Classical and Quantum in Adiabatic Computation

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Is it quantum computing?

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It is a quantum computer if…

- It solves classically non-poly problems in poly time?
- There is a verifiable presence of large scale entanglement?
- It does anything classically impossible?
- It correlates better with quantum models than classical models?

How quantum is it?

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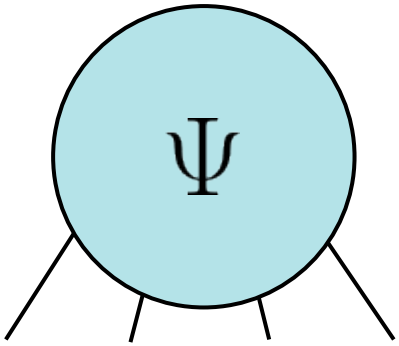
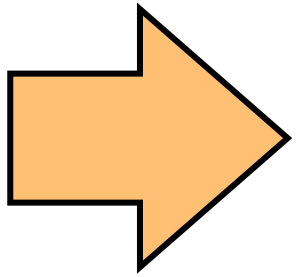
Pragmatic approach to benchmarking:

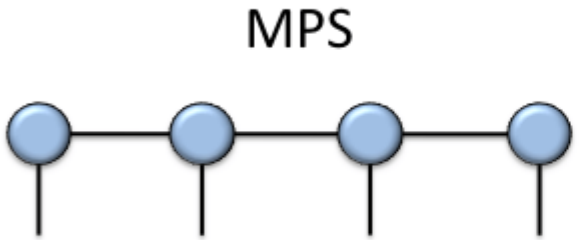
We need exponential data resources to simulate a full quantum dynamics

What resources do we need to perform as well as a given putative adiabatic quantum computer?

