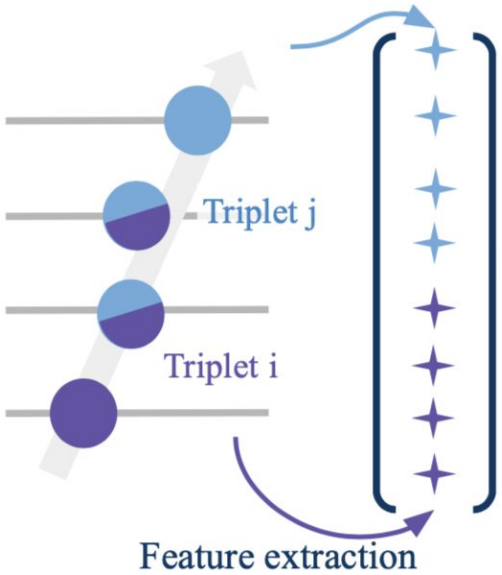
Quantum Computing meeting update

11.12.2023

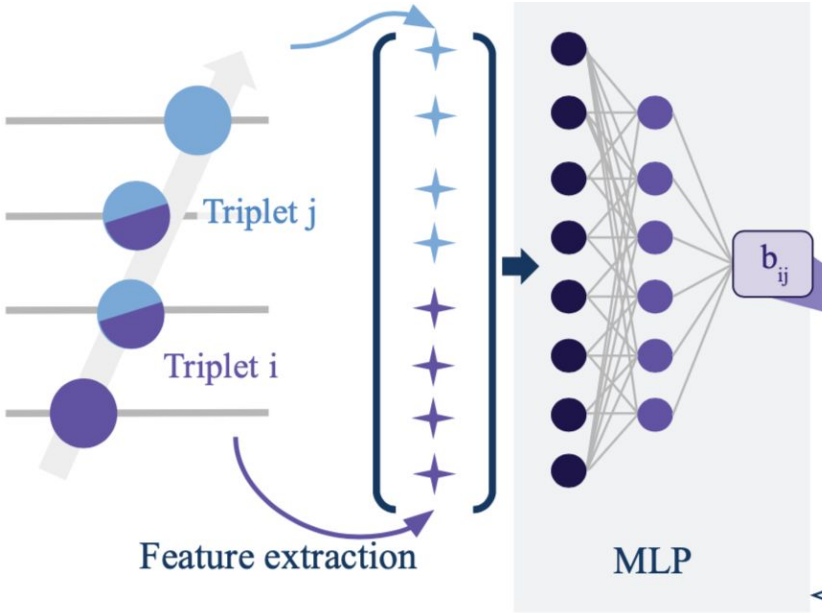
Recap

- Not all QUBOs can be derived analytically
- QUBOs can be used for all problems that can formulated as a binary decision tree
- Learn encoding from data directly:
  - Improved solution quality for highly entangled clusters?
  - Improved noise resilience?
  - Generalisable?
- Simple model has been implemented!

