

國立中央大學數學系

專題演講

主 講 人：黃琮暉教授 (國立清華大學動力機械工程學系)

演講題目：**Robust Meshfree Methods for Extreme Event Analysis**

演講茶會：2023年04月20日(星期四) 3:30 p.m. ~ 4:00 p.m.

茶會地點：中央大學鴻經館M306

演講時間：2023年04月20日(星期四) 4:00 p.m. ~ 5:00 p.m.

演講地點：中央大學鴻經館M107

Abstract：

Over the past 25 years, meshfree methods have emerged as a promising class of computational techniques, with considerable success. The reproducing kernel particle method (RKPM) and moving least squares (MLS) are examples of meshfree methods that offer flexible ways to construct basis functions with higher-order continuity, arbitrary order of completeness, implicit smooth derivative, and control of locality, making them effective for solving various partial differential equations (PDEs). Due to their "meshfree" nature, these methods have proven to be robust in handling computational mechanics problems involving extreme conditions such as high strain-rates, strong hydrodynamical effects, high incompressibility, and damage/fragmentation processes. These extreme phenomena are commonly encountered in event analysis such as landslides, air blasts, tsunamis, and structural failures, which are difficult or even impossible to model using conventional numerical tools like the finite element method (FEM) due to severe mesh distortion or entanglement. In this presentation, we will introduce the state-of-the-art meshfree particle formulations, including the development of robust stabilization and quadrature rules that enhance accuracy, stability, and efficiency. We will also present different extreme event studies to benchmark the effectiveness of the proposed methods. Additionally, if time permits, we will discuss the latest developments in machine learning techniques from a meshfree perspective.

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