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Nota di contenuto	Intro -- Contents -- I: DEFINITIONS AND METHODOLOGY -- 1. Introduction to graphs -- 1.1 Graphs, directed graphs, and weighted graphs -- 1.2 Trees -- 1.3 Vertex correlation, assortativity -- 1.4 Hierarchical properties of graphs -- 1.5 The properties of scale-free networks -- 2. Graph structures: communities -- 2.1 Introduction -- 2.2 Typical subgraphs, motifs -- 2.3 Classes of vertices -- 2.4 Centrality measures, betweenness, and robustness -- 2.5 Clustering detection, modularity -- 2.6 Communities in graphs -- 3. Scale-invariance -- 3.1 Geometrical scale-invariance: fractals -- 3.2 Measuring the fractal dimension -- 3.3 Scale-invariance and power laws -- 3.4 Plotting a power law -- 3.5 Scale-invariance in natural sciences -- 3.6 Scale-invariance in economics and in social sciences -- 4. The origin of power-law functions -- 4.1 Random walk, Laplace equation, and fractals -- 4.2 Power laws from minimization principles -- 4.3 Multiplicative processes and normal distribution -- 4.4 Preferential attachment, the Matthew effect -- 5. Graph generating models -- 5.1 Random graph model -- 5.2 The small-world model -- 5.3 The Barabási-Albert model -- 5.4 Modifications to the Barabási-Albert model -- 5.5 Copying models -- 5.6 Fitness based model -- 5.7 Graph from optimization principles -- II: EXAMPLES -- 6. Networks in the cell -- 6.1 Basic cell biology -- 6.2 Protein-protein interaction network -- 6.3 Metabolic pathways -- 6.4 Gene regulatory networks --

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Sommario/riassunto

Many different systems both in nature and in technology can be described by means of networks of interconnected components. Despite their different aspects, all of them share similar mathematical properties. In this book we explain how to recognize these features and why these different systems develop this common structure.
