



**UNIVERSITÄT  
BIELEFELD**



Faculty of Physics



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THE UNIVERSITY OF  
MELBOURNE

# Seminar

Bielefeld - Melbourne Random Matrices

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### Universality classes of non-Hermitian random matrices

Universality of Hermitian random matrix theory (RMT) has turned out to appear in various isolated quantum systems, such as quantum chaotic systems and many-body delocalized systems. Recently, open quantum many-body systems attached to an external environment has attracted much attention due to the development of experimental techniques. While non-Hermitian RMT should play a crucial role in understanding such open quantum many-body systems, the fundamental property of the non-Hermitian RMT, i.e., universality classes of the level-spacing distributions and their relation to symmetries, was not identified. In this talk, we discover two additional universal classes caused by the transposition symmetry [1] besides the previously known universality class by Ginibre. We numerically and semi-analytically discuss that there are only three universality classes for the level-spacing distribution in the bulk of the spectrum, while there are 38 different symmetry classes. We show that the newly found universality classes indeed manifest themselves in dissipative quantum many-body systems described by non-Hermitian Hamiltonians or the Lindblad equation, while the universality breaks down due to localization [2,3]. [1] R.H., K. Kawabata, N. Kura and M. Ueda., Phys. Rev. Research 2 (2), 023286 (2020). [2] R.H., K. Kawabata and M. Ueda., Phys. Rev. Lett. 123, 090603 (2019). [3] R.H., M. Nakagawa, T. Haga and M. Ueda., arXiv:2206.02984 (2022).

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0900 hrs CET**

Zoom Conference call— Please contact Lucas Hackl  
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