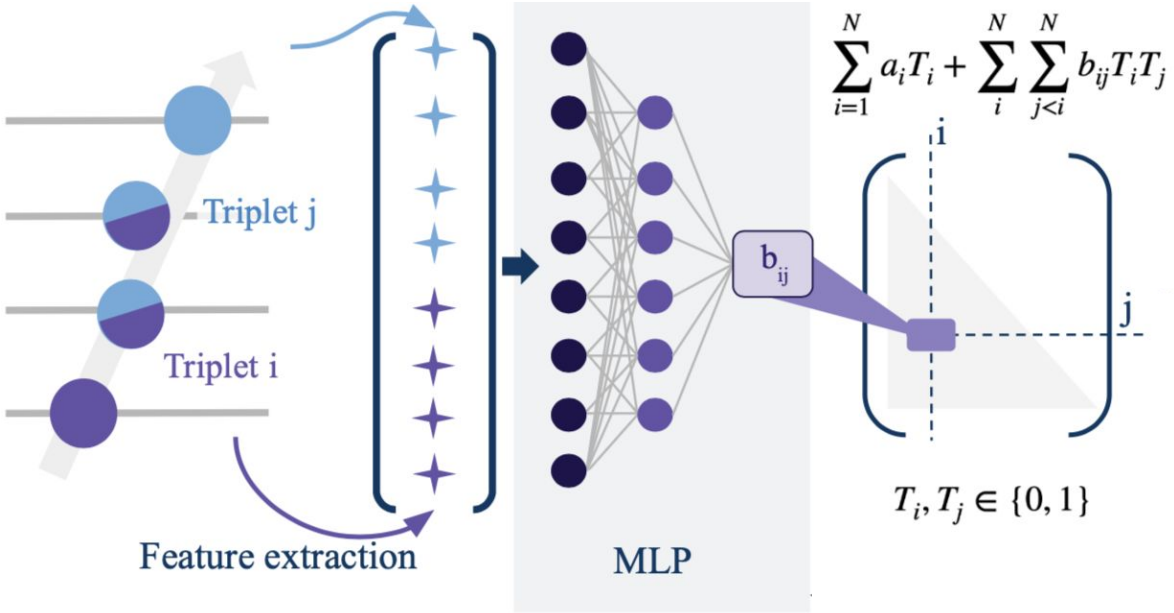
Learned QUBO encodings



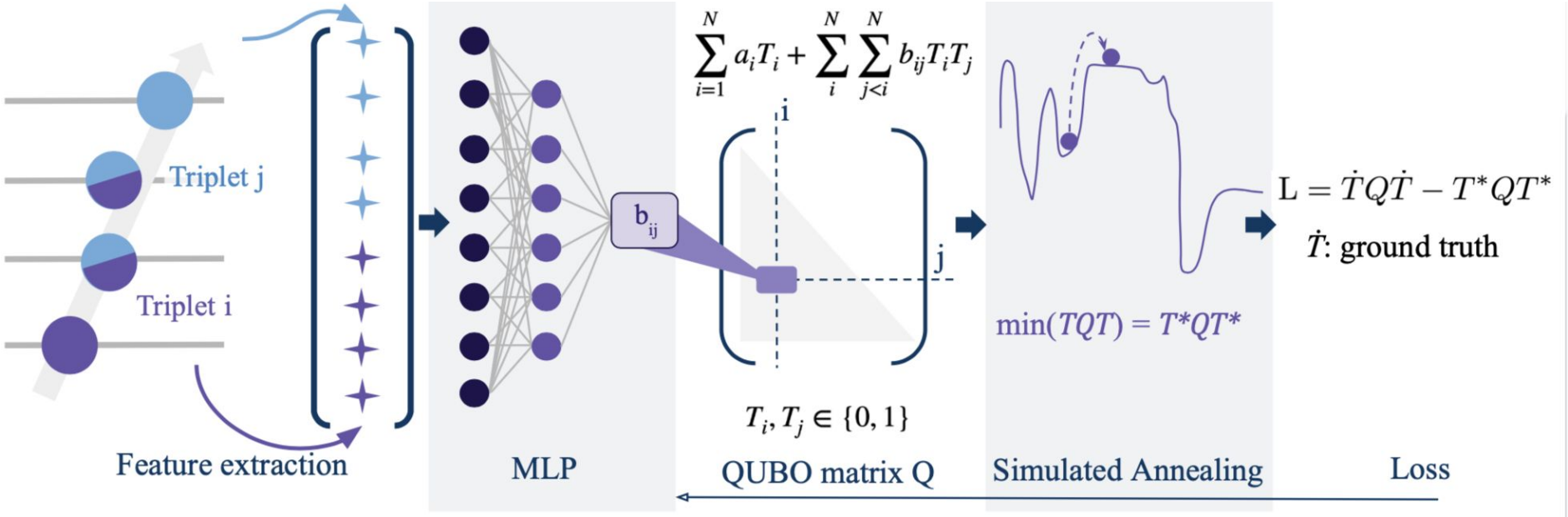
Learned QUBO encodings



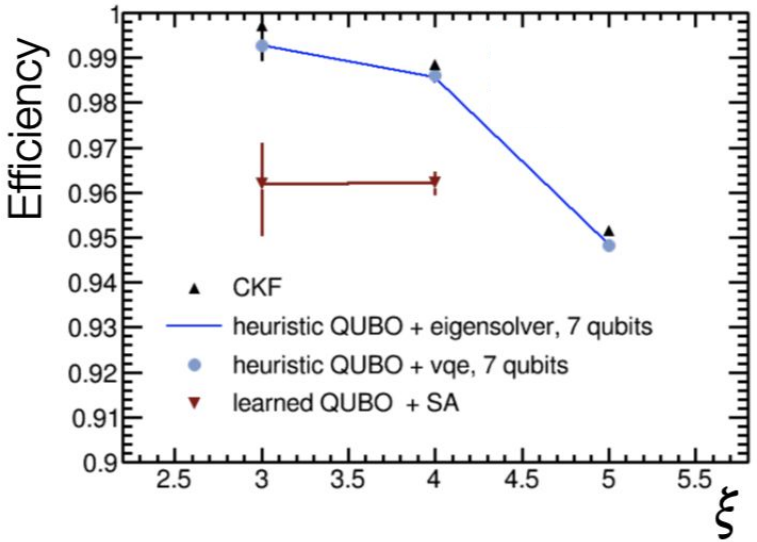
Learned QUBO encodings



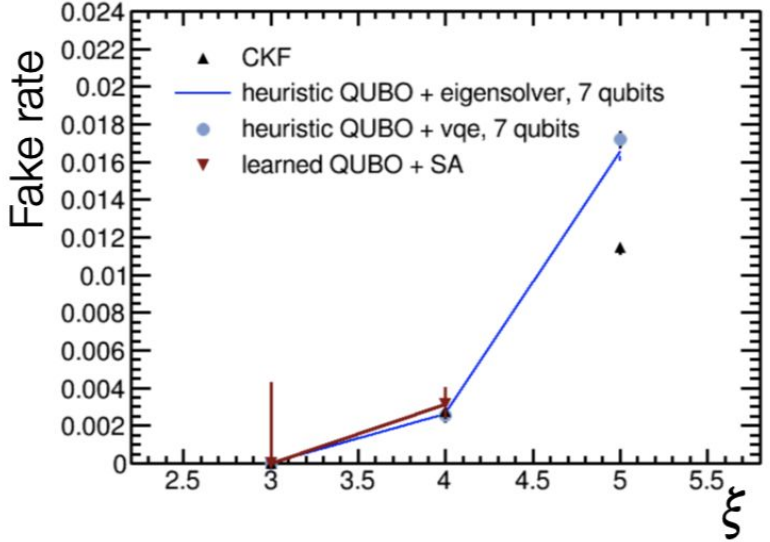
Learned QUBO encodings



Learned QUBO encodings: Results



$$\text{Efficiency} = \frac{N_{tracks}^{matched}}{N_{tracks}^{generated}}$$



$$\text{Fake rate} = \frac{N_{tracks}^{fake}}{N_{tracks}^{reconstructed}}$$

Outlook

- Datasets need to be adjusted: goal is to learn on clusters + high xi
- Include higher xi (4>)
- Refine loss function (reduce entries, multiple solutions)
- Refine features and hyperparameters (angles, conflicts, layers)
- Include annealing (jülich)
- Generalise to other optimisation problems