The Hong Kong University of Science and Technology

Department of Mathematics

MPhil THESIS EXAMINATION

A Fast Level Set Optimization Framework with an Application to Inverse Gravimetry

By

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ABSTRACT

This thesis presents an efficient level set-based optimization framework for domain recovery problems formulated as $Ax = b$, where x represents the characteristic function of an unknown domain. By employing a binary level set representation of the interface, our approach offers significant computational advantages over traditional PDE-based level set methods, enabling faster evolution of the zero level set boundary during optimization. The TV-L1 model is also employed to impose robust geometrical regularization.

We demonstrate the effectiveness of this framework through its application to the inverse gravimetry problem - the reconstruction of subsurface density anomalies from surface gravitational field measurements. Numerical experiments showcase the improved performance of our algorithm in solving this class of inverse problems, highlighting its potential for practical applications.

Date : 23 July 2025, Wednesday

Time : 2:00 pm

Venue : Room 4472 (Lifts 25-26)

Thesis Examination Committee

Chairman	:	**Prof. Yang XIANG, MATH/HKUST**
Thesis Supervisor	:	**Prof. Shing Yu LEUNG, MATH/HKUST**
Member	:	**Prof. Hai ZHANG, MATH/HKUST** *(via online mode)*

(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).