Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3571** Type: **Invited Speaker / Conférencier(ère) invité(e)**

(I) Machine learning augmented experiments for topological and quantum materials research

Tuesday 20 June 2023 09:00 (30 minutes)

Spectroscopic techniques have made remarkable progress in the past decades have played a critical role in advancing our understanding of quantum and topological materials. However, the interpretation of the spectroscopic data and information extraction processes can be highly nontrivial. In this symposium talk, we introduce machine learning as an auxiliary technique for various experiments that can lead to our improved understanding of quantum phenomena. We show that it can enhance the identification of nuanced magnetic effects at topological insulator interfaces [1], and directly be used to predict materials'topological classes using simple spectra indicators [2]. Beyond resolution improvement or classification, we show that machine learning can also be used to predict materials properties that are challenging to obtain by conventional methods, such as phonon density-of-states [3] and phonon dispersion relations [4], or extracting hidden information in time-resolved data [5]. We highlight the importance of the representations and envision a few more challenging problems that can benefit from machine learning [6], from strongly correlated systems to finding topological materials that are ready for room-temperature devices.

[1] https://aip.scitation.org/doi/10.1063/5.0078814
[2] https://onlinelibrary.wiley.com/doi/abs/10.1002/adma.202204113
[3] https://onlinelibrary.wiley.com/doi/10.1002/advs.202004214
[4] https://arxiv.org/abs/2301.02197
[5] https://onlinelibrary.wiley.com/doi/10.1002/adma.202206997
[6] https://aip.scitation.org/doi/10.1063/5.0049111

Keyword-1

Topological materials

Keyword-2

machine learning

Keyword-3

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Session Classification: (DCMMP) T1-7 Quantum Materials Symposium | Symposium sur les matériaux quantiques (DPMCM)

Track Classification: Symposia Day (Tues. June 20) / Journée de symposiums (mardi, le 20 juin): Symposia Day (DCMMP - DPMCM) - Quantum Materials | Matériaux quantiques