Defining degrees of quantum resources







$$\#\text{Vars} = 2^N$$

$$\#\text{Vars} = 2N\chi^2$$

Closest states of lower rank

Defining degrees of quantum resources

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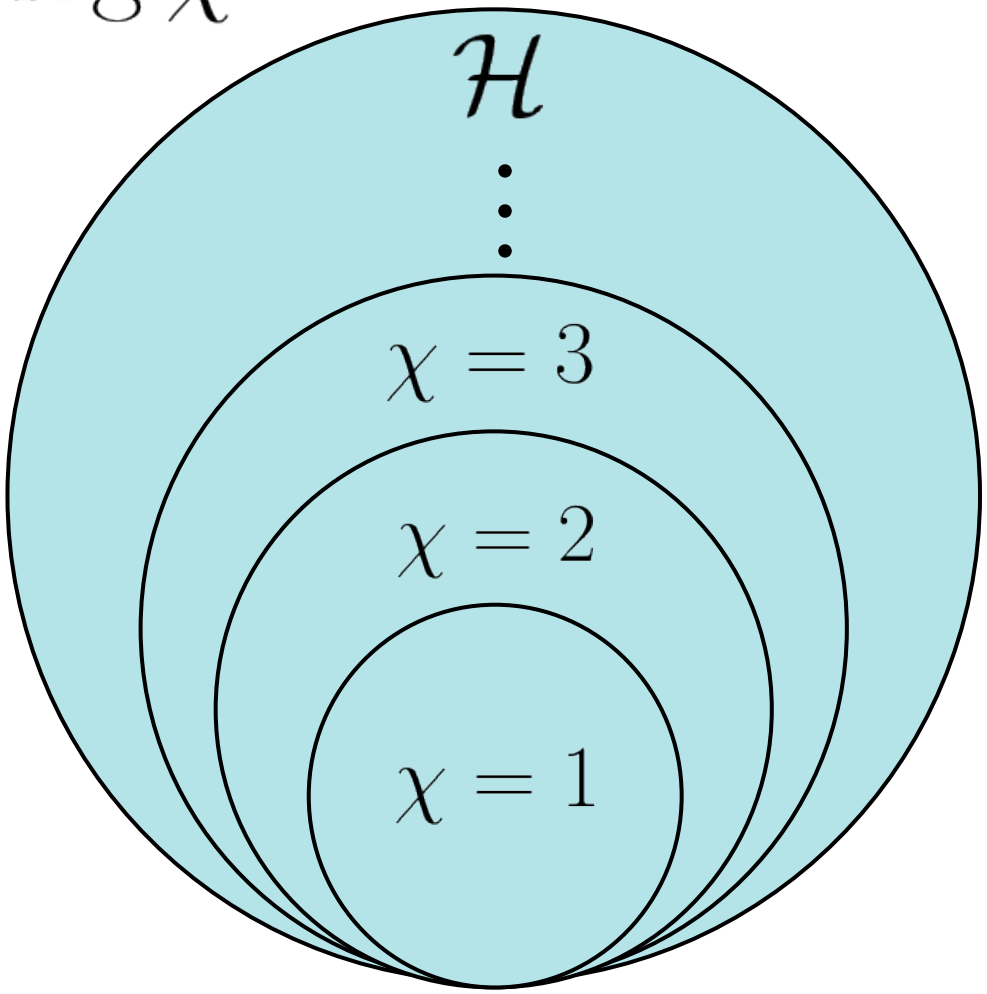
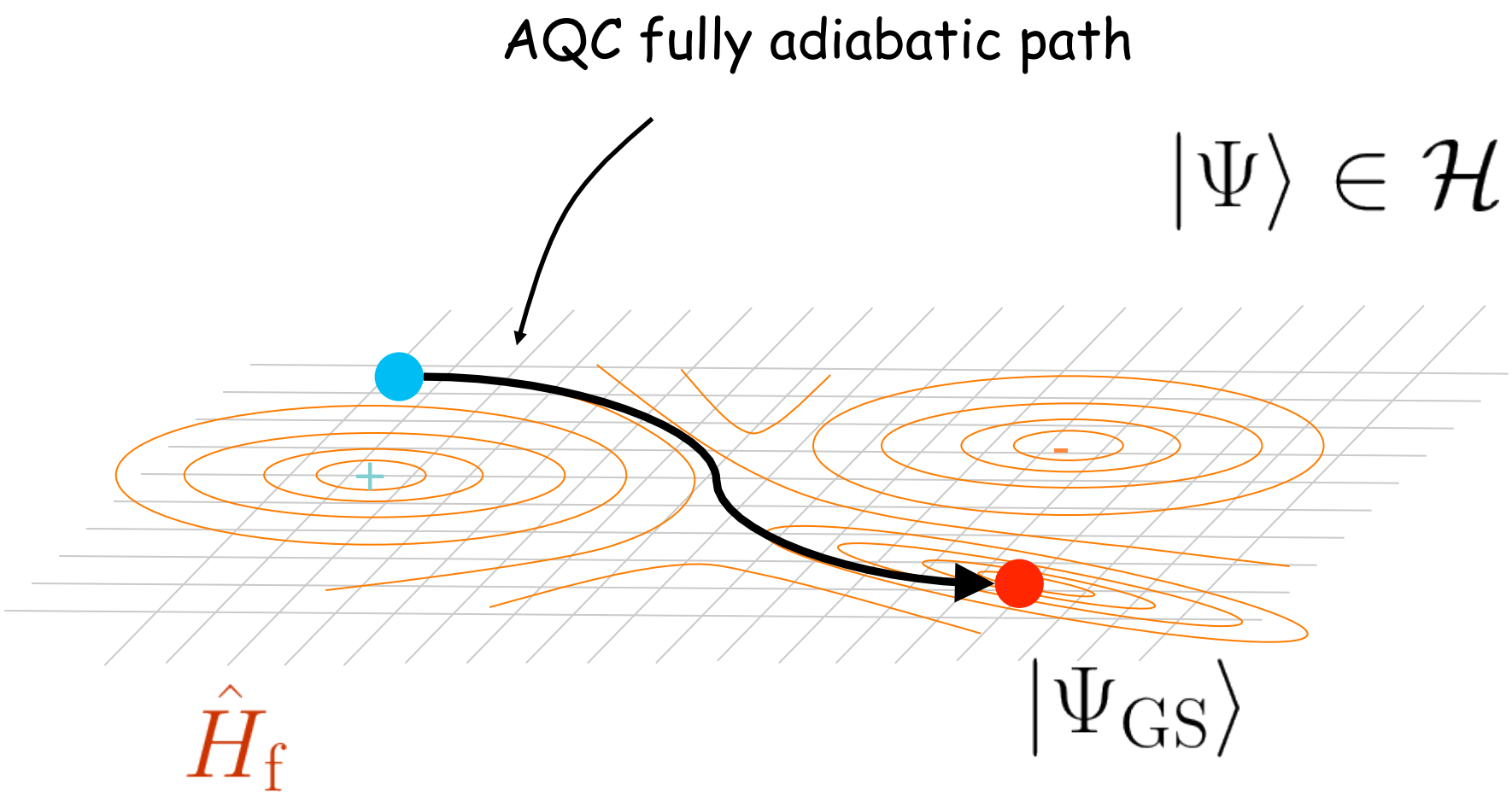
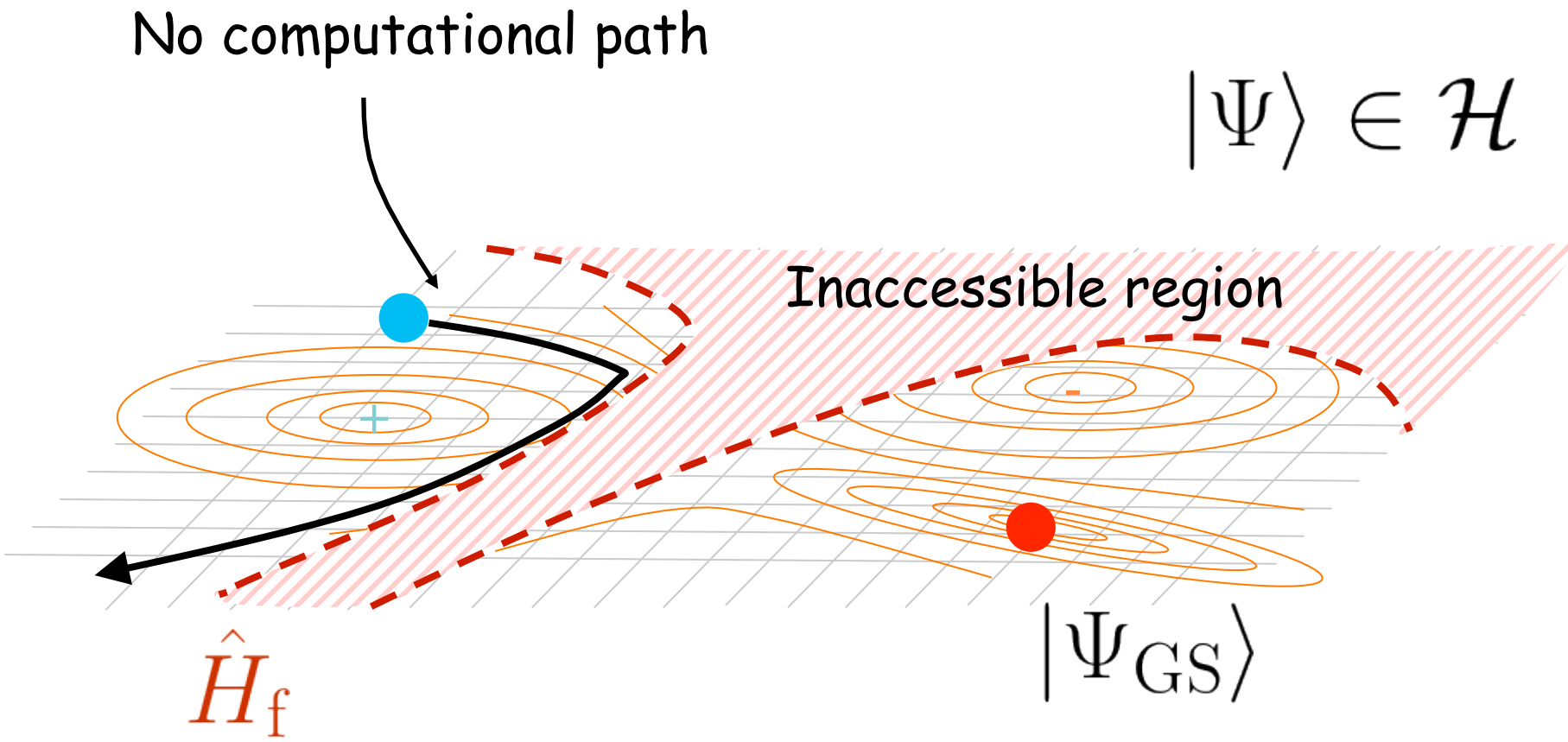
$$E(\Psi) \leq \log \chi$$



