Do Hun Kim

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SUMMARY

Computer Science & Mathematics double major (**GPA 3.97 in-major**) with strong foundations in algorithms, systems, and machine learning. Proficient in **Python, PyTorch, Django, NestJS, SQL**, and distributed training frameworks; experienced across research, infrastructure, and production software.

- **Artificial Intelligence + Neuroscience Integration**
  Co-authored papers currently under review at ICLR and NeurIPS on perceptual-initialized ViTs and representation stabilization; built RSA pipelines to align human fMRI data with deep neural network embeddings using PyTorch DDP.
- **Scalable ML Infrastructure & Distributed Systems**
  Built multi-GPU training workflows with rank-synchronized checkpointing and O(n log n) RDM comparison, improving reproducibility and computational efficiency.
- **Production-level Full-Stack Engineering**
  Led backend and system design for real-time ride-matching and POS platforms (TriMed, CHERground) using Django, NestJS, MySQL, AWS, and Firebase.
- **Applied Problem Solving & Clean Code Practices**
  Applied Clean Architecture, dependency injection, and performance tuning (e.g., TypeORM optimization) across research and Agile startup environments.

SKILLS

Programming: Python, Java, JavaScript, TypeScript, C++, SQL
Frameworks & Libraries: PyTorch, TensorFlow, PsychoPy, Django, React Native, NestJS, Tailwind CSS
Systems & Tools: Docker, AWS (EC2, RDS, Lambda), Firebase, Git, Jira, YAML, OpenCV, pandas, NumPy

EDUCATION

B.S. Computer Science and B.A. Mathematics (Double Major) **Aug 2019 – May 2026**
Vanderbilt University, Nashville, TN

GPA: 3.60/4.0 overall, **3.97/4.0 in major**
Coursework: Algorithms, Foundations of Machine Learning, Applied ML, Operating Systems, Software Design, Programming Languages, Data Structures, Discrete Math, Probability & Statistics, Linear Algebra, Differential Equations
Research: Multimodal ML research on fMRI–model embedding alignment *(Tovar Brain-Inspired AI Lab)*
Focus Areas: Deep learning (PyTorch), distributed training (DDP), dimensionality reduction (PCA, RSA), behavioral supervision

PROFESSIONAL & RESEARCH EXPERIENCE

TriMed Emergency Transport App, *Founding Engineer, Startup* **Jul 2025 – Present**

- Leading system architecture for a real-time ride-matching app in underdeveloped regions (Bangladesh, Indonesia) as founding engineer.
- Spearheaded cross-platform mobile app with React Native, enabling real-time emergency and medical ride scheduling.
- Integrated Google Maps API for live tracking, routing, and ETA between patients and hospitals.
- Developed backend with Node.js, Express, Firebase Auth, Firestore, and AWS S3 for secure data and media storage.
- Preparing for 50-user pilot launch with full-stack MVP across web and mobile by Sep 2025.

Stabilizing DNN & Human Neuroimaging Embeddings, ***Tovar Brain-Inspired AI Lab,*** **Jun 2025 – Present**
Vanderbilt University (Advisor: Dr. David A. Tovar, MD, PhD)

- Explored instability in comparing fMRI-derived and DNN-generated embeddings across model architectures and seeds.
- Co-authored a robust alignment pipeline matching fMRI vectors with ViT, AlexNet, and ResNet representations using RSA.
- Conducted large-scale multi-GPU training with PyTorch DDP; implemented vectorized RDM computation and PCA-based compression.
- Developed an O(n log n) outlier detection method, reducing embedding alignment runtime by 60% while improving experiment stability.

Perceptual Initialization of ViTs, ***Tovar Brain-Inspired AI Lab, Vanderbilt University*** **Apr 2025 – May 2025**
(Advisor: Dr. David A. Tovar, MD, PhD)

- Tackled the challenge of improving vision-language model generalization by initializing image encoders with human perceptual structure.
- Implemented a perceptual-seeded ViT initialization pipeline using human-derived triplet embeddings and combined it with CLIP's contrastive loss.
- Trained on 8 GPUs using PyTorch DDP and optimized for zero-shot transfer across benchmarks.
- Achieved a 2–3% accuracy gain on ImageNet-1K within 15 epochs, outperforming standard random and Kaiming initializations.

