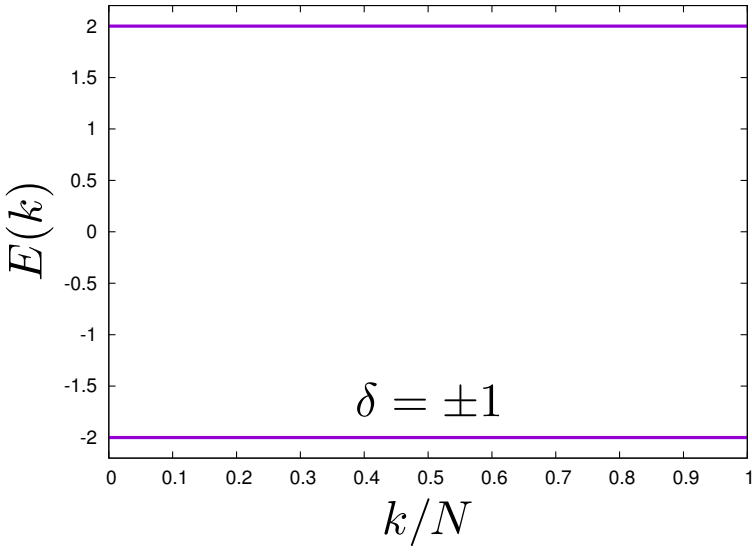
The Su-Schrieffer-Heeger model

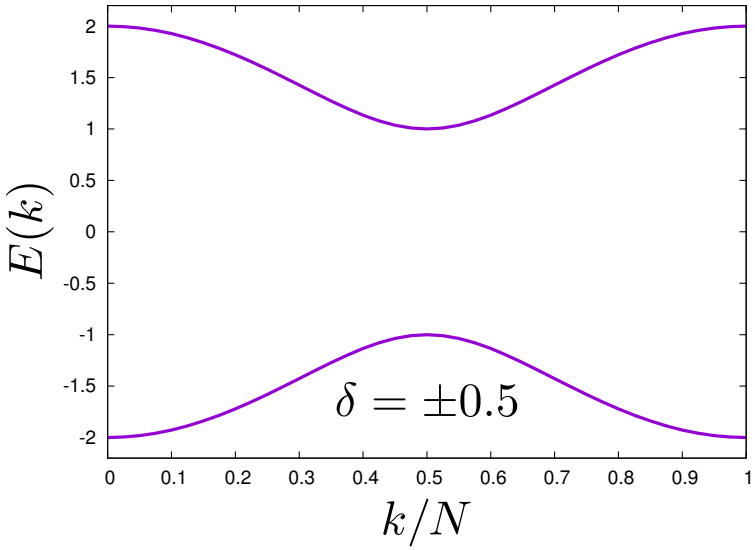
C. Repellin

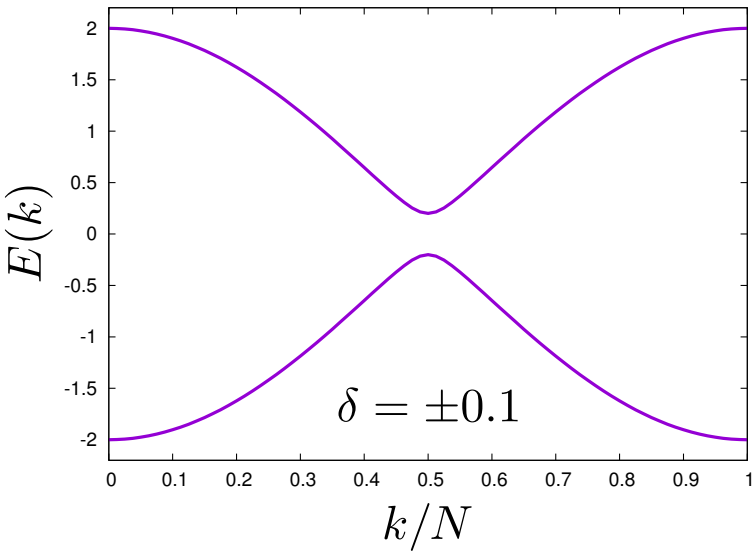
Massachussets Institute of Technology

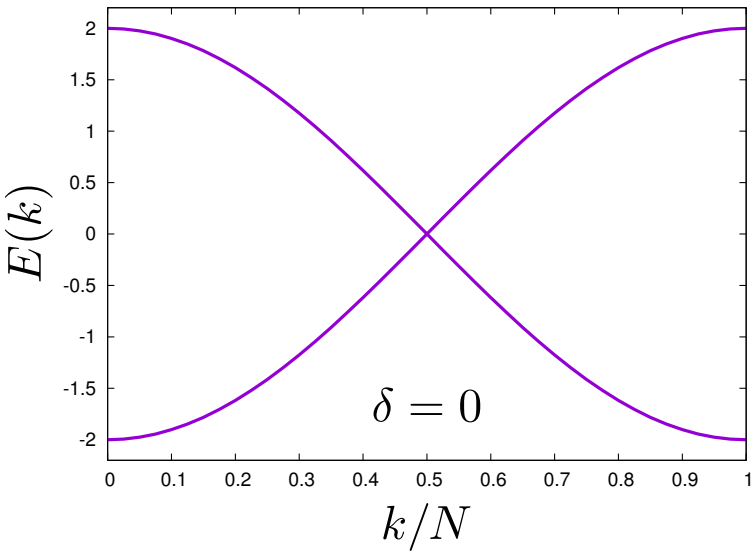
Universidad de Los Andes – Topological order and beyond

