

Future Research Plan

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I am particularly interested in operator inequalities involving convex and concave functions, such as Jensen's inequality and the AG-mean inequality. Some of these inequalities have extremely simple forms, yet it remains unknown whether they hold. I aim to contribute to resolving such open problems.

In recent years, my focus has expanded to developing unified approaches that can derive multiple operator inequalities simultaneously, rather than proving them individually. This structural perspective connects naturally with other fields such as functional analysis and harmonic analysis, suggesting broad interdisciplinary potential.

Currently, I am studying how to construct large matrices using symmetric and anti-symmetric tensor products. These constructions often lead to intriguing patterns in eigenvalues, traces, and norms, and they align well with majorization-type inequalities. I have already proven several inequalities using this method, and I believe there is much more to explore.

In addition, over the past two years, I have been engaged in data analysis projects aimed at applying mathematics to industry. A major task has been to provide "mathematical validation" for results produced by AI—essentially, building mathematical models that justify AI outcomes. This has led me to a deeper interest in understanding and interpreting neural networks through mathematics. By analyzing their structure, node computations, and optimization methods, I hope to contribute to more effective design and training of AI models.

Currently, I am conducting joint research with Professor Kenji Kimura of Matsue College of Technology on the equations of motion for mobile robots, and we are preparing a paper entitled "Kinematics and Trajectory Analysis for Mobile Robot Adapted Four Omni Rollers." In this study, we propose a simplified kinematics validation method using a CAD simulation environment. This method enables efficient and practical validation experiments in the early stages of development, while significantly reducing both time and economic costs. I would like to continue actively contributing mathematical approaches to other research fields in the future.