ALEXANDER DERKATSCH

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Education

| 2014-2021 | **CALIFORNIA POLYTECHNIC STATE UNIVERSITY** San Luis Obispo, CA | B.S. Aerospace Engineering |
| 2008-2017 | **PRINCETON FLYING SCHOOL** Princeton, NJ | Private Pilot License, AUGUST 2017 |

Self Employment

bigBespoke LLC **Founder** – Huntsville, AL (nights and weekends) *2024-present*

- Developed www.copapp.ai from zero leveraging frontier models with cursor.
- Full-stack JavaScript – architecting, coding, and debugging a large React + Node codebase.
- Applied AI / LLM integration – custom prompt engineering, multi-step reasoning chains, generative image & text, conversation context management, sentiment / insight extraction.
- Firebase suite mastery – Authentication, Firestore (hierarchical, multi-tenant data model), Cloud Functions, Storage, Hosting, Emulator Suite, security-rules hardening, CI/CD with firebase deploy; alt: vercel, supabase, and clerk
- Implemented OIDC Authorization Code + PKCE end-to-end: JWKS signature validation, strict iss/aud/exp/nonce checks, secure cookie sessions (HttpOnly, Secure, SameSite), and refresh-token rotation with reuse detection; mapped IdP claims → RBAC.
- Built per-tenant token-bucket rate limiting at edge and app tier (exposed X-RateLimit-* + Retry-After); hot-key sharding avoided single-key contention at peak load; clear fail-open vs fail-closed policy with metrics.
- Serverless architectures – designing stateless functions (over 30 callable/HTTP endpoints), CORS handling, cold-start mitigation. Heavily utilization of useful packages with npm.
- Designed a multi-tenant document data model (Mongo/Firestore-style) with granular auth rules and privilege-escalation checks; mitigated hot partitions via sharded counters and composite indexes.
- Real-time & interactive UX – React hooks, context providers, global state, dynamic routing (App.js), live chat interface, video & animation performance tuning.
- Scaled APIs by moving heavy LLM/media jobs to queues (Pub/Sub/Tasks), adding circuit breakers and retries with jitter; added caching and index tuning to reduce p95 latency by {X}% and stabilize error-budget burn.
- Cloud payments – end-to-end Stripe Checkout + Webhooks, subscription life-cycle logic
- DevOps & tooling – Git workflow, Node 18 runtime, package/version management, automated emulator data export, ffmpeg media optimization pipelines.
- Secured webhooks and signed requests with HMAC + timestamp/nonce replay protection; implemented idempotency keys for non-idempotent POSTs to make client retries safe across networks.
- Data analytics – departmental dashboards, aggregation functions, trend mining, certification scoring.
- Security & authorization – role-based gating in UI, granular Firestore rules, privilege escalation checks.
- Rapid prototyping & product design – Tailwind for responsive layouts, component library, minimal-friction UX for both solo and enterprise accounts.

Employment

BEYOND GRAVITY **Aerospace Systems Engineer** – Huntsville, AL (full time) *2022-present*

- Systems Engineering lifecycle for SLS Block 1B (Artemis 4,+) subsystems: Maintained Risks Issues Opportunities and agile method workgroup (scrum), resolved qualification directed requirements integration and verification, system performance & test campaigns, and resin system designs for production for the Universal Stage Adapter (USA).
- Authored and updated human systems safety & risk assessments documentation, navigating Army/Space-Force (DoD) requirements, tracing hazards to verifiable records in DOORS, and validating closure through test artifacts for the USA.
- Operated as a technical lead and program-level deputy, performing as the sole systems engineer and IPT lead for the United States site. Duties include performing compliance assessments and system readiness in accordance with NASA,

MIL, specifications. Supported SOW/specifications from a safety perspective, supplying measurable safety requirements, verification methods, and acceptance criteria.

