WINXON NGUYEN
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EDUCATION

University of California-Los Angeles, Los Angeles, CA June, 2028
- *BS in Applied Mathematics w/ Specialization in Computing | BS in Statistics & Data Science*
- **Relevant Coursework***: Abstract Linear Algebra, Honours Physics, Discrete Structures, Differential Equations, Real Analysis, Data Structures & Algorithms, Numerical Analysis, Machine Learning*

EXPERIENCE & PROJECTS

VoroNav: Offline Navigation System for Autonomous Systems, *Developer*, Los Angeles, CA 2026
- Built a from-scratch parallel Voronoi engine, Jump Flooding, with **NumPy**, multithreaded **Numba**, and **PyTorch** backend to produce a bit-identical output and checked against an exact solver (**358 tests**). Diagnosed slow 64-bit math on Apple GPU and wrote a custom Metal kernel that sped it up 100×: a **2048² diagram in 14 ms**, 276× faster than NumPy.
- Designed a maximum-clearance Voronoi roadmap planner and benchmarked it against A*, *clearance-weighted A** and RRT* on 94 maps (4,100 queries, 58K planner runs). Its paths were at least as far from walls as A**'s in 99.5% of queries, with **70% more average clearance**. It tied tuned weighted A** on safety **with 1.5–3.6× faster queries**.
- Built an offline perception-to-planning pipeline (SAM 2 floor masks → bird's-eye grid → roadmap) and an error-injection study (190K graded plans) showing that clearance halves collisions from segmentation leaks but not from missed obstacles. On first-person video, collisions fell from **0.6–1.1% (A*) to ≤0.1%**, and a leak-detection gate I designed raised recall from **8% to 65%**.
- Building the stack's **state estimator (nav-ekf)**, a 15-state error-state Kalman filter fusing **IMU and GPS**. Derived by hand, verified it against finite differences, and ported it to **C++20/Eigen** to match the Python reference (1.2 µs per IMU step, zero heap allocations). It is statistically consistent in simulation (NIS 3.00 vs 3 expected). **Ran on real EuRoC drone flights,** traced its outage overconfidence to in-flight IMU noise 30–40× the data-sheet.

UCLA: Math + Code + Art, Los Angeles, CA April 2026-Present

Researcher
- Developed **Python** applications creating higher dimensional Voronoi tessellations in art and music. Built out visual **deep learning** model to measure art and music styles, and transfer art semantic across pieces.
- Deconstructed **Meta's Segment Anything Model (SAM) image encoder** with a faculty advisor to study its object-segmentation reasoning, then derived a custom Voronoi density-field equation that converts segmented images into multi-dimensional generative mosaics

Lead Developer
- Lead developer of VoroLens, an in-browser Voronoi Mosaic app for the Oceanside Museum of Art exhibition (Aug 2027). Implemented SlimSAM in **Python**, runs client-side via WebGPU/WASM in a Web Worker. Allows users to turn any general image into a Voronoi tessellation with variable number of centroidal nodes and image weights. Incorporated **Lloyd relaxation algorithm** to increase user control over their art piece.

BruinML: Fitted Residual Dynamics, *Researcher*, Los Angeles, CA September 2026- Present
- Paper proposing transformers as interacting particles. Records GPT-2's residual stream, fit an attention ODE across layers, and test the Geshkovski–Rigollet clustering and energy predictions against BERT/ALBERT controls.

PairRank: Pairwise Restaurant Ranking Under Noisy Conditions Study, *Developer*, Los Angeles, CA 2026
- Built a pairwise restaurant ranking web app w/ **Django REST, PostgreSQL,** and **Angular/ Typescript**. Simulated users with known preferences to measure how many "better or worse?" questions place an item in a ranked list when answers are inconsistent. Bayesian bisection **cut placement error 14× (2.88 → 0.20 positions)** but costed 5 more questions.
- Designed a simulated A/B test with a power analysis validated by 2,000 simulated experiments (481 users/arm for 80% power; A/A false-positive rate 4.35%). Verified by replaying 1,080 simulated transcripts with matching results.

CruX Neuroscience, *Developer*, Los Angeles, CA September 2025-June 2026
- Built an end-to-end **ETL pipeline** in **Python** processing live 16-channel EEG data into a real-time focus-state classifier; framing the task as binary classification enabled threshold-based decision rules.
- Exposed the classifier through a **Python API** integrated into users' existing workflows, cutting time-on-task by 60-80% versus baseline completion times reported on comparable public datasets.

a **Sharpe ratio of 1.38.**

TECHNICAL SKILLS

- *Computer Languages:* C++20, Python, C, TypeScripts, JavaScript, SQL, R
- *Tools:* Pandas, Eigen, NumPy, Numba, pybind11, PyTorch, CMake, GoogleTest, Django REST Framework, PostgresSQL, Docker, Regression, Time Series Analysis
- *Languages:* Fluent: English, Vietnamese, Mandarin
- *Awards:* Math Department (’22, ’23, ’25), CIF Athletic Scholar Award ’25, International Scholar ’25, SoCal Field Band (Gold 2021, Bronze ’22, Silver‘24), Louis Armstrong Award ’25