James Mullen

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Research Interests	Human-robot interaction, LLM-Enabled agents, Embodied AI, Generative AI, Virtual and augmented reality, Operationalized AI.			
Education	UNIVERSITY OF MARYLAND Ph.D. in Computer Science Advised by Dinesh Manocha and Ming Lin in GAMMA Lab	2021-2025 (Expected)		
	VIRGINIA TECH B.S. in Mechanical Engineering, 3.91 GPA	2017-2021		
Honors & Awards	IEEE Conference on Virtual Reality and 3D User Interfaces Best Paper Honorable Mention	2023		
	National Science Foundation	2022		
	Graduate Research Fellowship (\$159,000)			
	University of Maryland Deans Fellowship (2x, \$5,000)	2021 & 2022		
	Kaytheon AI/ML Scholars Fellowship (Estimated \$400,000, dec.	lined) 2021		
	Raytheon Innovation Grant (x2 \$30,000+)	2020 2019 & 2020		
	Virginia Tech Engineering Scholarship (3x, total \$8,250)	2018 & 2019 & 2020		
Experience	UNIVERSITY OF MARYLAND	2021-Present		
	NSF Fellow and Graduate Research Assistant			
	Advisor: Dr. Dinesh Manocha, Dr. Ming Lin			
	Language Model Driven Robotics			
	• Created Language-Guided Exploration (LGX) [3], which uses large langua			
	 models (LLMs) to tackle exploration in a zero-shot object navigation paradigm with a 27% improvement over the previous state-of-the-art Developed LAP, using LLMs and a novel action-feasibility metric in robotic planners to minimize hallucinations, resolve ambiguities, and know when to ask for help, leading to a reduction in human help of 33% (under review) Integrated novel out-of-distribution detection techniques with a robot agent and user interfaces to improve navigation performance (in progress) Human Animation Placement with Scene Affordances Invented PAAK [5], placing human animations into an arbitrary 3D scene using an autoencoder, scene geometry, and active learning, such that they appear plausible 			

• Formulated follow-up, PACE [4], tailoring the animations to the geometry of the scene, resulting in more natural-looking scene placements, preferred by humans in a user study 81% of the time over state-of-the-art motion synthesis methods

AMAZON LAB126

Applied Scientist Intern

Advisor: Tony Qi and Dhruva Kumar

Architected HomeEmergency [1], a 1000+ sample dataset of audio-based emergencies in the home including falls and fires accounting for most home deaths
Designed a novel probabilistic scene graph that employs Bayesian inference to process past data and new observations, improving emergency and audio source localization by 32% over state-of-the-art methods

• Employed multi-modal LLMs at the potential emergency location to determine if an emergency is occurring that requires emergency services

· Verified real-world transferability on the Astro device and a ClearPath TurtleBot

AMAZON

Applied Scientist Intern

Advisor: Dr. Reza Ghanadan

 \cdot Constructed SafetyDetect [2], a 1000+ sample simulator-based dataset for detecting potentially dangerous and unsanitary conditions in home environments

• Developed an LLM-based method using GPT-4 to exploit a scene graph and classification prompting technique to identify over 90% of anomalous scenarios

VIRGINIA TECH

Undergraduate Research

Advisor: Dr. Dylan Losey, Dr. Brain Lattimer

• Developed a multimodal feedback system to intuitively communicate a robot's inferences to humans using augmented reality for passive visualization and haptic feedback for active guidance [5]

• Shaped and conducted a user study to evaluate our multi-modality method against single-modality baselines, showcasing a user efficiency improvement of over 40%

RAYTHEON

AI Research Intern & Principal Investigator

Advisor: Dr. Philip Sallee Computer Vision Research

• Explored connections between imagery annotation types and neural network performance [7], [11]

2018-2021

2019-2021

2024

2023

· Designed novel probabilistic pseudo-annotations, achieving state-of-the-art results on cheaply annotated data [10]

· Created and implemented a new clustering-based method of hardening neural networks against out-of-distribution data, data drift, and adversarial attacks, [8] Innovation Center Research Project

· Pitched a unique approach for course of action planning using 'costmaps' and AI to a panel of 7 research and business executives, receiving funding to pursue the idea · Directed execution as youngest ever PI in the company, including tracking funds, managing the team, and developing business interest, U.S. Patent No. 11,726,482 [9]

