# Quantum Information and Computing

Assignment 4 (due in two weeks)

November 15, 2022

1. **Continuous time-independent Schrödinger Equation** Consider the one dimensional quantum harmonic oscillator defined by the Hamiltonian:

$$H = \hat{p}^2 + \omega^2 \hat{q}^2 \tag{1}$$

   (a) Write a Fortran program to compute the first $k$ eigenvalues $E_k$ and eigenvectors $|\Psi_k\rangle$.

   (b) How would you rate your program in terms of the priorities we introduced in class for good scientific software development (Correctness, Stability, Accurate discretization, Flexibility, Efficiency)?