



Informatik-Kolloquium

Der Fachbereich Informatik der Johannes Kepler Universität Linz¹ lädt in Zusammenarbeit mit der Österreichischen Gesellschaft für Informatik (ÖGI) zu folgendem Vortrag ein:

Topic: Generalization bounds for variational quantum machine learning

Presenter: **Matthias C. Caro, MSc** Department of Mathematics, TU Munich, Germany

Date: Tuesday, August 10th 2021, 14:00

Location: JKU, Science Park 3, room HS 19

Virtual: https://jku.zoom.us/j/91887846636?pwd=Q1kvVFR1RFRPMis0WHhpTGNoSUImZz09

Abstract:

A large body of recent work has begun to explore the potential of parametrized quantum circuits (PQCs) as machine learning models, within the framework of hybrid quantum-classical optimization. In particular, theoretical guarantees on the out-of-sample performance of such models, in terms of generalization bounds, have emerged. Most of these so far focus on how properties of the trainable part of a PQC influence the generalization behavior, the classical-to-quantum data-encoding has received less attention. I will give an overview over these results and then explain our approach towards deriving generalization bounds for PQC-based models that depend explicitly on quantum data-encoding strategy. I will also illustrate two applications: Performance guarantees for trained PQC-based models on unseen data and PQC-design guided by multi-dimensional structural risk minimization.

Short Bio:

Matthias C. Caro (<u>https://sites.google.com/view/matthiasccaro</u>) received his Bachelor's degree in Mathematics from the Technical University of Munich (TUM), Germany, in 2016. After one year as a visiting student at St John's College, Oxford, he then pursued his Master's degree in Mathematics, which he received from TUM in 2019. He is currently a doctoral candidate at the chair of Mathematical Physics at TUM, supervised by Michael M. Wolf as part of the TopMath Program (<u>https://www.ma.tum.de/en/studies-information/elite-programs/topmath.html</u>). His research focus lies at the intersection of learning theory and quantum information theory: He studies the theoretical limitations and potential of quantum machine learning. Moreover, he is interested in the foundations of classical learning theory and in questions of (Non-)Markovianity in quantum information theory.

Einladende: Assist.-Prof. Dr. Richard Küng, Univ.-Prof. Dr. Robert Wille Institut für Integrierte Schaltungen Abteilung Integrierter Schaltungs- und Systementwurf

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