

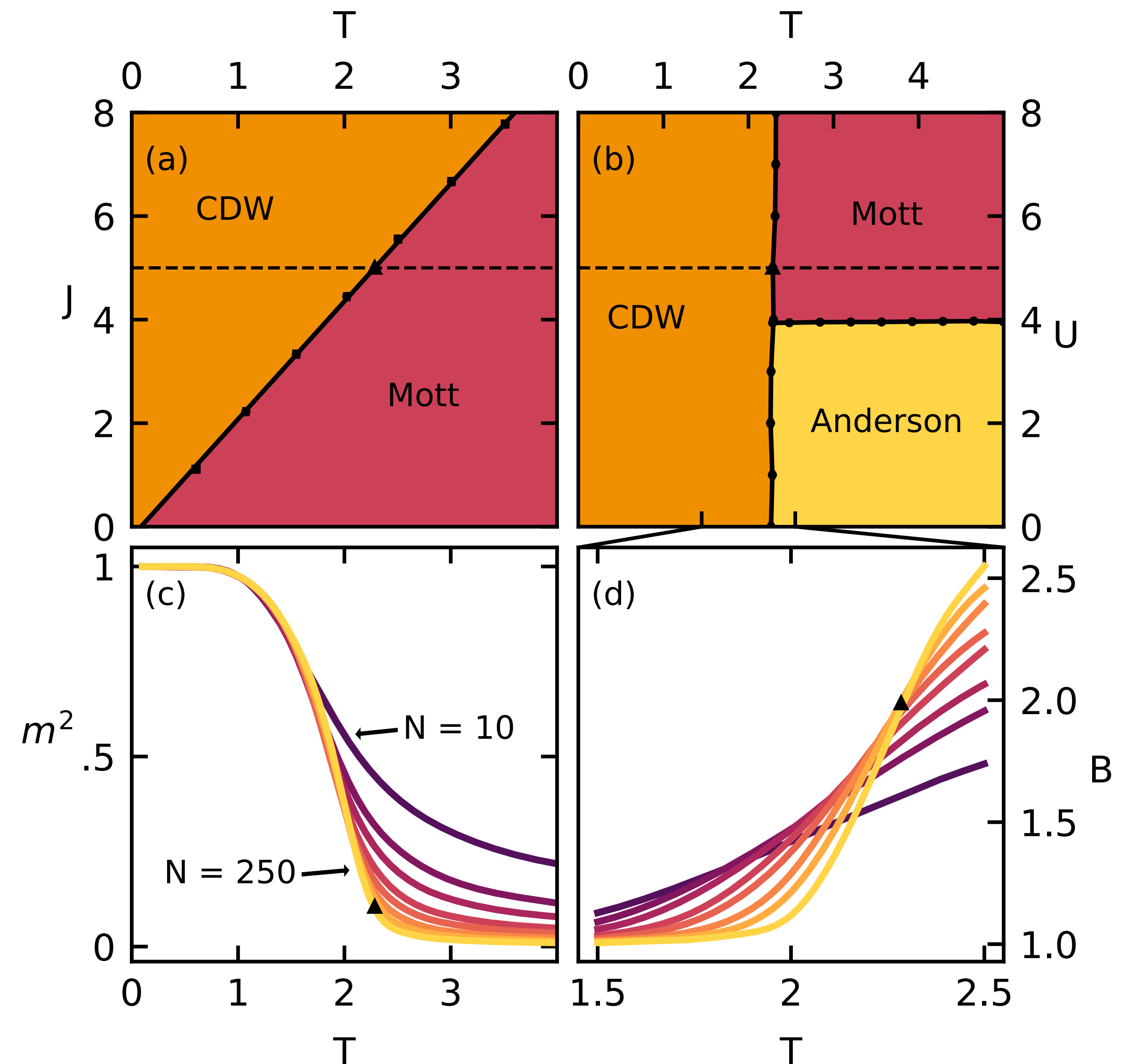
# Summary

- Aimed to bring interesting 2D correlated electron physics down to 1D
- Defined a 1D long ranged Falikov-Kimball Model
- Rich phase diagram and Disorder Free Localisation
- Disorder model: Went to larger  $N$  to pin down the localisation physics.

## Future work

- Finite temperature SSH Model
- Non-equilibrium dynamics
- Cold Atom realisation

Thank you, any questions?



# Finite Temperature: Markov Chain Monte Carlo

- Exploits the classical/quantum split of the model.
- At fixed  $S_i$  we can solve the quantum system exactly up to about 300 sites.
- MCMC: Gives us a random walk over spins states  $S_i$  with a thermal distribution.
- A two step method from Krauth gives a 2-10x speedup. [1]
- Get thermal expectation values of:
  - Density of States
  - CDW Order Parameter: Staggered magnetisation
  - Energy Resolved Inverse Participation Ratio (measure of localisation)

