# MMAE SEMINAR

**Monday, January 25, 2010**
**E-1 BUILDING – CRAWFORD AUDITORIUM**
**3:30 – 4:30 PM**

## Direct Digital Design and Manufacturing from Massive Point-Cloud Data

Pinghai Yang
**IIT**
Advisor: Xiaoping Qian

### Abstract

Rapid advancement of 3D scanning techniques has fueled the growing use of scanned point-cloud data in product design and manufacturing. In this talk, I will present a new approach to digital design and manufacturing from acquired point-cloud data. This approach allows direct and automated processing of point-cloud data into suitable geometric form for subsequent product development use. It bypasses laborious and error-prone CAD model reconstruction, the bottleneck issue in the current practice of digital design and manufacturing.

This new, direct digital design and manufacturing (D3M) approach is based on a moving least-squares (MLS) surface representation. This talk will cover the following three key components underpinning the D3M approach.

• Mathematically, formulae and methods for differential geometric and topological analysis on the MLS surface have been developed.

• Computationally, the above mathematical results are utilized to develop fundamental algorithms for MLS surface based surface intersection that are critical for D3M. We focus on addressing basic properties of these algorithms, including geometric adaptivity, bounded error and topological robustness.

• Application-wise, the above algorithms have been successfully extended to various D3M applications, including rapid product geometric design, numerical controlled machining, and rapid prototyping.