



**The Hong Kong University of Science and Technology**

**Department of Mathematics**

**MPhil THESIS EXAMINATION**

***A Sufficient Condition of Sample-Efficient Reinforcement Learning with General Function Approximation***

*By*

**Mr. Wei XIONG**

**ABSTRACT**

In this paper, we study reinforcement learning (RL) with general function approximation, where either the value function or the model dynamics is approximated by a given abstract hypothesis space. We propose the generalized eluder coefficient (GEC), which measures the hardness of generalization from the historical in-sample error to the prediction error, and further serves to measure the hardness of learning an RL problem. In terms of the algorithmic design, we propose an optimization-based framework for RL with general function approximation, following the general principle of “Optimism in the Face of Uncertainty” (OFU). Compared to existing algorithms, the proposed framework does not explicitly maintain the confidence set, and neatly handles both model-free and model-based problems with a low GEC. Theoretical analysis shows that our regret results match those provided by existing frameworks.

**Date : 27 June 2023, Tuesday**

**Time : 10:30 a.m.**

**Venue : Room 3494 (Lifts 25/26)**

**Thesis Examination Committee**

**Chairman : Prof. Tianling JIN, MATH /HKUST**

**Thesis Supervisor : Prof. Tong ZHANG, MATH/HKUST**

**Member : Prof. Dong XIA, MATH/HKUST**

**Member : Prof. Xinzhou GUO, MATH/HKUST**

*(Open to all faculty and students)*

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).