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Nano-scale electronic structure of strongly correlated electron systems

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Stellingen

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NANO-SCALE ELECTRONIC STRUCTURE OF STRONGLY CORRELATED ELECTRON SYSTEMS

1. Discrepancies between ARPES, STS, and quantum oscillations in quantum materials are a reflection of their strongly correlated nature. *Chapter 2 of this thesis*
2. The superconducting state of overdoped $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$ is best described as an emergent granular superconductor. *Chapter 3 of this thesis*
3. The process responsible for Cooper pair breaking in overdoped $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$ cannot be accurately described in a mean-field framework. *Chapter 3 of this thesis*
4. Self-supervision circumvents an important drawback of supervised machine learning in spectroscopy imposed by the limited availability of data. *Chapter 4 of this thesis*
5. The puddles of charge modulation in non-superconducting overdoped $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$ are signatures of strong QPI rather than charge ordering. *Li et al. PRX 11, 01107 (2021)*
6. The anomalous behavior of the Van Hove singularity in $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$ goes beyond local shifts in chemical potential. *Webb et al. PRX 9, 021021 (2019)*
7. While offering a significant increase in measurement speed, parallel spectroscopy has only limited application for quantum materials due to the reduced energy resolution. *Zengin et al. PRR 3, L042025 (2021)*
8. The accurate determination of the gap structure using quasi-particle interference by Sharma et al. is held back by not addressing the rich physics of the Sr_2RuO_4 surface. *Sharma et al. PNAS 117:10 (2020)*
9. Public engagement by scientists should more often address the way science works in addition to the topic at hand.

*Willem Olivier Tromp
Leiden, December 20th 2022*