Joseph McKee

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Profile

- Passionate engineer with 6+ years building cutting edge consumer electronics products in the fields of real-time signal processing and machine learning.

- Track record of delivering technical algorithm-based solutions for audio conferencing (Dolby), and long range LiDAR systems for autonomous vehicles (Baraja).

- Expert level proficiency in embedded C/C++, Python and MATLAB.

- Competent with modern machine learning and data-science frameworks, including pytorch, scipy, numpy, cupy (CUDA), pandas, xarray and SQL.

- Strong skills in CI/CD practices, including the metrication and functional testing of algorithm-based software.

- Mentor of growing engineers working in both very small and large team environments.

Key Accomplishments

- Designed algorithms to improve Baraja LiDAR detection performance by reducing false alarm rate through the estimation of receiver noise and laser side-mode interference.

- Led a cross-functional team to significantly improve detection of distant dark objects for Baraja's direct-detection LiDAR.

- Delivered real-time audio processing algorithms for Dolby Voice interactivity solutions, including beamformers, echo cancellers, noise suppressors and network resilience algorithms.

- Helped deliver Dolby's innovative spatial audio capture solutions from concept through to factory testing and production.

- Presented novel data-driven audio capture design methodology at company's annual tech leadership summit.

- Led student team to develop adaptation of 802.11g PHY for high data rate OFDM communication for a 1U cube-satellite.

Work & Experience

Senior Algorithm Engineer, Baraja (08/2021 - present)

- Developed novel noise reduction algorithms for Baraja's direct-detection LiDAR resulting in successful demonstrations at CES to form new potential customers.

- Validated and improved key sensor metrics including noise floor, sensitivity and spectrum through system engineering methods and a simulation tool.

- Implemented DSP processing chains from scratch, with CUDA GPU acceleration, and built CI/CD pipelines for the team.

- Constructed an LMSE optimisation approach to laser calibration that improved product build quality by enhancing distant dark object detection.

- Utilised genetic algorithms and DNNs to enhance robustness to various error sources such as band-limiting, phase-noise and thermal noise.

<u>Staff DSP Engineer, Senior DSP Engineer, DSP Engineer, Dolby Australia (10/2016 - 08/2021)</u>

- Designed real-time audio firmware and DSP features for Dolby Voice, including noise suppression, echo management, network codec support, and media streaming.

- Designed and helped bring to market a data-driven algorithm for generating ambisonic sound-fields for arbitrary microphone arrays, unlocking a large new business opportunity for Dolby with partners in consumer electronics.

- Specified production factory tests for a line of conference phones, and guided their implementation in China.

- Analysed large amounts of production data to identify failure trends and inform necessary changes to the factory processes.

- Developed Python packages to evaluate audio performance objectively and automate data collection, enabling rapid prototyping.

- Lead the development of the automated tuning of capture and playback algorithms for all Dolby Voice enabled devices from Dolby's Poland office.

- Co-maintained the Jenkins CI framework with the scrum team, employing pytest for functional tests, and C for unit tests.

<u>Student Engineer & Team Lead, Melbourne Space Program (2015-2016)</u>

- Led a team of students to develop a high-data-rate OFDM telecommunication system for the Melbourne Space Program's first 1U cube-satellite.

- Designed and implemented real-time optimised algorithms for the full telecomms data-pass on an Analog Devices TigerSHARC DSP processor, within the computation budget.

- Fostered growth in new team members by explaining system architecture and working with them on their individual contributions.

- Worked with other engineering teams through integration challenges.

Education & Achievements

- University of Melbourne (2011-2016)
  - Masters of Electrical Engineering (H1 First-class honours).
  - Bachelor of Science, Mechanical Systems (H2A second-class honours)
- Won first place legal prize at Dolby's annual IdeaQuest in 2018 and 2021. Obtained patent for invention.
- Built many interesting IoT projects with ESP32s at home, with the purpose of educating the younger generation on STEM. Such projects have included:
  - A voice-interactive smart-speaker from scratch, to interface to popular cloud-based natural language processors.
  - A PID-controlled inverted pendulum cart balancing a tennis ball,
  - A fun network DSP framework (in C/Python/JS to stream real-time sensor data across networked devices, and visualise the data live in the browser with plotly.js.

References

Available on request