Janghyup Sohn

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Education

Purdue University   December 2022
Bachelor of Science in Neuroscience   *West Lafayette, IN*

Professional Strengths

- **Full-Stack Product Development Expertise**: Directly led and executed every aspect of building innovative hardware/software, from customer research and systems architecture to hands-on development and deployment. I have leveraged my wide-ranging skillset to deliver perception and generative AI services in the form of SaaS web, iOS App, and embedded robotics products.

- **Leadership in Engineering Innovation**: Leading as a founder and CTO, I have navigated the complexities of startup environments, making deeply informed critical engineering decisions to ship high-performance products under tight timelines. I have experience in effectively rallying an organization around a focused vision, such that team members feel intrinsically motivated and stakeholders feel confident in the organization's objectives and product market fit.

Experience

Military Service   Dec 2018 – Aug 2020
Republic of Korea Army, SGT   *Camp Humphreys, South Korea*
- Served as Korean Augmentation to the US Army (KATUSA) in the role of field translator in the 501st CBRNE Technical Escort Company, 23rd CBRNE Battalion, 2nd Infantry Division, US 8th Army

HYDO   Oct 2020 – Dec 2021
Solo Developer   *Seoul, South Korea*
- Received 7,000,000 KRW in K-STARTUP grant funding from Korea Institute of Startup & Entrepreneurship Development to develop a computer vision-based cycling safety system.
- Designed and implemented patent-pending overtake prediction algorithm.

Boreal Bikes   Feb 2022 – Apr 2022
Machine Vision Developer   *Berlin, Germany*
- Implemented multi-camera object detection and fusion, enabling clients to benchmark novel computer vision models on Boreal Bikes research bike platform.

                                                        May 2022 – May 2023
Chief Technology Officer   *Berlin, Germany*
- Architected and integrated all hardware and software for Holoscene Salzburg, a sensor-rich research bike as part of Austrian Research Promotion Agency's "Future of Mobility" program (Bike2CAV).
- Conducted two 3-day seminars for the Bike2CAV symposium where I gave in-depth tutorials of camera, LiDAR, V2X, and vehicle kinematics dataset collection, visualization (Foxglove) and postprocessing (PyTorch loaders) to a group of graduate & PhD candidates.
- Led a joint development team at DLR (German Aerospace Center) to deliver Bobbi, a Boreal Bikes research bike with a particular focus on software-defined motor control and in-house fabrication of the e-drive system.
- Collaborated with Prof. Holgar Caesar (Intelligent Vehicles Lab, TU Delft) to produce detailed specifications for Holoscene Delft, with a view to creating a cycling equivalent of his renowned nuScenes benchmarking dataset. The proposal received 30,000 EUR from "Climate Action Research and Education Seed Call" award.

Tozoa   Jun 2023 – Jan 2024
Founder   *Seoul, South Korea*
- Led a small team in creating, marketing, and expanding PrepGPT, an LLM-based tool for generating new and high-quality Digital SAT questions and answers on demand, reducing educational material acquisition costs by 20x for educators and improving study experience for students.
- Starting fully bootstrapped, achieved 11,000 USD in revenue from pre-made exams using PrepGPT within the first month of launch.
- Shipped PrepGPT Assistant, a Chrome browser plugin for tight integration with a client's existing student management and test administration platform, increasing productivity for teachers.
- Currently developing Velovision Rearview, a small wireless cycling camera for use with Velovision, an overtake prediction and warning application that uses Neural Engine on iPhone for on-device inference.

Projects

HYDO Velovision | *Python, PyTorch, OpenCV, Kalman Filtering, NVIDIA Jetson*   HYDO
- **Challenge:** To build a computer vision pipeline incorporating deep learning and accurate trajectory prediction post-processing under strict latency and power consumption budgets. With no existing cycling datasets, I had to build one from the ground up.
- **Innovative approach :** I developed a bounding box fusion algorithm using pre-trained object detection models to automatically label cyclists, pedestrians, and motor vehicles in my own cycling onboard videos. This created a unique dataset that existing models couldn't distinguish.
- **Solution advantages:** A patent-pending system that runs on NVIDIA Jetson at 30fps under 10W, able to track cyclists and overtakes 4 seconds in advance at 90% accuracy.
- ⬡ Open-sourced on Github: hydoai/velovision

Holoscene Research Bikes | *ROS2, Livox LiDAR, Foxglove, Teensy, UART & I2C, V2X, PCB Design, VESC, Websockets*   Boreal
- **Challenge:** To develop a two-wheeled AI perception platform for research, balancing user-friendly dataset collection for non-technical users with advanced customizability for developers, two often opposing requirements.
- **Innovative approach :** I developed the operating system with modular, containerized ROS2 nodes, allowing us to provide a standard sensor suite and custom integration for specialized sensors as needed by our clients. Additionally, I created an intuitive web interface on top of our OS to for easy operation by non-technical users. Choosing to build on open standards meant that advanced users were empowered to further enhance the bikes' functionality.
- **Solution advantages:** Our platform's flexibility allowed us to select cost-effective components suitable for any mobility AI project and eliminate code duplication.
- 🌐 Holoscene Salzburg for Bike2CAV
- 🌐 BoBBi for DLR (German Aerospace Center)

