

# Final Project

project 1 Consider the harmonic oscillator

$$L = \frac{1}{2} m \dot{x}^2 - \frac{1}{2} m \omega^2 x^2$$

- (a) Evaluate the ground state energy  $E_0$  in Monte Carlo path integral
- (b) Plot the ground state probability and compare with expected analytic form
- (c) Calculate  $\langle E(T) \rangle$  at finite temperature and compare with expected analytic form

project 2 Anharmonic double well potential

$$L = \frac{1}{2} m \dot{x}^2 - a (x^2 - b^2)^2$$

(a) Evaluate the ground state energy  $E_0$  in Monte Carlo path integral and the first excited state  $E_1$

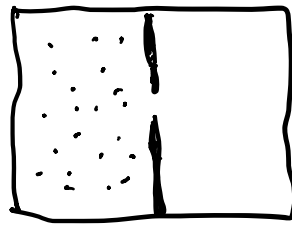
(b) Plot the ground state probability

project 3

2 dimensional harmonic oscillator with parts (a), (b), (c) like in project 1

project 4

ideal gas in box with  
wall partition with opening  
2 dim



$$pV = RT$$

project 5

2 dim Ising model