-Time collision, Bouzidi interpolated bounce-back for curved boundaries, and Smagorinsky LES turbulence modeling; validated 15 benchmark regimes against analytical solutions.
- Integrated Physics-Informed Neural Networks (PINNs) to supervise and accelerate flow field solutions across transient multi-regime velocity profiles.

Cauchy: 2D Finite Element Structural Solver | *C++, Python, FEA*

- Developed a header-only C++20 finite element solver featuring bar and bilinear quadrilateral (Q4) elements, COO-to-CSR sparse matrix assembly, and direct Cholesky or iterative Conjugate Gradient solvers.
- Validated structural mechanics across 6 canonical cases (cantilever deflection, Michell truss, L-bracket, Cook's membrane) matching analytical solutions within 1%
- Implemented automatic negative Jacobian detection, adaptive mesh refinement h-refinement loops, and element-centroid principal stress tensor recovery.

SwarmGNC: Decentralized UAV Formation Control & Flight Software | *C++, Python, GNC*

- Designed a decentralized multi-agent UAV swarm simulation using 6-DOF state-space dynamics (RK4), LQR optimal control, and 3D Direction Cosine Matrix guidance for 7-drone wedge formation keeping.
- Implemented C++17 flight software featuring a 10-state guarded transition state machine, an FDIR fault-monitoring module, and a 100 Hz quaternion-based 6-DOF rigid body dynamics kernel.
- Built a software-in-the-loop (SIL) testing framework via MAVLink over UDP and a GPU-accelerated desktop Ground Control Station (Dear PyGui/ImPlot) for real-time telemetry and mission command.

Technical Skills

Aerodynamics & CFD: ANSYS CFD, STAR-CCM+, SU2, OpenFOAM, Gmsh, ParaView
Programming & CAD/FEA: Python, C++, MATLAB, SolidWorks, Autodesk Fusion, Git, CMake
Dynamics & Control: LQR Optimal Control, State-Space Dynamics, APF Guidance, Graph Laplacian, Monte Carlo
Manufacturing: CNC Machining, 3D Printing, Lathe & Mill Operations, MIG Welding

Education

University of Ottawa Ottawa, ON, Canada
Bachelor of Applied Science (BASc), Biomedical Mechanical Engineering *May 2026*
Coursework: Fluid Mechanics, Heat Transfer, Control Systems, Vibration Analysis, Machine Design, CAD/FEA

Accreditation: CEAB-accredited; ABET-equivalent