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Special Issue at Journal of Nonlinear and Convex Analysis

"Fixed Point Theory and Convex Optimization with Applications"

On behalf of the contribution and honor for celebration the 65th birthday of

Professor Suthep Suantai

Fixed point theory deals with the conditions under which a function, often in a metric space or topological space, maps at least one point to itself. This simple yet powerful concept has profound implications in various fields such as:

-Numerical Methods: Algorithms such as the Newton-Raphson method for finding roots of functions or solving systems of equations rely on fixed point iterations.

-Game Theory: The Nash Equilibrium, a fundamental concept in economic theory, can be characterized as a fixed point of a best response function in non-cooperative games.

-Differential Equations: In both ordinary and partial differential equations, fixed point theorems like the Banach fixed point theorem are used to prove the existence and uniqueness of solutions under certain conditions.

On the other hand, convex optimization is a subfield of optimization that studies the problem of minimizing convex functions over convex sets. The convexity of the function or the set simplifies the optimization problem significantly, ensuring that any local minimum is also a global minimum, which is not generally the case in broader optimization scenarios. This also has been widely applied as follows:

-Machine Learning problems, including training logistic regression models or support vector machines, can be formulated as convex optimization problems.

-Signal Processing: Techniques in signal processing, such as filter design and beam forming, often use convex optimization to manage and improve signal quality.

-Control Systems: Convex optimization is vital in control theory for designing systems that optimize performance criteria subject to physical constraints.

Moreover, fixed point algorithms are pivotal in computational methods for convex optimization problems. For example, iterative methods for finding a minimizer of a convex function often involve fixed-point iterations of a function derived from the optimization problem. The convergence properties of these algorithms can be analyzed using fixed point theorems, providing valuable insights into their stability and efficiency.

Due to their applications, the study of fixed points and convex optimization not only contributes to a deeper understanding of mathematical theory but also drives innovation in high-impact application areas. The integration of these disciplines continues to be a fertile ground for research, particularly in the development of algorithms that solve real-world problems more efficiently and with guaranteed performance.

In 2025, we will celebrate the 65th birthday of **Professor Suthep Suantai,** a Professor of Mathematics at Chiang Mai University who is a highly accomplished mathematician. He is well known in the field of mathematics, particularly in areas such as fixed point theory, optimization, and iterative methods for solving equations. His work has contributed to both theoretical developments and practical applications in these areas.

This Special issue aims to collect original papers and share/discuss new ideas for theoretical advances in fixed point theory and convex optimization with applications.

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