5.1 Introduction

The task is to solve a linear system with n equations and n unknowns:

$$a_{11}x_1 + a_{12}x_2 + \dots + a_{1n}x_n = b_1, a_{21}x_1 + a_{22}x_2 + \dots + a_{2n}x_n = b_2, \vdots a_{n1}x_1 + a_{n2}x_2 + \dots + a_{nn}x_n = b_n.$$
(5.1)

Obviously, this can be written as $A\vec{x} = \vec{b}$, with an $n \times n$ matrix A and vectors \vec{b} , \vec{x} of length n. If all the a_{ij} are nonzero, such a system of equations is called *densely occupied*. To solve such a densely occupied linear system one uses the Gaussian elimination method. However, for linear systems where many coefficients are zero, the Gauss method will fail. In this case one uses different iterative methods.