Multimodal Learning Plasticity over Development, **Jan 2025 – Present**
Tovar Brain-Inspired AI Lab, Vanderbilt University (Advisor: Dr. David A. Tovar, MD, PhD)

- Designed and implemented a behavioral paradigm in PsychoPy to study audiovisual learning using novel shape-tone pairings across passive, active learning, and matching phases.
- Engineered a trial-logging pipeline that recorded reaction times, accuracy, and stimulus mappings to CSV for downstream machine learning and neural analysis.
- Pilot tested the task with interleaved trial types and real-time feedback; this serves as a foundation for the upcoming *Audiovisual Object Embeddings over Development* project involving large-scale behavioral data and neuroimaging.

REACH Mobile App, ***Personal Project*** **Jun 2024 – Mar 2025**

- Aimed to design a scalable, user-friendly social platform tailored to college students for anonymous school-related discussions.
- Served as frontend developer in an Agile SWE team led by a Goldman Sachs engineer; contributed across mobile and backend integration.
- Built core UI components using React Native and Tailwind, and designed the post/comment schema to support dynamic threading.
- Implemented OTA updates via Expo Go and optimized authentication and caching for responsive user interaction.

CHERground POS Refactor, ***Back-End Engineer Intern, Startup*** **Oct 2021 – Dec 2021**

- Faced critical performance issues in a production POS system handling over 10K transactions per month at a fashion startup.
- Took ownership of backend refactoring using TypeScript and NestJS, focusing on system stability and modular design.
- Applied Clean Architecture principles with dependency injection, and optimized TypeORM through caching, batch inserts, and index tuning.
- Achieved a 70% reduction in checkout latency and fully eliminated deadlocks during high-concurrency access.

Movie Ticketing Web App, Web Development *Bootcamp* **Oct 2021 – Oct 2021**

- Tackled the challenge of building a scalable movie booking backend that could handle concurrency and third-party login integration.
- Co-led backend development using Django and Docker, focusing on reliability under concurrent booking scenarios.
- Designed APIs for social login, reservation flow, and seat conflict resolution; deployed on AWS EC2 behind an Application Load Balancer.
- Improved session/token authentication stability and completed load testing under simulated multi-user conditions.

E-Commerce Web App, Web Development *Bootcamp* **Oct 2021 – Oct 2021**

- Developed RESTful APIs for users, products, carts, and reviews using Django; implemented full CRUD with auth.
- Deployed to AWS EC2 with RDS backend; gained hands-on experience in database ops, DevOps, and team integration.

PUBLICATIONS

- Yang Hu, Runchen Wang, Stephen Chong Zhao, Xuhui Zhan, **Do Hun Kim**, Mark Wallace, and David A. Tovar, "Beginning with You: Perceptual-Initialization Improves Vision-Language Representation and Alignment," Under review at IEEE International Conference on Learning Representation (ICLR), 2025, *arXiv preprint arXiv:2505.14204*, May 2025
- Grace Ko, **Do Hun Kim**, Zheling Zhang, Lening Nick Cui, Mark Wallace, and David A. Tovar, "Stabilizing DNN–fMRI Alignment via Iterative Seed Normalization.", *Under review at the Conference on Neural Information Processing Systems (NeurIPS), 2025*

HONORS AND COMPETITIVE ACHIEVEMENTS

- **USAMO Qualifier** — Qualified for the United States of America Mathematical Olympiad
  - Based on AMC 12 score of 138/150 (1st place in South Korea) and AIME score of 10/15
- **Honor Roll of Distinction**, Mathematical Association of America
  - Awarded for top percentile performance in AMC and AIME
- **Dean's List**, Vanderbilt University (3x)
  - Recognized for academic excellence (GPA threshold per semester met over 3 terms)
- ***WECODE Bootcamp Certificate***
  - Completed backend engineering training using Python/Django in an intensive team-based program (Jul–Oct 2021)