From quantum machine learning for the current 5G and future modulations of 6G to condensed matter physics

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This talk gives an overview of quantum machine learning (QML) for fast demapping of low order modulations of future wireless communications beyond the fifth generation (5G), including 6G and beyond, expecting to provide insights for QML for condensed matter physics. We will demonstrate that QML circuit can be constructed to solve the problem of demapper, which is in general difficult and intractable, especially when the number of modulation constellation points are significantly large and random [1]. We use an amplitude encoding technique to map the received signal constellations for complex binary phase shift keying (CBPSK), quadrature phase shift keying (QPSK), and introduction of future random modulations. This talk is also expected to stimulate other variational quantum algorithms (VQA) [2] for condensed matter physics, since the similar principle of this QML may be used to predict the collective and structural properties of large numbers of electrons, atoms or molecules in condensed matter physics.

[1] Khoirul Anwar and Mohamad Yusoff bin Alias, ”Quantum Machine Learning for Demappers of Low Order Modulations of 5G and Beyond”, The 1st Conference on Quantum Sciences and Technology (CONQUEST), 22–24 November 2022.
[2] M.Schuld and F.Petruccione, ”Machine Learning with Quantum Computers”, Quantum Science and Technology (Springer Nature Switzerland AG, 2nd Edition, 2021.