PrepGPT | *Javascript, React, Next.js, Vercel AI SDK, AWS EC2 and DynamoDB, LaTeX*   Tozoa
- **Challenges:** Scaling OpenAI's GPT-4 to surpass previous materials in generating diverse, high-quality SAT questions required extensive prompt engineering and still necessitated expert review. Additionally, presenting these results required a user-friendly web application.
- **Innovative approach :** I crafted internal audit tooling and cloud-based workflows to form tight feedback loops between our prompt engineers and expert reviewers. I used Vercel's new AI SDK to present the results to users in an inutitive, clean Next.JS web app.
- **Solution advantages**: With just two prompt engineers and three part-time reviewers, we created over 3200 test questions in a month, leading the market in practice tests for the new Digital SAT format. We enhanced the raw output to a degree that allowed us to market the LLM-based generation system as-is.
- 🌐 Try PrepGPT Demo

Velovision Rearview | *Rust, SLS 3D printing, Design for CNC, EasyEDA,SMD Soldering*   Tozoa
- **Challenges:** Simply put, designing consumer hardware. More specifically, ensuring good image quality, long battery life, reliable wireless communication, indefinite standby time, and strong water resistance in a sleek design, all while minimizing production capital costs and supply chain risks.
- **Innovative approach:** I leveraged novel additive manufacturing processes to produce the tough yet beautifully textured external shell. I used my PCB design experience to produce a very compact power controller board that handles battery and button interactions. All components were modeled in Shapr3D. I wrote Rearview's web server in Rust, which was an excellent fit for the low-power and reliability requirements for this product.
- **Solution advantages**: Velovision Rearview material costs are projected to be less than 75 USD in our first production batch.
- ⬛ Velovision Rearview App (Apple App Store)

Open Source Projects / Contributions

ClassySORT | *Multi-Object Tracking, YOLOv8, SORT Tracker*   GPL-3.0 License
- ClassySORT is designed to be a state-of-the-art (SOTA) multi-object tracker (MOT) for use by the worldwide computer vision community. And bcause the You-only-look-once algorithm (YOLO) detector is pretrained on COCO dataset, ClassySORT can detect and count and track 80 different kinds of common objects 'out of the box'.
- This project has over 100 stars on Github.
- ⬡ Github: tensorturtle/classy-sort-yolov5

Pycycling | *Reverse Engineering, Bluetooth Low Energy, ANT+, Python Packaging (pip)*   MIT License

- A Python package for interacting with Bluetooth Low Energy (BLE) compatible bike trainers, power meters, radars and heart rate monitors
- I contributed major components of the library, such as Fitness Machine Service, which provides bi-directional communication with smart cycling indoor trainers, and Rear View Radar service, which interprets messages from Garmin Varia devices.
- Github: zacharyedwardbull/pycycling

Ultralytics YOLOv8 | *Reverse Engineering, Bluetooth Low Energy, ANT+, Python Packaging (pip)*   AGPL-3.0 License
- Ultralytics YOLOv8 is a cutting-edge, state-of-the-art (SOTA) model for a wide range of object detection and tracking, instance segmentation, image classification and pose estimation tasks.
- I contributed nuImages dataset support to help users fine-tune detection models on one of the best urban environment datasets. I also made small contributions to improve inference output formatting for video inputs.
- Github: ultralytics/ultralytics

Rebox | *numpy*   MIT License
- A Python package for easily converting between bounding box formats.
- I created this package when I noticed how much boilerplate code was being written by computer vision coders just to convert between the various ways of annotating 2D rectangular bounding boxes. This package implements vectorized conversions between popular formats.
- Github: tensorturtle/rebox

Technical Skills

Natural Languages: English (fluent), Korean (fluent), German (basic)
Programming Languages I love: Rust, Python, Swift, Javascript
Programming Languages I don't like, but have used: Typescript, C++20, Bash, LaTeX
Technologies: React.js, Next.js, Astro JS, Vercel AI SDK, AWS (EC2, S3, DynamoDB, Amplify), Docker, Docker Compose, PyTorch, Github Actions, Linux (systemd, udev), Supabase, TailwindCSS,, PCB Design, FDM & SLS 3D printing for prototypes, CAD for CNC (Aluminum)
Tools: Vim, VS Code, XCode, Zed, Shapr3D, EasyEDA, Photoshop, Lightroom
Applications & Concepts: Deep learning, Computer Vision, Multi-modal LLM, Collaborative perception, ML Ops, Domain adaptation and transfer learning, V2X, LiDAR pointcloud, UART & I2C serial bus, Prompt Engineering, Reinforcement Learning, Neural Networks, Cellular Automata, Hyperspectual Imaging, GPS

Patents

- A BICYCLE WARNING DEVICE THROUGH OBJECT AUTOMATIC RECOGNITION AND A METHOD OF OVERTAKING WARNING USING THE SAME". Patent number: 10-2021-0163981. (Granted 2024-04-25)