Preface

Maintaining health is an important part of human activity, in which a lot of progress is being made all the time. Artificial Intelligence (AI) and Computational Intelligence (CI) techniques – in particular, deep learning techniques – have contributed to many of these successes. However, there are still many important and crucial medical challenges. To solve these remaining challenges, we must go beyond the existing techniques. In particular, we must go beyond the currently used AI and CI techniques: we must modify the existing techniques, combine them with other techniques, and/or come up with completely new ideas. This biomedical-inspired search for new AI and CI techniques is the main focus of this book.

In line with this focus, most of the chapters describe how AI and CI techniques can help in solving medical challenges. These chapters form Part 1 of this book. Of course, many challenging problems remain. To solve such problems, it is important to continue developing new AI and CI techniques. If these techniques are successful in other challenging application areas, there is hope that these techniques will be helpful in biomedical applications as well. In accordance with this reasoning, in the following parts of the book, we describe AI and CI techniques that have been successful in other application areas: finance (Part 2), transportation engineering (Part 3), and physics, in particular, physics of computation (Part 4). New promising AI and CI ideas that have not yet led to successful practical applications are described in Part 5.

We hope that this book will help practitioners and researchers to learn more about computational intelligence techniques and their biomedical applications – and to further develop this important research direction.

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