1. James F. Mullen Jr, Dhruva Kumar, Xuewei Qi, Rajasimman Madhivanan,

Refereed Conf Pro and Arti

Conference Proceedings and Journal	Arnab Sen, Dinesh Manocha, Richard Kim, "HomeEmergency - Using Audio to Find and Respond to Emergencies in the Home," <i>IEEE Robotics and Automation Letters (IEEE RA-L)</i> , 2025
Articles	 James F. Mullen Jr, Prasoon Goyal, Robinson Piramuthu, Michael Johnston, Dinesh Manocha, Reza Ghanadan, "'Don't forget to put the milk back!' Dataset for Enabling Embodied Agents to Detect Anomalous Situations," <i>IEEE Robotics and Automation Letters (IEEE RA-L)</i>, 2024
	 Vishnu Dorbala*, James F. Mullen Jr*, and Dinesh Manocha, "Can an Embodied Agent Find Your "Cat-shaped Mug"? LLM-Based Zero-Shot Object Navigation," IEEE Robotics and Automation Letters (IEEE RA-L), 2023. *Indicates Equal Contribution
	4. James F. Mullen Jr and Dinesh Manocha, "PACE: Data-Driven Virtual Agent Interaction in Dense and Cluttered Environments," <i>IEEE Virtual Reality (VR)</i> <i>and IEEE Transactions on Visualization and Computer Graphics (IEEE TVCG),</i> 2023 (Best Paper Honorable Mention)
	5. James F. Mullen Jr, Divya Kothandaraman, Aniket Bera, and Dinesh Manocha, "Placing Human Animations into 3D Scenes by Learning Interaction- and Geometry-Driven Keyframes," <i>IEEE/CVF Winter Conference</i> <i>on the Applications of Computer Vision (WACV)</i> , 2023
	6. James F. Mullen Jr , Joshua Mosier, Sounak Chakrabarti, Anki Chen, Tyler White and Dylan P. Losey, "Communicating Inferred Goals With Passive Augmented Reality and Active Haptic Feedback," <i>IEEE Robotics and</i> <i>Automation Letters (IEEE RA-L)</i> , 2021
	 James F. Mullen Jr, Franklin R. Tanner, and Philip A. Sallee, "Comparing the Effects of Annotation Type on Machine Learning Detection Performance," <i>IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPR)</i>, 2019.
Patents	8. Philip A. Sallee, James F. Mullen Jr, "Hardening Deep Neural Networks,"

(U.S. Patent No. 11,726,482). U.S. Patent and Trademark Office. (2024)

	9. James F. Mullen Jr and Rupal Nigam, "Systems and Metho	ods for Multi-	
	Factor Pathfinding," (U.S. Patent No. 12,141,238). U.S. Pater	nt and Trademark	
	Office. (2023)		
	10. James F. Mullen Jr, Jon Goldstein, Philip A. Sallee, and Fra	nklin R. Tanner,	
	"A Training Schema for Extended Object Detection with Pc	oint-Wise Labels,"	
	(U.S. Patent No. 11,068,747). U.S. Patent and Trademark Of	fice. (2021)	
	11. Philip A. Sallee, James F. Mullen Jr, and Franklin R. Tanner, "Machine		
	Learning Using Informed Pseudolabels" (U.S. Patent No. 1	1,669,724). U.S.	
	Patent and Trademark Office. (2023)		
Skills	Programming: Python*, PyTorch*, Matlab, Java, C#, Tensorflow, C	2++, C	
Exceptionally Experienced	Other Computing: Linux, AWS EC2*, AWS S3*, Unity3D*, Unreal Engine		
	Robotics: ROS*, ClearPath TurtleBot*, ThreeDWorld Simulator*, VirtualHome		
	Simulator*, RoboTHOR simulator, Habitat Simulator, Other ClearPath products,		
	Boston Dynamics Spot		
	Other: L ^A T _E X [*] , git [*] , Microsoft Office [*] , Microsoft Hololens, Meta Quest		
Outreach	Montgomery County Animal Shelter Volunteer Eagle Scout	2019 to 2021 2015	
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