Notation

I have made an effort to keep a consistent mathematical notation throughout the book. Although every symbol is defined in the text prior to its use, it may be convenient for the reader to have the list of major symbols summarized together. The list is presented below:

- Vectors are denoted with **boldface** letters, such as $\boldsymbol{x}$.
- Matrices are denoted with capital letters, such as A.
- The determinant of a matrix is denoted as $\det\{A\}$, and sometimes as $|A|$.
- A diagonal matrix with elements $a_1, a_2, \ldots, a_l$, in its diagonal is denoted as $A = \text{diag}\{a_1, a_2, \ldots, a_l\}$.
- The identity matrix is denoted as I.
- The trace of a matrix is denoted as $\text{trace}\{A\}$.
- Random variables are denoted with roman fonts, such as x, and their corresponding values with *mathmode* letters, such as x.
- Similarly, random vectors are denoted with roman **boldface**, such as $\mathbf{x}$, and the corresponding values as $\boldsymbol{x}$. The same is true for random matrices, denoted as X and their values as X.
- The vectors are assumed to be column-vectors. In other words,

$$\boldsymbol{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_l \end{bmatrix} = \begin{bmatrix} x(1) \\ x(2) \\ \vdots \\ x(l) \end{bmatrix}$$

  That is, the ith element of a vector can be represented either with a subscript x_i or as $x(i)$. This is because the vectors may have already been given another subscript; $\boldsymbol{x}_n$, and the notation can be cluttered.
- Matrices are written as

$$X = \begin{bmatrix} x_{11} & x_{12} & \ldots & x_{1l} \\ \vdots & \vdots & \ddots & \vdots \\ x_{l1} & x_{l2} & \ldots & x_{ll} \end{bmatrix} = \begin{bmatrix} X(1,1) & (1,2) & \ldots & X(1,l) \\ \vdots & \vdots & \ddots & \vdots \\ X(l,1) & X(l,2) & \ldots & X(l,l) \end{bmatrix}$$

- Transposition of a vector is denoted as $\boldsymbol{x}^T$ and the Hermitian transposition as $\boldsymbol{x}^H$
- Complex conjugation of a complex number is denoted as x^* and also $\sqrt{-1} := j$. The symbol ":=" denotes definition.
- The set of real, complex, integer, and natural numbers is denoted as $\mathbb{R}$, $\mathbb{C}$, $\mathbb{Z}$, and $\mathbb{N}$, respectively.
- Sequences of numbers (vectors) are denoted as x_n ($\boldsymbol{x}_n$) or $x(n)$ ($\boldsymbol{x}(n)$).
- Functions are denoted with lower case letters, e.g., f, or in terms of their arguments, e.g., $f(x)$ or sometimes as $f(\cdot)$, if no specific argument is used.