INTERNSHIP PROPOSAL

Laboratory name: CPHT
CNRS identification code: UMR 7644
Internship director'surname: SUBEDI Alaska
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Internship location: Ecole Polytechnique, Palaiseau

Thesis possibility after internship: YES
Funding: No, to be requested from the doctoral school.

Charge and spin density waves in the nickelate superconductors

Layered nickelate compounds such as $NdNiO_2$, $La_3Ni_2O_7$, and $Pr_4Ni_3O_{10}$ show signatures of superconductivity when doped or under pressure [1,2]. The nature of superconductivity in these materials has not been fully understood and is thought to be unconventional.

In addition to superconductivity, many of these materials exhibit charge and spin density wave instabilities that have also not been fully characterized. Identifying the microscopic interactions that lead to these ordered phases is an active area of research.

The goal of this internship is to determine the charge and magnetic ordering in these compounds using density functional theory based calculations. Since the possible charge and magnetic ordered phase space of these materials is large, we will design and train magnetic machine learning potentials to explore these instabilities.

[1] D. Li et al., "Superconductivity in an infinite-layer nickelate", Nature 572, 624 (2019).
[2] H. Sun et al., "Signatures of superconductivity near 80 K in a nickelate under high pressure", Nature 621, 493 (2023).

Condensed Matter Physics: YES		Soft Matter and Biological Physics:	YES/NO
Quantum Physics: NO		Theoretical Physics:	YES