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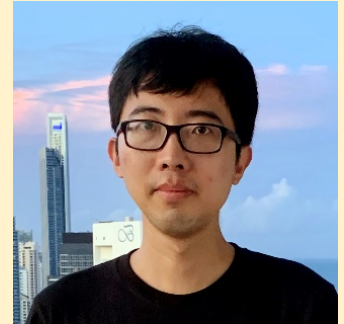
Wednesday, 24 November 2021, 2:00 pm (Sydney time)

(Zoom link: <https://macquarie.zoom.us/j/85829287435>)

Non-Hermitian topological photonics in synthetic dimensions

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Abstract:

The nontrivial topological features in the energy bands of non-Hermitian systems provide promising pathways to achieve robust physical behaviours in classical or quantum open systems. Recent advances in synthesizing dimensions beyond the spatial degree of freedom, especially in photonics, have provided unprecedented flexibility in realizing lattice Hamiltonians. A synthetic-dimension approach to non-Hermitian topology can enable new opportunities for observing non-Hermitian topological effects that are difficult to achieve in other means. In this seminar, I will summarize some of our recent results in the experimental exploration of non-Hermitian eigenvalue topology enabled by the concept of synthetic dimensions. I will show our experimental demonstrations of the topological winding of non-Hermitian band energies [1], achieved from implementing non-Hermitian lattice Hamiltonians along a frequency synthetic dimension formed in a ring resonator undergoing simultaneous phase and amplitude modulations. With two or more non-Hermitian bands, the system can be topologically classified by nontrivial braid groups. We performed the experimental demonstration of such braid-group topology with two energy bands braiding around each other, forming nontrivial knots or links [2]. Our experiments also show that the topological winding and braiding can be controlled by changing the modulation waveform, indicating the high flexibility of our platform.

[1] K. Wang *et al*, *Science* 371, 1240 (2021). [2] K. Wang *et al*, *Nature* 598, 59 (2021).

Speaker biography:

Dr Kai Wang is currently a postdoctoral scholar at Stanford University in the research group led by Prof. Shanhui Fan. Before Stanford, he received his PhD from the Australian National University in 2019. Prior to that, he obtained MSc from Friedrich-Schiller-Universität Jena and BE from Tianjin University. His research interests include quantum photonics, non-Hermitian topological photonics, and metasurfaces.

