

# **On-Site and Off-Site Solitary Waves of the Discrete Nonlinear Schrödinger Equation in Multiple Dimensions**

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## **Abstract.**

We construct several types of symmetric localized standing waves (solitons) to the 1 - dimensional discrete nonlinear Schrödinger equation (DNLS) with cubic nonlinearity for  $\epsilon > 0$ , where  $\Delta_\epsilon$  denotes the discrete Laplacian on  $\mathbb{Z}^d$ , using bifurcation methods about the continuum limit. Such waves and their energy differences play a role in the propagation of localized states of DNLS across the lattice. The energy differences, which we prove to be exponentially small in a natural parameter, are related to the "Peierls-Nabarro Barrier" in discrete systems, first investigated by M. Peyrard and M.D. Kruskal (1984). Joint work with Michael I. Weinstein