- Acting as the technical locus between team and customer, encompassing contract and clause interpretation and negotiation, providing external status, and supporting internal quality systems optimization.
- Travelled internationally for NASA/Dynetics SLS Payload Separation System (Exploration Upper Stage subsystem). Spent 12 weeks in Linköping, Sweden site to resolve NASA-standard compliance deadlock with Leidos-Dynetics prime.
- Uncovered areas for production lifecycle improvements like material choice process and fastener torquing methodology. Piloted a study for lowering the time-to-customize clamp band separation systems for different spacecraft to increase production rate. HEAVY USE of python for engineering products.
- Reviewed incident/fielding data, determined user risk levels, and coordinated mitigations (hardware/software updates), closing hazard records; as well as change, waiver, and exemption requests for payload adapter clamp band assembly, assessing safety implications, updating the hazard log, and recommending acceptance/mitigation dispositions
- Pushed for collaboration to change in manufacturing philosophy from Swiss sequential processing to more American style linear adjacent flow. Developed a rate-plan for a tiger-team initiative on an alternate production line, set to achieve a two-week takt time on Vulcan's aft skirt heatshield.
- Balanced requirements for human rating and manufacturability. Encompassed tests, product development opportunities, project milestones, and impacts between other trades. Worked production flow across portfolios, contributing to organization-wide internal product development, CFRP knowledge generation, technical documentation updates, reduced cost and mitigated risk.

PRINCETON AIRPORT **Flight Coordinator** – Princeton, NJ (40+ hours per week)   *2016-2017; 2013-2014*
- Interpersonal and Communication Skills: Formed strong relationships across a diverse group of students, renters, transients, and maintenance technicians; running front desk, point of sale and supplier part & material ordering.
- Fleet Coordination and Scheduling: Managed flight schedules for over 60 active student pilots and 100 aircraft renters, optimizing aircraft assignments based on capability, anomalies, and time constraints.
- Multitasking and Operational Management: Concurrently monitored air and ground traffic, operated fuel pumps for various aircraft, and balanced risks, logistics, and schedule flow directly under the airport director.

Experience

Undergraduate Practical Research Summer 2020-2022 **(Cal Poly Aerospace)** (40+ hours per week)
- AIAA and INCOSE Publications: Authored and presented papers on managing complexity in high-reliability organizations at prestigious conferences (AIAA SciTech 2022 paper #2022-0994 Managing Complexity through Quantifying Communication in High Reliability Organizations, paper #129 Managing Complexity through Collaborative Intelligence INCOSE Detroit Intl. Symposium). Papers focused on quantifying communication and collaborative intelligence, underlining novel approaches to enhancing operational efficiency in aerospace environments, including numerical methods and natural language programming theories.
- Systems Engineering Research: Conducted in-depth studies on systems engineering practices within private and government aerospace sectors. Developed frameworks and system concepts aimed at reducing faults and elevating process improvement by revolutionizing communication strategies for development and manufacturing using SysML and other requirement languages
- Innovative Research Methods: Excelled in defining research scopes, synthesizing between sparse sources, and integrating granular details into overarching concepts. Specialized in creating connections between theoretical research and practical applications in aerospace engineering. Familiar with MBSE, SML, DOORS
- Mathematical Modeling for High-Reliability Organizations: Innovated a unique mathematical modeling philosophy to integrate principles of high-reliability organizations into teams and workforces. The goal is to find deep patterns in language and behaviour that enable positive control of emergent properties in design.

Aerospace Capstone Spacecraft Design 2020-2021 **(Final Undergrad Project - Interstellar Object imaging)**
- System concept development and interdisciplinary coordination for ground systems comms and C&DH subsystems, elucidating the models necessary for 5 per pixel resolution at 10km/s fly by speed, only six months after Interstellar Object Discovery (ISO).
- Wrote and organized system breakdown structure and CONOPs for a ground system strategy to ensure operational capacity for high level science team requirement of enabling a 7 AU range for 100kbps data downlink in under nine months.
- Collaboration across orbital dynamics, propulsion, and science teams to devise MATLAB simulation to meet intercept window.

- Creation and ownership of part tracking and documentation for the spacecraft propulsion component tree following best practices and procedures, system safety reports, and addressing customer questions and requirements.
- Conducted deep dive trades on science collection to balance mission resilience and objectives to recommend launch profiles.

Cal Poly Hyperloop 2018-2019 **(SpaceX Hawthorne pod competition)**
- Work in a dynamic environment of inter subsystem coordination (SE) and systems integration (T&E), resulting in the team placing top 22 finalists out of ~130 in a world wide competition with a small, purpose driven team of 30 first-time-competing students.
- Authored test manual documentation and did risk mitigation for braking system, rotor-pads; performed heat transfer and material loss experiments and data analysis (Matlab 2020a) capable of supporting a deceleration from 80mph to 0mph in under 8 seconds.