ABHAY SHUKLA

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EXPERIENCE

FRC 604: Quixilver Robotics 2022 - Present
Controls/Software Lead (10-11) *California*

- Enhanced robot capabilities with computer vision and sensor integration, contributed to SOTA team software (particle filter localizer, time-optimal trajectory optimizer, annual robot control architecture). Developed team's competition data collection application Quickscout.
- 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) 2024
Brain-Inspired Computing Cohort Member *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 2023 - Present
Cofounder *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 effiicent 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.

Quickscout
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 *4.00 UW A-G*
Junior *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

- 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