

## SPECTRAL GAP OF DENSE RANDOM REGULAR GRAPHS

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**Time: Fri., Sept. 15th, 09:00 - 10:00**

**Venue: Room 102, SCMS**

### Abstract:

Let  $A$  be the adjacency matrix of a random  $d$ -regular graph on  $N$  vertices, and we denote its eigenvalues by  $\lambda_1 \geq \lambda_2 \cdots \geq \lambda_N$ . For  $N^{2/3} \ll d \leq N/2$ , we prove optimal rigidity estimates of the extreme eigenvalues of  $A$ , which in particular imply that

$$\max\{|\lambda_N|, \lambda_2\} < 2\sqrt{d-1}$$

with overwhelming probability. In the same regime of  $d$ , we also show that

$$N^{2/3} \left( \frac{\lambda_2 + d/N}{\sqrt{d(N-d)/N}} - 2 \right) \xrightarrow{d} \text{TW}_1,$$

where  $\text{TW}_1$  is the Tracy-Widom distribution for GOE; analogue results also hold for other non-trivial extreme eigenvalues.