# THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

## Department of Mathematics

# SEMINAR ON PDE

## Localization of bubbling for high order nonlinear equations

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### Abstract

We analyze the asymptotic pointwise behavior of families of solutions to the high-order critical equation

$$P_\alpha(u_\alpha) = \Delta_g^k u_\alpha + l.o.t. = |u_\alpha|^{2^\star - 2 - \epsilon_\alpha} u_\alpha \quad in \quad M$$

that behave like

$$u_\alpha = u_0 + B_\alpha + o(1) \quad in \quad H_k^2(M)$$

where $B = (B_\alpha)_\alpha$ is a Bubble, also called a Peak. We give obstructions for such a concentration to occur: depending on the dimension, they involve the mass of the associated Green's function or the difference between $P_\alpha$ and the conformally invariant GJMS operator. The bulk of this analysis is the proof of the pointwise control

$$|u_\alpha| \leq C|u_0|_\infty^{(2^\star - 1)^\wedge 2} + C\left(\frac{\mu_\alpha^2}{\mu_\alpha^2 + d_g(x, x_\alpha)^2}\right)^{\frac{n-2k}{2}} \quad for\ all\ x \in M\ and\ \alpha > 0,$$

Where $|u_\alpha(x_\alpha)| = \max_M |u_\alpha| \to +\infty$ and $\mu_\alpha := |u_\alpha(x_\alpha)|^{-\frac{2}{n-2k}}$. The key to obtain this estimate is a sharp control of the Green's function for elliptic operators involving a Hardy potential.

**Date:** **6 March 2025 (Thursday)**

**Time:** **4:00pm**

**Zoom Meeting:** https://hkust.zoom.us/j/96565292221 **(Passcode: 269806)**

*All are Welcome!*