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Long Form CV

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1 Work Experience

1.1 Oxa Autonomy Ltd (Autonomous Vehicles)

Staff Motion Planning Engineer (Fully Remote – Toronto, Canada) Feb 2020 - Present

Remotely led the primary Integration and Verification & Validation (V&V) team as a senior member of Oxa's Motion Planning group. Ultimately, responsible for steering the company-wide V&V vision for autonomy performance and reliability, developer productivity and software release efficiency. While sitting at the intersection of the engineered and machine-learned self-driving product, equally involved in the core autonomy software (C++), synthetic testing (Python) and cloud scaling (Terraform, Kubernetes, Argo) stacks alongside the company's 200+ developers.

Leadership Responsibilities:

- Led and managed the Europe-based V&V team delivering robust and long-standing solutions for hardening and scaling autonomous vehicle (AV) technology and scaling autonomous vehicle (AV) technology.
- Defined the company's self-driving V&V strategy, including KPIs, philosophy, continuous integration/deployment (CI/CD) and on-road test plans.
- Set technical roadmap and, designed and drove test procedures for new V&V processes
- Line management duties including hiring, career coaching and promoting ICs up to Staff-level
- Maintained a balanced test environment integrating subsystem- and system-level V&V
- Oversaw the development of processes, tooling and automation to enable product testing
- Implemented real-time performance monitoring (Grafana, SQL) for on-road operations
- Defined non-conformance management processes for new V&V processes to ensure accountability and rapid closure to protect AV performance
- Guided VP/Head of Engineering and Principal Engineers to lead long-term V&V growth strategy

Technical Responsibilities:

- Architected C++ metrics interface and implemented autonomy KPIs for internal, customer and regulatory, monitoring and reporting.
- Re-architected cloud orchestration of developer CI/CD using Google Kubernetes Engine to deliver 1000s of daily tests at scale.
- Led and developed CI/CD of vehicle dynamics model (Gitlab + Python) to harden and enable dynamics feedback loop in the drive-time logic.
- Led CI/CD deployment with Mapping, Release and Solutions team to increase developer productivity and support on-road deployment.
- Coach V&V engineers on Planner architecture, mathematical inner-workings and technical layout to accelerate capability integration

1.2 Space Flight Laboratory (Space & Defence)

Lead Guidance, Navigation and Control (GNC) Engineer (Toronto, ON) Jan 2010 - Jan 2020
Security Clearance: CGP Reliability Status

Led the foundational Guidance, Navigation and Control (GNC) design, engineering and delivery for operation by Kepler Communications, GHGSat Inc and Hawkeye 360. GNC system flown on over 50+ different revenue-generating spacecraft for communications, environmental- and asset-monitoring with total hardware value of $\sim$ \$200 MM.

- Architected the GNC systems for all satellite platforms for technology demonstration, science, communication and military applications. Implemented C/C++ flight code flown on dozens of satellites currently operated by Kepler Communication, HawkEye 360, GHGSat Inc.
- Responsible for deliverables across Phase A (feasibility) to Phase E (production and operation), encompassing entire engineering design cycle for 10 different projects.
- Operated in a substantial technical capacity, while undertaking business roles to help lead department, streamline client-lab interactions, aid overall business objectives and produce deliverables to international customers, private firms and government agencies.

Technical Responsibilities:

- Implemented guidance and control systems to (2σ) accuracies of $5''$ (knowledge) and $18'$ (pointing), respectively. Implemented navigation systems using GPS receivers, optical sensors, magnetometers and gyroscopes to knowledge accuracies of 10 km (2σ) in satellite position and $4'$ (2σ) in satellite orientation.
- Developed and implemented trajectory planner, frequency-based controllers and probabilistic estimators (Kalman filters, batch, etc.) for inertial pointing and agile target tracking.
- Hardware flight qualification, C/C++ flight code, hardware calibration, software-in-the-loop simulations, hardware-in-the-loop testing and on-orbit command-and-control for data inferencing, planning and real-time imaging of the Earth.
- Led space qualification of military (ITAR) hardware from TRL-1 to TRL-8 in collaboration with Canadian government and overseas hardware supplier.

Leadership Responsibilities:

- Acted as GNC technical authority in supporting cross-functional initiatives.
- Scoped system capabilities and requirements, best practices, technical tools and test plans.
- Collaborated and negotiated deliverables from external partners, vendors and sub-contractors.
- Prepared proposals, design reviews and strategic roadmaps for new projects/technologies.
- Presented works at client-facing milestone meetings and international conferences.
- Managed and delegated departmental tasks and led junior members.

