RESEARCH SEMINAR

DEPARTMENT OF GEOGRAPHY & RESOURCE MANAGEMENT
THE CHINESE UNIVERSITY OF HONG KONG

Improving daily nighttime light time series for urban dynamics monitoring

23rd October 2025 (Thu)
4:30 – 6:00 pm (UTC+8)
Rm 221, Wong Foo Yuan Building, CUHK

Nighttime light (NTL) remote sensing offers a unique and powerful lens for observing human activities from space in near-real-time. NTL provides a direct signature of socioeconomic dynamics, proving invaluable for monitoring variables such as GDP, population distribution, urbanization processes, and energy consumption. The recent availability of continuous daily NTL products has opened up new frontiers for capturing high-frequency human dynamics, but its application is severely limited by noise from clouds, atmospheric conditions, and observational geometry. This research systematically addresses these challenges through three main contributions. First, it proposes a novel framework to reveal the spatial heterogeneity of uncertainties by effectively separating the influences of multiple factors on the daily NTL time series. Second, it provides a mechanistic explanation for the angular effect, proposing a conceptual model of how urban 3D landscapes create anisotropic light signatures. Finally, it introduces CRYSTAL, a novel and effective method specifically designed to address pervasive data gaps caused by cloud contamination, thereby generating a high-quality daily NTL time series with superior spatial continuity and accurate restoration of temporal changes. The utility of this reconstructed data is demonstrated through a dual-perspective framework analyzing urban vitality via NTL intensity and a novel Fluctuation Index (NLFI).

Xiaoyue Tan
Postdoctoral fellow
Department of Land Surveying and Geo-Informatics, The Hong Kong Polytechnic University

Dr. Tan is a Postdoctoral Fellow in the Department of Land Surveying and Geo-Informatics at The Hong Kong Polytechnic University, where she also earned her PhD. Her research interests lie in urban remote sensing and nighttime light (NTL) remote sensing, and she has participated in multiple related research projects. She specializes in developing innovative methods to reconstruct spatiotemporal data by addressing challenges such as data uncertainty, angular effects, and cloud contamination, with the ultimate goal of supporting evidence-based urban planning.

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