

# Ground state energy of quantum dots using the coupled cluster method

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Something about coupled-cluster... Preferably doubles.

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## II. THEORY

In this project we will study a system of  $N$  interacting electrons. We will be looking at a Hamiltonian consisting of a one-body and a two-body part. The one-body part is given by

$$h(\mathbf{r}_i) = -\frac{1}{2}\nabla_i^2 + \frac{1}{2}\omega^2\mathbf{r}_i^2, \quad (1)$$

where we use natural units  $\hbar = c = e = 1$  and set the mass to unity. The two-body part is the Coulomb interaction potential.

$$v(\mathbf{r}_i, \mathbf{r}_j) = \frac{1}{|\mathbf{r}_i - \mathbf{r}_j|}. \quad (2)$$

We thus get the total Hamiltonian

$$H = \sum_{i=1}^N h(\mathbf{r}_i) + \sum_{i<j}^N v(\mathbf{r}_i, \mathbf{r}_j). \quad (3)$$

## I. INTRODUCTION

In this project we will study the ground state energy of quantum dots.

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\* Project code: <https://github.com/Schoyen/FYS4411>