Journée des nouveaux entrants

Quantum machine learning for experimental and theoretical nuclear and particle physics

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Post-doc with **Denis Lacroix** (IJCLab) and **Frédéric Magniette** (LLR, École polytechnique)

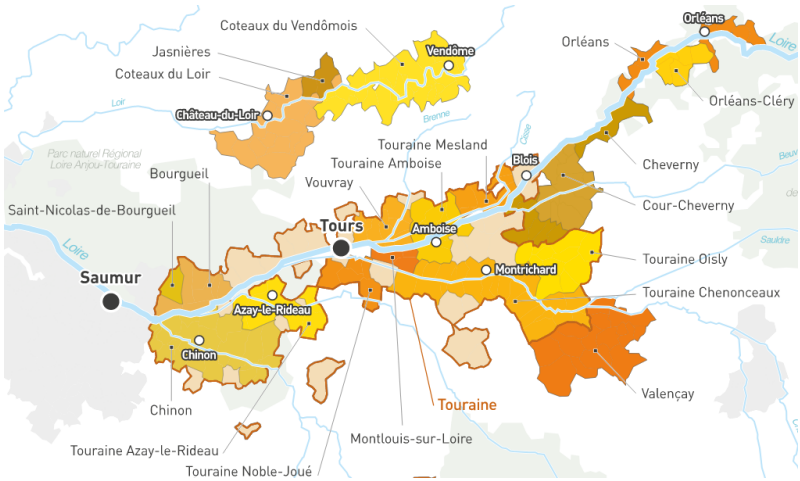
December 2021, 1st

Who am I?

(now with more white hair and less Notre-Dame)

Who am I?

castles ($\sim$ 44) and wine ($\sim$ 17)

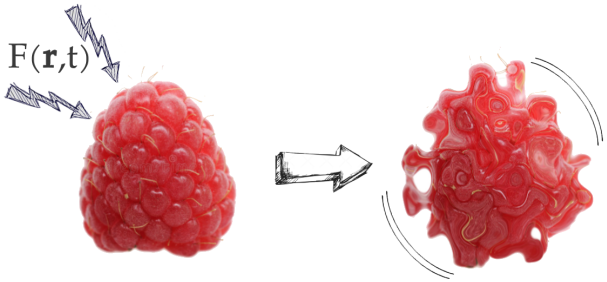


(now with more white hair and less Notre-Dame)

- featherless biped ..... (1995-now)
- **PhD nuclear theory** ..... (2018-2021)
- **postdoc quantum machine learning** ..... (2021-2023)
- A127a (but currently A101a)
- beaujeaul@ijclab.in2p3.fr
- none yet (but 01.69.15.63.01 is fine)

What did I do?

Studied this:

