Visualization of Concepts in Condensed Matter Physics

Nikolai Plambech Nielsen
Niels Bohr Institute

Outline

- Introduction
- Background
- Lattices and crystal structure
- The reciprocal lattice and scattering
- Band structure

Introduction

Background

Bloch's theorem

$$\psi(\mathbf{r}) = e^{i\mathbf{k}\cdot\mathbf{r}} u(\mathbf{r}) \tag{1}$$

Lattices and crystal structure

$$\mathbf{R} = \sum_{i=1}^{d} n_i \mathbf{a}_i \tag{2}$$

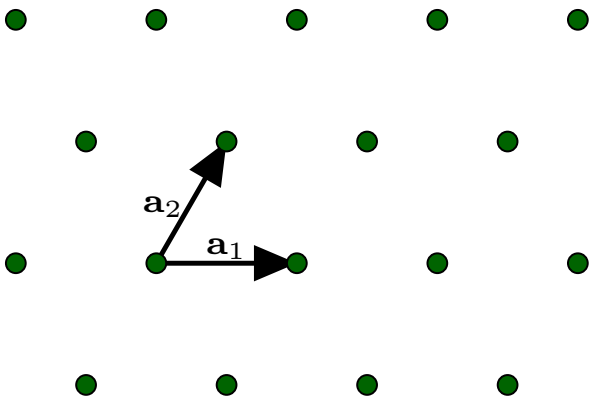

Figure: A triangular lattice. $\mathbf{a}_1 = a \cdot (1, 0)$, $\mathbf{a}_2 = a \cdot (1/2, \sqrt{3}/2)$

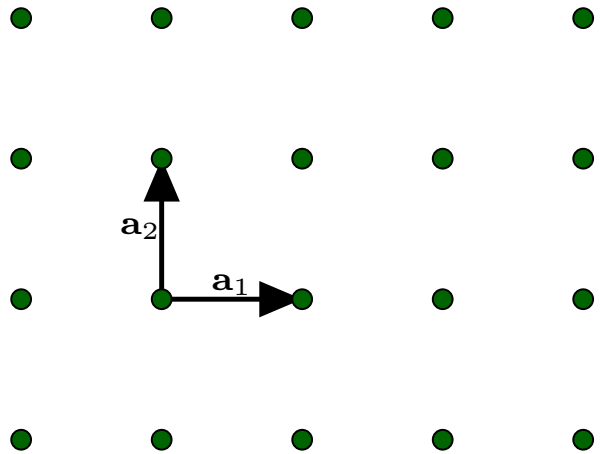

Figure: A square lattice. $\mathbf{a}_1 = a \cdot (1, 0), \mathbf{a}_2 = a \cdot (0, 1)$