Band structure









$N = 40$ unit cells

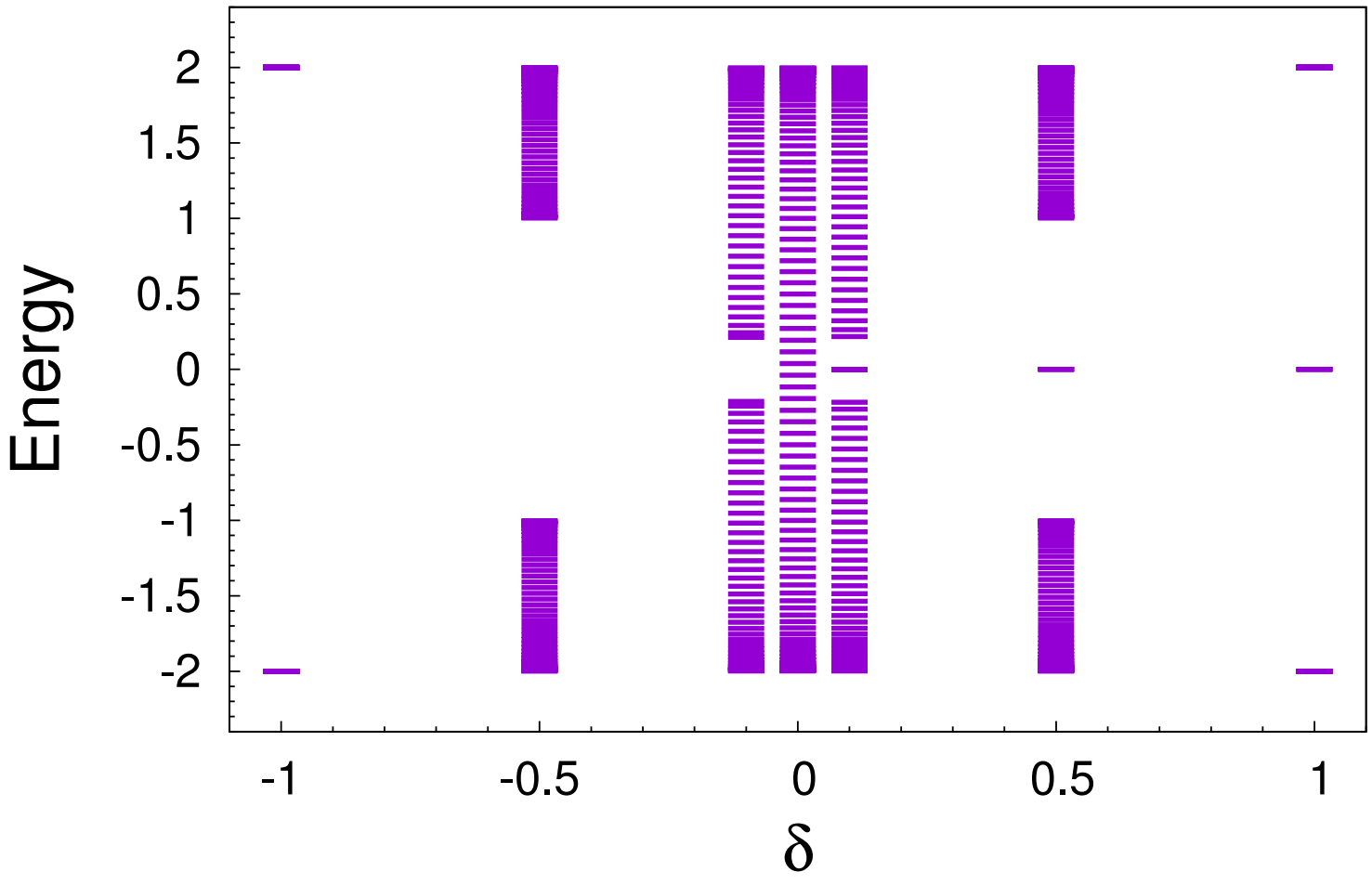
SSH spectrum with PBC

```
import numpy as np
from numpy import linalg as LA
import os

Delta = 0.2

NbrUnitCells = 40

Hamiltonian = np.zeros(shape=(2 * NbrUnitCells, 2 * NbrUnitCells))

for Position in range(0, NbrUnitCells - 1):
    Hamiltonian[2 * Position][2 * Position + 1] = (1.0 - Delta)
    Hamiltonian[2 * Position + 1][2 * Position] = (1.0 - Delta)
    Hamiltonian[2 * Position + 1][2 * Position + 2] = (1.0 + Delta)
    Hamiltonian[2 * Position + 2][2 * Position + 1] = (1.0 + Delta)
Hamiltonian[2 * NbrUnitCells - 2][2 * NbrUnitCells - 1] = (1.0 - Delta)
Hamiltonian[2 * NbrUnitCells - 1][2 * NbrUnitCells - 2] = (1.0 - Delta)
Hamiltonian[2 * NbrUnitCells - 1][0] = (1.0 + Delta)
Hamiltonian[0][2 * NbrUnitCells - 1] = (1.0 + Delta)

Energies = np.sort(LA.eigvalsh(Hamiltonian))
for Index in range(0, 2 * NbrUnitCells):
    print (NbrUnitCells, Energies[Index])
```

SSH spectrum with OBC

```
import numpy as np
from numpy import linalg as LA
import os

Delta = 0.2

NbrUnitCells = 40

Hamiltonian = np.zeros(shape=(2 * NbrUnitCells, 2 * NbrUnitCells))

for Position in range(0, NbrUnitCells - 1):
    Hamiltonian[2 * Position][2 * Position + 1] = (1.0 - Delta)
    Hamiltonian[2 * Position + 1][2 * Position] = (1.0 - Delta)
    Hamiltonian[2 * Position + 1][2 * Position + 2] = (1.0 + Delta)
    Hamiltonian[2 * Position + 2][2 * Position + 1] = (1.0 + Delta)
Hamiltonian[2 * NbrUnitCells - 2][2 * NbrUnitCells - 1] = (1.0 - Delta)
Hamiltonian[2 * NbrUnitCells - 1][2 * NbrUnitCells - 2] = (1.0 - Delta)

Energies = np.sort(LA.eigvalsh(Hamiltonian))
for Index in range(0, 2 * NbrUnitCells):
    print (NbrUnitCells, Energies[Index])
```

SSH open boundary conditions



$N = 40$ unit cells