Future Work

Based on the findings and discussions in this thesis, several potential directions for future research are identified:

- Investigate the existence, uniqueness, and controllability of nonlinear dynamical systems in higher-dimensional spaces, both for integer and fractional order systems.
- Explore robust control strategies for nonlinear dynamical systems subject to uncertainties and external disturbances, emphasizing both integer and fractional order systems.
- Analyze the existence, uniqueness, and controllability of stochastic nonlinear dynamical systems, considering both integer and fractional order cases.
- Investigate the control and stability properties of hybrid dynamical systems that combine integer and fractional order dynamics, including impulsive effects.
- Apply the theoretical results on controllability to real-world systems such as biological systems, economic models, and engineering systems, highlighting practical implications and challenges.

- Develop and analyze efficient numerical methods for solving fractional order dynamical systems, focusing on accuracy, stability, and computational complexity.
- Study optimal control problems for fractional order systems, including the derivation of necessary conditions for optimality and the development of computational algorithms.
- Explore adaptive control techniques for nonlinear and fractional order systems, emphasizing real-time adaptation to system parameter changes.
- Investigate the controllability and synchronization of interconnected and networked systems composed of integer and fractional order subsystems.
- Conduct a detailed stability analysis of impulsive systems with both integer and fractional orders, considering various types of impulses and their effects on system behavior.