SIJIE (SKYLER) HAN

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RESEARCH INTEREST

I am passionate about developing intelligent systems at the intersection of **computer vision**, **embodied AI**, and **robotics**. My research focuses on designing realistic simulation environments to train autonomous agents, enabling them to reason, plan, and adapt in complex, dynamic settings.

EDUCATION

University of Toronto *Sep 2023 - Present*
BASc in Engineering Science, Robotics Major & AI Minor — GPA: 3.83/4.0

Relevant Coursework: Deep Learning, Electronics for Robotics, Computer Vision, Control Systems, Robot Modeling and Control, Microcontrollers

SKILLS

Programming Languages	C/C++, Python, Java, Javascript, MATLAB, React Native
Tools and Frameworks	ROS/ROS2, Isaac Sim, Unreal Engine, Gazebo/RViz
ML Libraries	PyTorch, TensorFlow, Nvidia cuDNN

EXPERIENCE

CSAIL, Massachusetts Institute of Technology Sep 2024 - Present
Embodied AI Research Intern *Cambridge, MA (Remote)*

- Worked with Prof. Antonio Torralba, Kabir Swain, and Sony AI collaborators to co-develop **VirtualEnv**, a large-scale **Unreal Engine 5 simulation platform for embodied AI**, implementing procedural 3D scene generation, interactive assets, and benchmarking pipelines.

- Built the **dataset and evaluation stack** (8k+ scenes, 120k daily tasks), integrated LLM backends for smart agent control (vLLM, GPT-4o, Claude 3), and developed failure-mode logging tools; co-authored the **AAAI 2026 accepted paper**.

- **Ongoing:** extending this work toward new research directions in **prompt-to-3D environment generation**, detailed in the project section.

People, AI, & Robots Research Group, University of Toronto Apr 2024 - Aug 2024
Robotics Research Intern *Toronto, ON*

- Built chemistry-focused digital twins in NVIDIA **Isaac Sim**, enabling safe training and validation of robotic manipulation algorithms before deployment to physical lab environments.

- Developed dynamic texture and camera pipelines that improved robustness of vision-based policies against real-world variability.

- Integrated **SAM2** (Segment Anything Model 2) with **rospy** and NVIDIA FoundationPose, boosting pose estimation accuracy by **17%** in the real-world setup, enhancing robotic arm reliability in manipulation on chemical lab equipments.

aUToronto   Sep 2023 - Jun 2024
Autodrive Team Member, Tracking Division   *Toronto, ON*

- Processed multimodal ground-truth data (LiDAR, radar, camera) to benchmark tracker performance, improving object persistence tracking by **23%** in adverse weather and lighting.
- Implemented tracking methods (**Kalman Filter**, **HMMs**) in **ROS2**, reducing dynamic object position uncertainty and enabling reliable 2D-to-3D projection tracking when LiDAR was degraded.

PROJECTS

Under Review Project   Aug 2025- Dec 2025

- Led a generative embodied AI simulator development extending CSAIL's **VirtualEnv**; developed a **text-to-3D environment generator** that converts natural language prompts into an interactable 3D environment using **vision-language models (VLMs)**; this work is currently **under review at CVPR**.
- Implemented the full **Unreal Engine 5 pipeline** for procedural asset spawning, rule synthesis, and level design, creating dynamic benchmarks to evaluate agent robustness under domain shift.
- Built a **web-based live Unreal session interface**, supporting real-time visualization, iterative AI feedback, and direct scene editing (e.g., snapshots, camera movement, object spawning), enabling interactive AI-in-the-loop 3D environment construction.

Polarity Analysis   Apr 2023 - Aug 2023

- Analyzed **110,000+ user reviews** from 39 suicide-prevention apps using an NLP pipeline (lemmatization, TF–IDF vectorization, stopword removal), producing high-quality datasets for supervised sentiment modeling.
- Benchmarked five classifiers (GaussianNB, MultinomialNB, Logistic Regression, SGD, Random Forest); the best-performing **Random Forest** achieved **F1 = 87.2**, later integrated with thematic coding ($\kappa = 0.81$) to extract actionable UX insights for app design.

PUBLICATIONS

- K. Swain, **S. Han**, A. Torralba, **Under Submission**, ICML 2026
- K. Swain, **S. Han**, A. Torralba, **Under Review**, CVPR 2026
- K. Swain, **S. Han**, A. Raina, J. Zhang, S. Li, M. Stopa, A. Torralba. **VirtualEnv: A Platform for Embodied AI Research.** *AAAI 2026.*
- K. Darvish, A. Sohal, A. Mandal, H. Fakhruldeen, N. Radulov, Z. Zhou, J. Choi, **S. Han**, B. Zhang, J. Chae, S. Veeramani, A. Wright, Y. Wang, H. Darvish, Y. Zhao, G. Tom, H. Hao, M. Bogdanovic, G. Pizzuto, A. Cooper, A. Aspuru Guzik, F. Shkurti, A. Garg. **MATTERIX: Towards a Digital Twin for Robotics-Assisted Chemistry Lab Automation.** *Nature Computational Science*, 2025.
- S. Okuboyejo, **S. Han**, S. Jha, C. Eneja, R. Orji. **Insights from User Reviews to Improve Suicide Prevention Apps: A Machine Learning and Thematic Analysis-Based Approach.** *International Journal of Human–Computer Interaction*, 2025.

REFERENCES

Prof. Antonio Torralba	torralba@mit.edu
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Dr. Ayush Raina	ayush.raina@sony.com