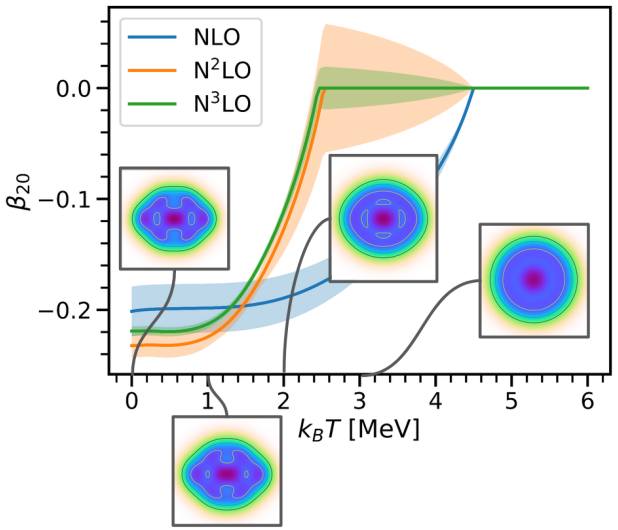


with QCD-related (="ab initio") nucleonic interactions

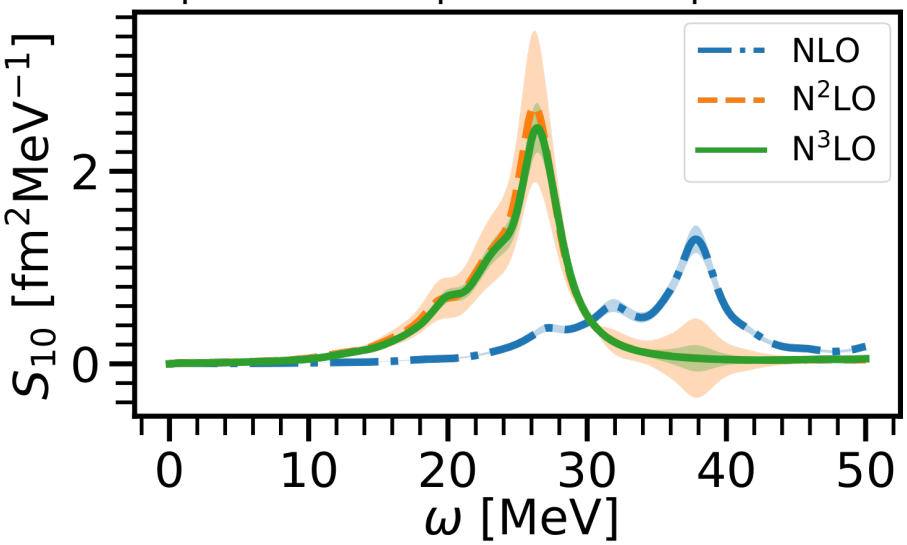
- lots of strongly correlated degrees of freedom → involved numerical calculations
- alternative to "standard" way: Nakatsukasa et al. (2007) for pheno interactions

- PhD goal: can we adapt the method to QCD-related interactions?
- PhD results: yes + extension to $T > 0$ + connection to the standard method

Thermal phase transition in ^{56}Fe

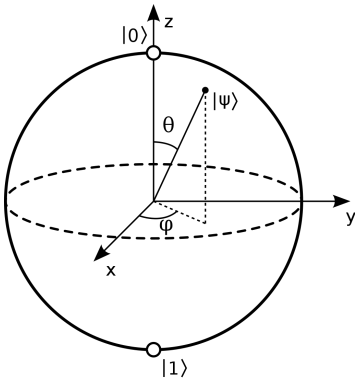


Response to a dipole electric probe

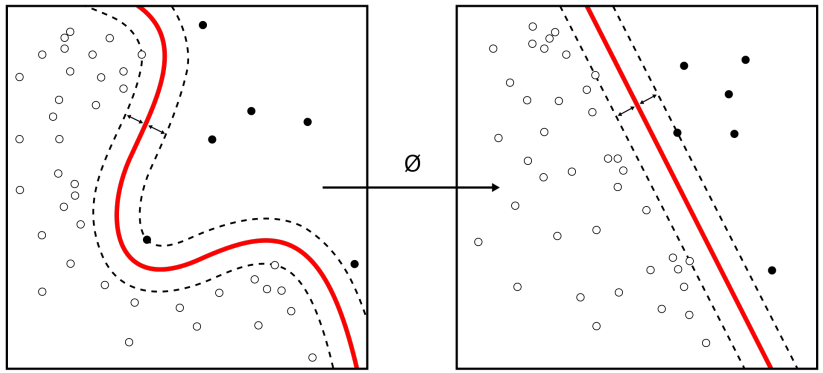


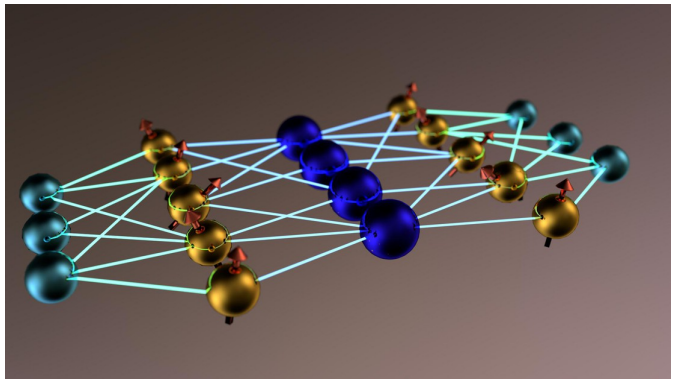
What will I do?

Quantum mechanics ∼ state superposition + non-locality



Machine learning ∼ use lots of data to treat bigger lots of data





What for?
- particle identification (CMS): QML for data classification & anomaly detection
- many-body theory (symmetry breaking & restoration, similarity renormalisation, lattice theories, ...)

