

ABHAY SHUKLA

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EXPERIENCE

FRC 604: Quixilver Robotics

Controls/Software Lead (10-11)

2022 - Present

California

- Enhanced robot capabilities with computer vision and sensor integration, contributed to team software (particle filter localizer, time-optimal trajectory optimizer, annual robot control architecture). Developed team's competition data collection application Quicksout.
- Developed a progressive web app for TheBlueAlliance, modernizing the univerally used platform and providing comprehensive, real-time access to all competition and team data over 30+ years.
- Led subteams in design, manufacturing, and programming of FRC team robot while teaching new members about robot development.

UCLA COSMOS (CA Summer School for Mathematics & Science)

Brain-Inspired Computing Cohort Member

2024

California

- Conducted deep analyses of the computational principles and neurological correlations of 20+ key machine learning mechanisms (attention, visual processing, recurrent systems, reinforcement, etc), gaining a comprehensive understanding of their capabilities and limitations.
- Developed StereoSampleGAN with UCLA funding to generate high quality stereo audio samples with a 99.77% reduction in training epoch count and and 9.56x reduction in parameter count compared to compared to monophonic audio generation models SpecGAN and WaveFlow.

Bay Area STEM Academy

Cofounder

2023 - Present

California

- Taught 700+ elementary to high school students diverse STEM topics via numerous in-person and online workshops covering Robotics, Engineering, Machine Learning, and Programming Fundamentals.
- Raised \$6000+ to support local STEM outreach initiatives for underrepresented communities and children health foundations, recruited 15+ academy mentors.

PROJECTS

StereoSampleGAN

GitHub Repo: <https://github.com/shuklabhay/stereo-sample-gan>

- WGAN-based computationally efficient approach for generating high-fidelity stereo audio samples. Leverages attention mechanisms, optimized loss functions, and effective signal processing. Research partially funded by UCLA and pending publication.
- New architecture overcame low-quality and monophonic limitations of existing audio generation methods with a 99.77% reduction in training epoch count and 9.56x reduction in parameter count compared to compared to SpecGAN and WaveFlow architectures.

Quicksout

GitHub Organization: <https://github.com/frc604>

- Developed scalable and flexible robot performance analysis application for multimodal FRC event data collection and visualization. New captured metrics empower informed strategic decisions at high-stakes competitions, contributing to the team's international success.
- Supports 130+ users on FRC604, data collected for 700+ team robots over 1 year. Trained 10+ team members in webdev to build app and expand application capabilities to fit annual challenges.

Domotron

Robot Website: <https://604robotics.com/2023-2024-crescendo/>

- Developed computer vision and physics-based shot calculations, driver control automation, and competitive autonomous routines for world championship division winning robot.
- Designed climber winch mechanism and robot vertical elevator, maximizing robot's competitive capabilities and earning the robot the Industrial Design, Innovation in Control, and Autonomous Awards.

EDUCATION

Leland High School

Junior

4.00 UW A-G

San Jose, CA

SKILLS

Technical Fields

AI/ML, Robotics, Signal Processing, CAD, 3D Printing, Webdev/Appdev

Other

Digital Audio Production, Graphic Design, Video Editing

HONORS & AWARDS

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|-----------------------------------------------------------------------------------------------|------|
| • FRC604: World Championship Milstein Division Winner (12/3500 Internationally + 4/300 in CA) | 2024 |
| • NextFlex FlexFactor: Entrepreneurship Competition Winner (1/260 in CA) | 2024 |
| • OneHacks III Hackathon: Third Place (3/120 Internationally) | 2023 |
| • SCU/SVUDL Invitational: PF Debate Finalist (2/140 Internationally) | 2022 |