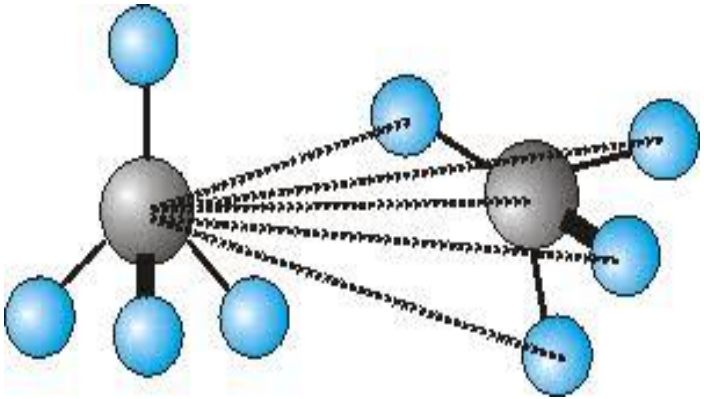
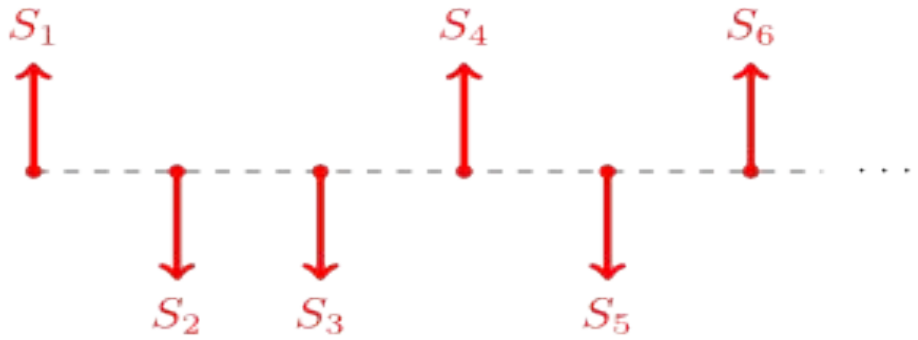
# Solving Quantum many-body problem with Artificial Neural Network

Jerry Zheng
University of Oxford
Supervised by: Prof. Herschel Rabitz, Dr. Tak-San Ho

# Quantum many-body problem



# 1-D Ising model



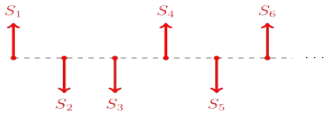

**Configuration M**

Schrodinger's equation:

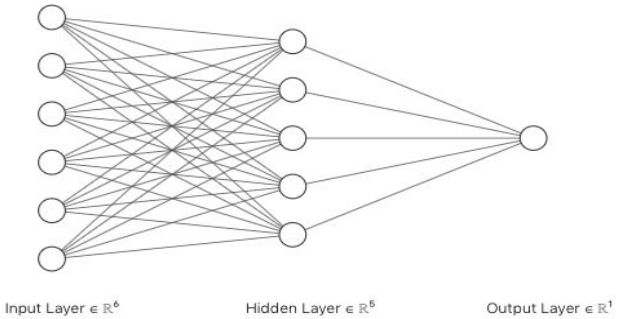
$$\begin{cases} \cdots \\ i\hbar\dfrac{\partial \Psi_M}{\partial t} = H(t)\Psi_M \\ \cdots \end{cases}$$

$\Psi_M(t)$, where M range from 1 to$2^N$

# Simulation with FFNN



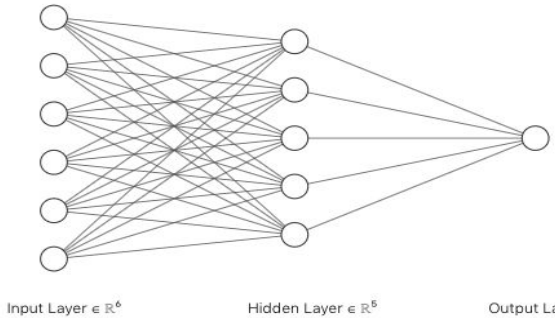

Input




Output $\Psi_M(t)$

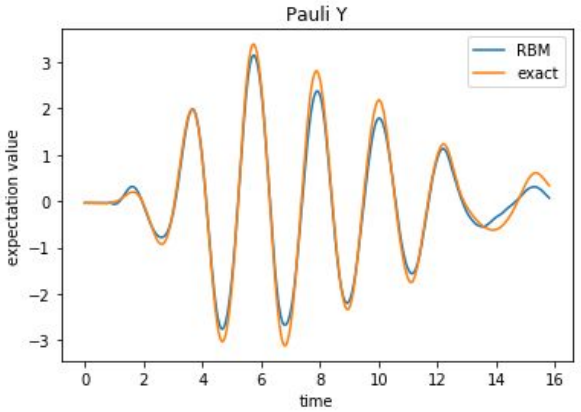
(1, 0, 0, 1, 0, 1)

Network evolve



# Aims

1. Can the neural network map to the complete Hilbert space?




2. Can the neural network scale better than other numerical methods?

# Thank you!