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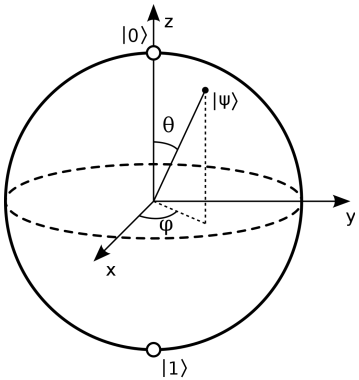

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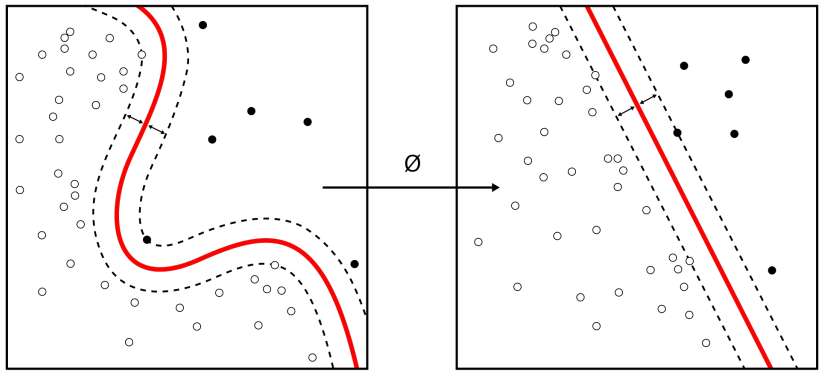

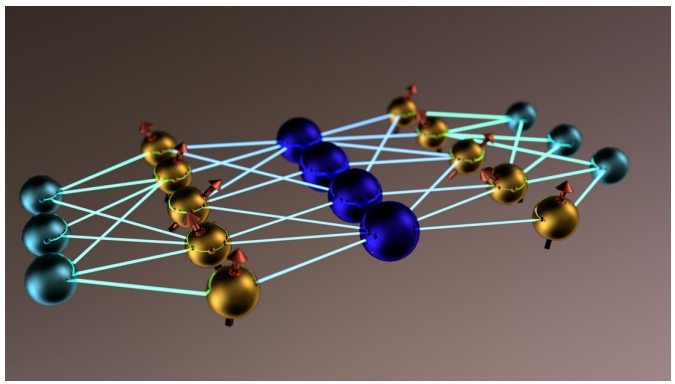

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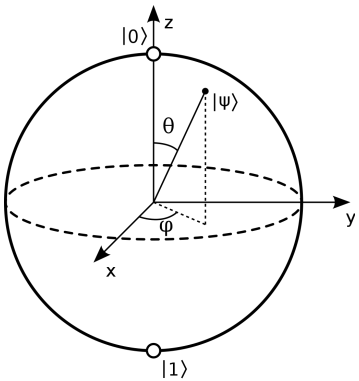

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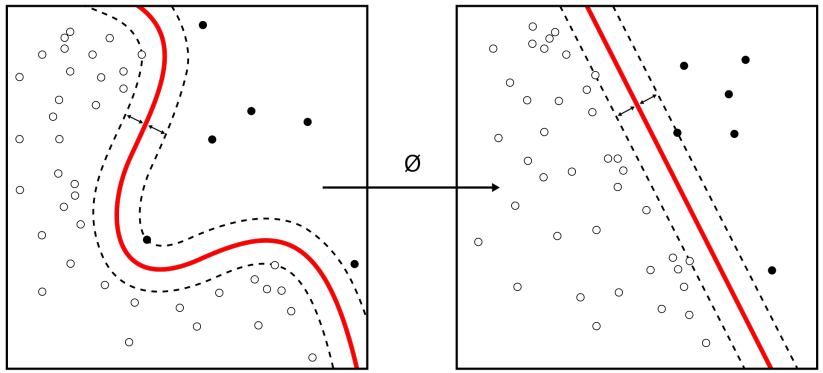

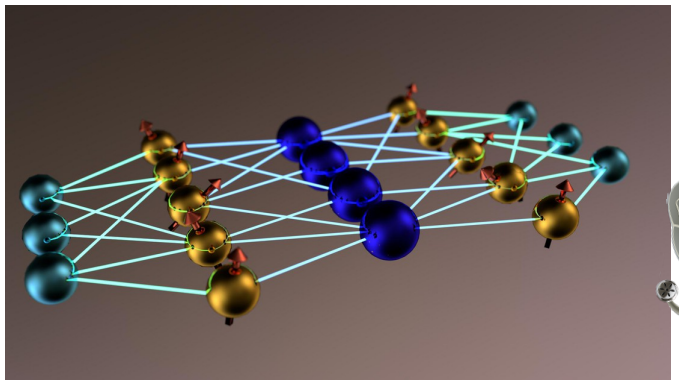

it's a muffin!

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That's all Folks!