Statement of Research Interest

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My research interest lies in Machine Learning, specifically Reinforcement Learning (RL). I have tried my best to prepare myself for a rigorous Ph.D program through undergraduate coursework in Computer Science, 4 years of relevant job experience R&D solving important problems of AI, and personal collaborative projects in Machine Learning with AI researchers at Apple.

Presently, I am working as a Game and AI Algorithms Engineer at FRAG Games. For the last two years, I have been crafting AI algorithms for Games. When I joined the Frag, the team was using the A* informed search algorithm to run in separate threads. But the team faced a problem that the projects in which multiple units were finding paths on elaborate grid maps, A* was taking more than one second to find paths for some units which seemed to lag. Considering my prowess in computational Algorithms, I was tasked with solving this issue. I researched and employed the Jump Point Search (JPS) Algorithm drawing inspiration from Danial Harabor's 2014 research publication- a novel approach not previously applied in Unity. It takes log(n) time to put one node in the heap and in JPS, I meticulously programmed to avoid putting those nodes in the Heap which could be ignored for exploring. I successfully solved the problem resulting in algorithm 1 and more magnitudes faster than A* which took 0.04 seconds to find path where A* took 1.5 seconds. After the success of this research, I wrote a professional **research paper** in Latex using my several years of experience in Latex, which you can see here with more information about me.

My motivation for research in AI is such that in 2022, after the 9-5 job, I, under the supervision of Dr. Aamer Zaheer- Computer Vision Architect at Apple, worked on developing LLM driven application in Unity engine in which a user verbally chats with talking character. It was developed and more research is needed to improve its features. Additionally, I developed the Boids algorithm to simulate realistic flocking behavior for characters and troops in FRAG games. Moreover, I have experience in creating RC and path-following robot cars using microcontroller chips. I also took time out of my job to teach Robotics in the winter 2023 BootCamp "Robotics for Children" with Prof. Sarfraz Raza.

I want to do research to extend the use of Reinforcement Learning (RL) and other ML techniques to drive the **intelligent actions** of AI bots in dynamic environments. I have peculiar ideas about using this technology for **mental health** to help people dealing with stress issues and loneliness since it is something very important to me, and admission into the Ph.D program in your institute will help me fulfill this purpose. My R&D experience has equipped me with the abilities to make important contributions to this area of research.