Classification of problems by quantum resources

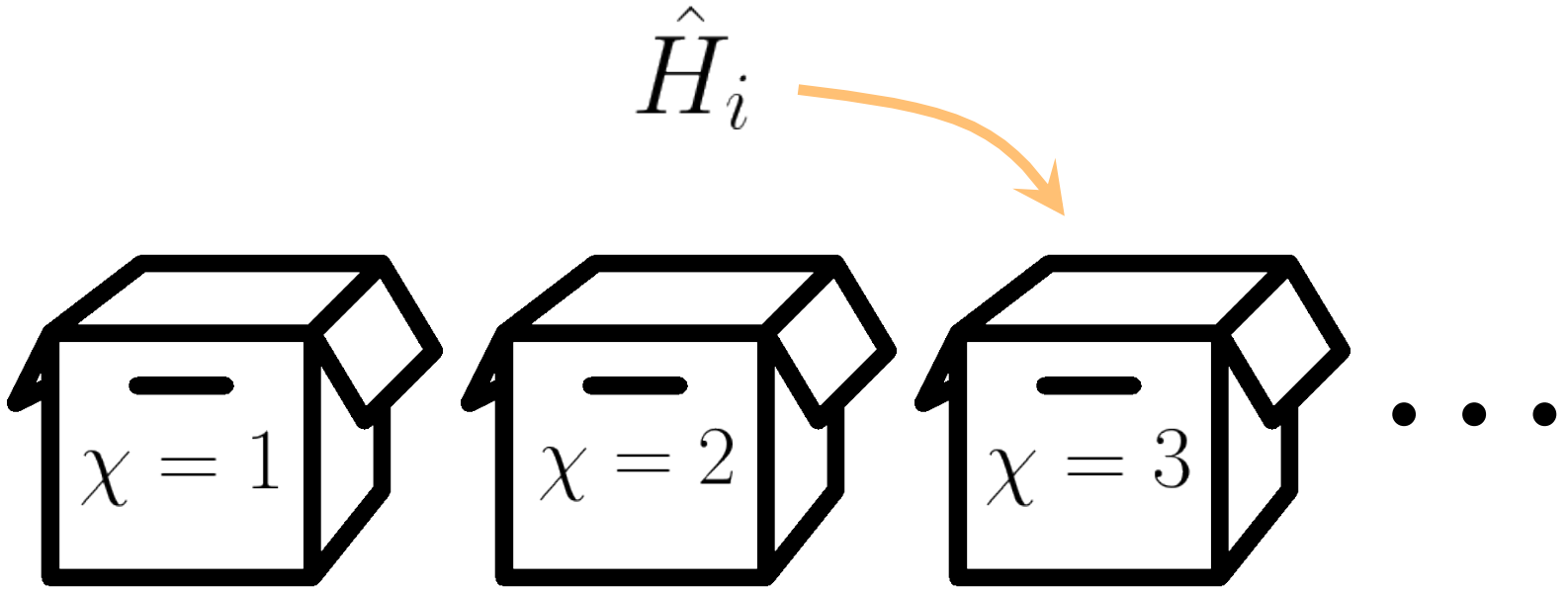


Classification of problems by quantum resources



Classification of problems by quantum resources

Classify AQC problems based on χ required to solve



Benchmarking quantum technology

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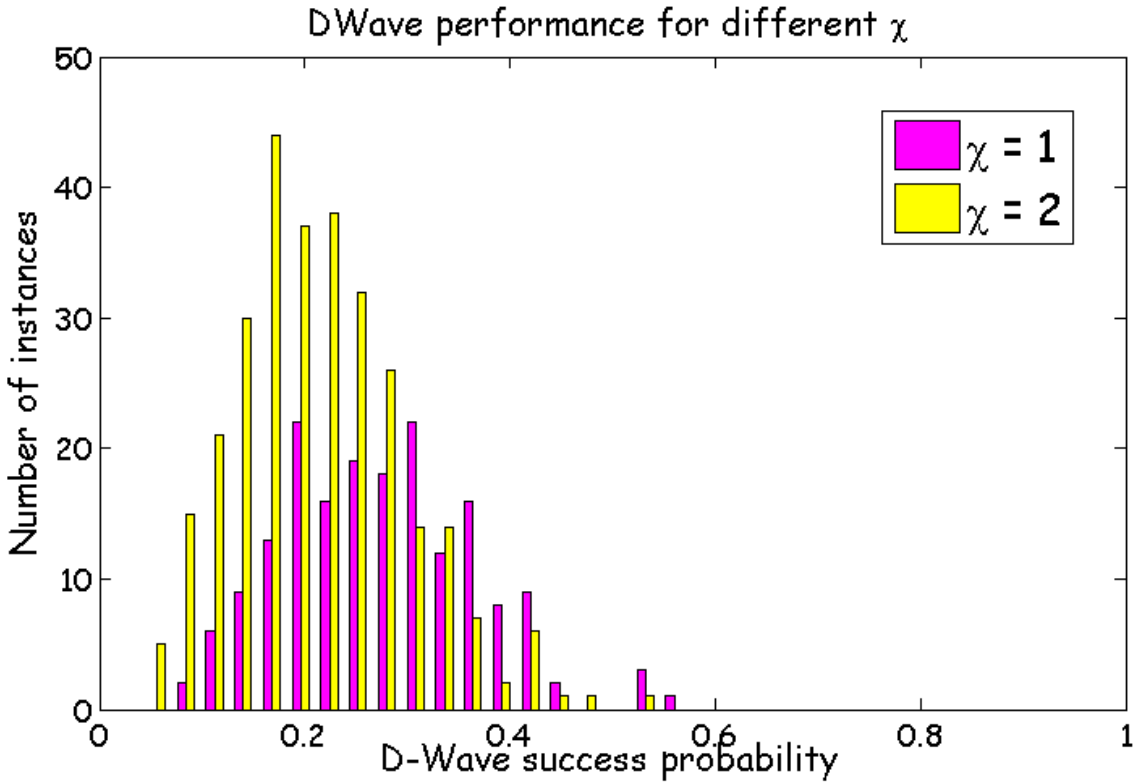
Compare success rates with quantum technology



Thanks!