Santiago Hopkins

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EDUCATION

University of California, Berkeley

GPA: 3.81/4.0

B.S Mechanical Engineering, Minor in City and Regional Planning **Anticipated Graduation:** 2025

- **Accomplishments:** NCAA Division I Student-Athlete (California Men's Soccer)
- **Awards:** Eloi Vasquez Memorial Scholarship Recipient, Spring 2022 Big C Society Inductee, Pac-12 Fall 2023 Academic Honor Roll

EXPERIENCES

Zoox - *Mechanical Design Engineering Intern* **05/2024 - 08/2024**

Water Contact Angle (WCA) Measurement Automation Tool -- *Advanced Hardware Engineering*

- Developed design criteria and core functionality for an automated WCA measurement tool to accurately assess solar and natural degradation of hydrophobic coatings on onboard camera lenses, both in controlled lab environments and during routine maintenance checks
- Implemented using Python and C++, leveraging OpenCV2 for computer vision tasks and the LSQ-Ellipse library for precise ellipse fitting
- Applied Gage R&R methods to validate the on-fleet WCA automation tool, achieving ±5° accuracy, and reducing processing time by ~60%

Characterization and Validation of Sensor Contamination Mitigation (SCM) Module Wash System -- *EE Systems*

- Designed a validation procedure for alternative external gear pumps and solenoid manifolds to adhere to current Zoox cleanability standards
- Developed sturdy mounting fixtures for the pump and valve manifold using CATIA v6, enhancing functionality and limiting vibration
- Developed communication protocols with CAN for valve control and LIN for pump control, enabling 10hz pump motor state messaging
- Used IPEMotion, LabView, and Python to design user test interfaces to monitor pressure in real-time during the wash system cycle
- Created a 1-D hydraulic circuit model in GT-Suite, incorporating localized and distributed losses, and achieved approximately 8% accuracy

Formula Electric at Berkeley (FSAE Driverless) – *Autonomous Mechanical Systems Lead* **01/2023 - 08/2024**

Autonomous Braking System (ABS) -- *Project Supervisor*

- Established design criteria and general timeline for the 1st iteration of an autonomous braking system for a Formula Student-style EV vehicle
- Designed an Emergency Brake System (EBS) via mechanical and electrical methods, enhancing existing fail safes for an 18ms response time
- Developed pneumatic circuit using pistons to pressurize front and rear brake hose in parallel w/ brake pedal, enabling safe testing methods
- Developed low-level controller for variable pressure regulator and solenoid valve, integrating pressure transducers and IMU acceleration data

Autonomous Steering System (ASS) -- *Project Supervisor*

- Led development and integration of modular robotic steering system to mimic human steering inputs, achieving lock to lock steering in <1s
- Designed belt drive system with custom HTD-5mm pulleys, and built an in-house hall-effect absolute rotary encoder to prevent overturning
- Integrated driving motor via CAN communication, and configured microcontroller to perform rapid adjustments via a tuned PID controller

LiDAR, Camera, and Compute Sourcing, Mounting, and Positioning -- *Project Supervisor*

- Led CAD and fabrication of mount to dynamically and safely position LiDAR sensor on vehicle with up to 35 degrees of possible adjustment
- Collaborated with computer vision software engineers to find optimal "push-broom" angles to produce the optimal sensor fusion.
- Used Nvidia's CUDA on Jetson Orin NX to reduce self-driving stack frame processing from ~1500ms to ~80ms , a 95% reduction

Institute of Transportation Studies | Smart Cities – *Undergraduate Research Assistant* **05/2023 - 08/2023**

- Using VTA traffic data, developed a robust Python model visualized with Kepler.gl to analyze traffic patterns in a scenario w/o public transit
- Began initial data acquisition and modeling for a scenario where the City of Berkeley removed 'Berkeley Barriers' from certain intersections

World Surf League | Kelly Slater Wave Co. – *Wave Systems Engineering Intern* **05/2023 - 08/2023**

CFD Prototyping and Validation for Artificial Wave Generator | *Technical Project Lead*

- Found optimal bathymetry shapes for novel and proprietary wave generation technology for commercial use using SimCenter STAR-CCM+
- Led CAD development and on-site implementation of experimental methods to validate CFD metrics, such as resultant force, vortex ratio
- Analyzed over 20 hours of wave video to analyze wave shape and logged and presented necessary metrics to inform design revisions

Cross-Shore Wind-induced Changes to Field-Scale Overturning Wave Shape **08/2023 - 12/2023**

- In conjunction with USC and Scripps researchers on a continuation of this project, published in Cambridge's Journal of Fluid Mechanics
- Quantified effect of differing wind speed and direction on wave shape using advanced CFD techniques, such as overset mesh

PROJECTS

Predicting Bee Colony Success using Machine Learning – *Technical Project Lead* **01/2023– 05/2023**

- Led technical development of 10 classifier and regressor algorithms on open source 'Smart Bee Colony' tabular and audio data files
- Analyzed more than 15 hours of bee colony audio files using MFCC and Lasso Regularization for 'best features' selection
- Predicted bee colony success with around 85% accuracy using SciKit Learn's ExtraTreesClassifier and built in scoring metrics (F1 scoring)

Wind Turbine Optimized for Stiffness and Power Output – *Aerodynamics Lead* **08/2021– 12/2021**

- Led CAD focused on optimizing wind turbine airfoil design and pattern in order to maximize power output from winds up to 25 mph
- Used Solidworks FEA to estimate expected stiffness and to inform design and revisions of the tower's single adhesive joint
- Measured overall power output and stiffness, achieving power output in the 95th percentile and and stiffness in the 90th percentile

SKILLS

Hardware: SolidWorks, CATIA v5/v6, Siemens NX, Ansys, Mechanical Design, Mechatronics, Controls, Robotics, CFD (STAR-CCM+)
Manufacturing: Technical Drawings, GD&T, CNC Machining, WaterJet, LaserCutting, FDM/SLA 3D Printing, Lathe, Mill, Drill Press
Software: Git, Python, C++, GT-Suite, IPEMotion, MATLAB, Machine Learning, Neural Networks
Product Management: Product Development, Time Management, Team Management, Interpersonal Communication, Decision-Making, Resilience