1.3 Pratt and Whitney (Aviation)

Co-op Structures Engineer (Mississauga, Canada) Jun 2007 - Aug 2008
Security Clearance: CGP Reliability Status

- Devised and managed all aspects of specimen quality assurance and testing for aircraft jet engines in order to substantiate product life, assess forging properties and predict future performance. Work directly incurred a savings of 185 engineering-hours ($\sim$ $25,000 CAD) per year.
- Devised and managed all aspects of spin pit and specimen testing for compressor rotors to substantiate low cycle fatigue (LCF) life and forging material properties.
- Maintained and upgraded specimen product database (SPD) housing over 20 years of engine damage and testing history for departmental-wide use
- Developed and optimized advanced analytics and statistical methods to automate SPD queries, thereby incurring a savings of 185 engineering-hours ($\sim$ $25,000 CAD) per year
- Maintained and upgraded LCF history database by developing methodology to quantify foreign object damage testing, and profiling testing methodologies for departmental reference.
- Supported various international teams and engine programs through material/stress and statistical analysis, hands-on inspection and data mining for both field and experimental parts.
- Optimized data analysis techniques and enhanced lifing analysis tools, thereby incurring a savings of 185 engineering man-hours ($\sim$ $25,000) per year.

2 Technical Education

University of Toronto (Computer Science) 2015 – 2018
Supplementary Graduate Studies (Toronto, ON); GPA: 4.0/4.0

- Topics: Machine Learning, Neural Networks, Computer Vision

ESA/JRC School on Global Navigation Satellite Systems (GNSS) Aug 2015
European Space Agency Joint Research Centre (Barcelona, Spain)

- GNSS Topics: signal processing, iono/tropospheric effects, interference technologies, augmentation systems, inertial navigation design, entrepreneurship, IPR/patents.

MASc (Aerospace Engineering) Nov 2013
University of Toronto - Space Flight Laboratory (Toronto, ON)
Advisor: Dr. Robert E. Zee; GPA: 4.0/4.0

- Developed and implemented Attitude and Orbit Control System (AOCS) design for Earth Observation (EO), communication and technology demonstration satellites.
- Verification of AOCS design through integrated high fidelity simulation of orbital mechanics, sensor/actuator characterization and flight software-in-the-loop.
- Thesis: Attitude and Orbit Control of Small Satellites for Earth Pointing
- Topics: Numerical Methods/Optimization, State Estimation, Dynamics and Control

BASc (Engineering Science: Aerospace Engineering) Jun 2009
University of Toronto (Toronto, ON)

- University of Toronto National Arbor Scholar and Dean's Honour List

3 Business and Leadership Training

Oxford Leading Strategic Projects Programme 2024
University of Oxford (Said Business School)
Strategic project management for highly complex endeavours which leave a lasting legacy beyond traditional outputs such as scope, cost and quality covering:

- Strategic Project Management
- Global Stakeholder Management
- Complex Risk Assessment and Management

Project Management and Leadership (Certificate) 2019
University of Toronto School of Continuing Studies (Toronto, ON)

- Topics: Managing Teams, Business Strategy, Negotiation, Conflict Resolution, Public Presentation

4 Technical Training

Real-Time Industrial Controller Design Workshop Dec 2012
Texas Instruments (Toronto, ON)

- Workshop on synthesizing real-time digital controllers for brushless motors.

Machinist Operations (Course) Jul 2008
George Brown College (Toronto, ON)

- Obtained 100hrs of precision machining skills for fitted machine parts.

Finite Element Analysis Training Jun 2007
Return On Investment Engineering (Toronto, ON)

- Applied and was instructed in ANSYS FEA techniques including APDL, thermal-structure, modal and bonded-contact analysis.

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5 Skills

Leadership: Public Presentation, Strategy, Line/Stakeholder Management, Proposals
Analytics: Numerical Methods, Non-linear Optimization
Software Development: C, C++ (17/20), Python, SQL
Cloud Development: GCP, Kubernetes, Docker, Argo
Commercial Software: STK/GMAT, MATLAB, Simulink, Orekit
Engineering: Systems Design, State Estimation, Control Systems, Astrodynamics

6 Conferences and Publications

DMSat-1: Next Gen. Environmental Monitoring on a Small Satellite Platform May 2018
4S Small Satellites Systems and Services Symposium (Sorrento, Italy)

In-Orbit Guidance, Navigation and Control Experiences of GHGSat-D Jun 2017
European Space Agency Conference on GNC Systems (Salzburg, Austria)

On-Orbit Earth Observation Performance of GHGSat-D Apr 2017
IAA Symposium on Small Satellites for EO (Berlin, Germany)

Optical Payloads for Space Missions (Ch. 40) Dec 2015
Book publication for John Wiley and Sons Ltd.

Emerging Small Satellite Earth Observation Technologies (Poster) Apr 2015
IAA Symposium on Small Satellites for EO (Berlin, Germany)

Design of the NEMO-AM Attitude and Orbit Control System Jun 2014
European Space Agency Conference on GNC Systems (Porto, Portugal)

NEMO-AM: Autonomous Nanosatellite for EO and Aerosol Monitoring May 2014
4S Small Satellites Systems and Services Symposium (Mallorca, Spain)

Estimating Titan's Electron Conductivity from the Huygens Experiment Apr 2009
Journal of Planetary and Space Science (vol. 58, issue 14-15, pp. 1945-1952)

7 Professional Affiliations and Certifications

Licensing Executive Society (Toronto Chapter) 2017 – Present
Professional Engineers of Ontario (PEO), P.Eng License 2015 – Present
American Institute of Aeronautics and Astronautics (AIAA), Member 2006 – Present