Nik Kim

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Research Interest

My broad research interests are:

- Cooperative AI
- Machine learning, especially crossbreeding traditional and modern approaches.
- Game (system) design and development.
- Mixed research method.

Links

Works	Profiles	Writings	Codes	Videos
Website	***Profiles***	***ML Blog***	***GitHub***	***YouTube***

Education

Carnegie Mellon University — Pittsburgh, PA, U. S

M.S. Computational Design — Expected 2025.05

- Thesis topic: Developing Little Cooperative Machine Agents

Dongguk University — Seoul, Korea

B.S. Architecture — 2019.08

Research Experience

Little Cooperative Machine Agents – *ongoing*

Master's Thesis, Advisor Committee: Daragh Byrne, Vernelle Noel, School of Architecture. Paul Pangaro, School of Design – CMU, Pittsburgh, USA

My research focuses on modeling the real-time cooperative machine agent by genuinely interbreeding different machine learning algorithms – reinforcement learning, subsumption architecture and recursive intention reasoning. This approach intriguingly integrates machine learning theories from ML, Robotics and Psychology.

- Research Question: How can machine agents be designed to cooperate with human players in real-time?
- Here, I propose little machine agent that holds four characteristics – 1) learn game environments and rules, 2) learn optimal mode of cooperation, 3) learning should be real-time online learning, 4) agents facilitate two-way communication and feed-back system.
- I tackle this problem by extensively analyzing, deconstructing, and crossbreeding various machine learning methodologies across different domains.

Human-Machine Guitar Hero

Independent Study, Advisor Prof. Paul Pangaro, School of Design – CMU, Pittsburgh, USA

I implemented a "Play with" cooperative model between humans and machines by locating them in a gaming environment. "Play with" denotes a form of "cooperative behavior model" wherein *co-equal* entities possessing *learning abilities* cooperate to achieve *shared objectives*.

- Adaptive Machine Learning: The machine player holds **attention** to every play of its human partner. Then based on playstyle decision quadrant, the machine learns human's playstyle. Using this information, the machine agent adapts to its counterpart.
- Communication Support: The game includes **communication system**, allowing both players to share strategies and coordinate their gameplay.
- Recognition: This research was selected and presented at the **2024 Meaningful Play** Conference.

Matterport 3D to Text Adventure

Research Assistant, Prof. Daragh Bryne, School of Architecture – CMU, Pittsburgh, USA

We developed an API that converts web-based 3D models into a text adventure format, enabling visually impaired individuals to explore 3D spaces through a gaming experience. This innovative approach illustrates how large language models (LLMs) can be meaningfully leveraged to improve accessibility in digital environments.

- How it works: The API retrieves 3D data from the web and generates interfaces that allow users to configure settings such as the number of rooms, paths, and puzzles. It then captures screenshots and, using an LLM API, generates descriptive, interactive text and puzzles for each room, creating a game-like experience.
- Output: The final product is a web-based text adventure that represents the original 3D model, providing an accessible alternative for users.
- Current Development: The API is currently being refined, with a focus on enhancing accessibility features, including full screen reader compatibility.

Work Experience

Carnegie Mellon University

Research Assistant, Why Research Lab, Prof. Daragh Bryne 06, 2024 –

- Role: **Main researcher** developing web API that gamifies web 3d model into text adventure game for visually impaired users.
- Work: API development, accessible design, documentation and writing.

Head Teaching Assistant, Prof. Juney Lee 01 – 04, 2024

- Role: Head TA of Structural Design 1: Form and Forces.
- Work: Work sheet revision and update, running course Q&A forum.

Teaching Assistant 10 – 12, 2023

- Role: TA of developing course materials for Structural Design 1 & 2.
- Work: Studying graphic statics, update diagrams and units.

Studio Heech 07 – 09, 2022

Architectural Designer, Director. Hee Chan Park

- Role: Led a spatial design project as a project manager.
- Work: In responsible of conceptual design to construction coordination, preparing drawing set including sharp drawing.

VS-A Korea 2019 – 2022

Façade Consultant, Director. Na Rae Kim, Robert-Jan van Santen

- Role: **Technical consultant** in between designers and engineers.
- Work: Engineered multiple projects which involved **design automation and optimization.**

Publications

Nik Kim. (2024). Human Machine Guitar Hero: Developing a cooperative AI agent a human player can play with*, Proceedings of 2024 Meaningful Play. *(currently production in progress)*

Selected Projects

AR Battleship, AR Strategy, Unity and Tilt five AR

Team project — role: UI/UX designer, programmer

- This project transforms the classic board game "Battleship" into an AR version using the Tilt Five AR tabletop headset.
- Research question: How do AR environments unlock design freedom for creators and enhance the player's experience compared to the classic version?

MoleArchy, VR Action, Unity and Meta Quest 2

Team project — role: producer, programmer

- You're a rookie mole exterminator hired by Mole Busters Inc.! Prepare for your first mission to exterminate these mischievous moles.
- This immersive VR game is based on a whack-a-mole design but with dart-throwing mechanics.

A Walk with Shooting Star, 3D Adventure, Unity

Individual project — role: game designer, system designer, programmer

This is a conversation-based journaling game where players walk with their companion, "Shooting Star," and reflect on their day. The purpose of this research game is to explore how a generative AI-powered game agent can foster journaling behavior through dialogue and emotional connection.

- It cleverly utilizes LLM APIs (agent making) and Google Forms (journal recording) to build the game's core mechanics.
- Potential Research Question: This research explores the potential **of LLM-powered agents to interpret non-verbal cues** from human players.

Coursework

Computer Science

- Fundamentals of Programming
- Java for Application Programmers
- Data Structure for Application Programmers

Machine Learning

- Introduction to Deep Learning
- Mathematical foundations of Machine Learning
- Computational foundations of Machine Learning

Game Design and Programming

- Game Programming for Designers
- Introduction to the Unity Game Engine
- Research Issus in Designing for XR

Skills

Programming: Python, Java, C#, Unity, Processing, Pytorch, Javascript
Documentation: LaTex, InDesign
3D: Rhino 3D, Grasshopper
Language: Korean, English

Honors & Awards

Grand	The art of Youth Housing *Junglim Student Architecture Grand Contest*	2019
Excellence	Seoul Architecture LAN Tour Video Contest *13th Seoul International Architecture Film Festival*	2021
Excellence	Planting Play in Seoul Forest *7th Union of Architecture School in Seoul Pavilion festival*	2018
Excellence	Architecture holds Culture *6th Union of Architecture School in Seoul Pavilion festival*	2017
Excellence	Seoul Social Housing Idea Contest *Seoul City*	2017
Selected	Gyeonggi Architectural Grand Contest *Gyeonggi Architects Association*	2018
Selected	Capturing Everyday lives in Seoul *Seoul Made Media Video Contest*	2020

Press

Archiworld Journal, 2019.12. no. 295 p.152 “Our Home Timetable”