

Preface

There are many textbooks that teach the basics and more advanced concepts of mathematical techniques and engineering approaches or the pathophysiology of neurological disorders. But for some readers, such a specialized treatise is more than bargained for. A medical doctor, who wants to interpret an EEG spectrum, does not need to know all intricacies of Fourier theory. On the other hand, an engineer who wants to employ spectral analysis techniques to improve the differential diagnosis of tremor, does not need a full understanding of tremor pathophysiology. Yet, both for physicians and engineers, it is important to bridge the gap between technology and medicine.

With this book, I hope to provide a guide for those interested in crossing over from the field of medicine – neurology in particular – to the field of technology and vice versa. Neurologists and residents in neurology, medical engineers, medical students, biomedical engineers and students, technical medicine students, or students of other interdisciplinary fields may therefore all find this book interesting and useful.

This text is inspired by a lecture series that I started teaching to residents in neurology back in 2006. The goal of that lecture series was to explain mathematical and physical principles underlying neurological diagnostic techniques to medical doctors. Being a mathematician by training, I noticed that my initial more conventional approach was not optimal; only by introducing the abstract concepts through concrete neurological cases I was able to get my educational message across. This experience motivated me to choose an uncommon approach for this book.

Each chapter starts with an outline of what should be known after studying the chapter. Then the neurological problems of interest are introduced through one or more patient cases. Subsequently, the neurodiagnostic technique that can help establish a diagnosis is outlined and the necessary mathematics, physics, or engineering principles are explained. Finally, the new knowledge is applied to the patient cases and other applications of the neurodiagnostic technique are discussed. To help understand the essentials of each chapter, questions with answers are provided throughout the text. For the interested reader, mathematical details are

provided in separate boxes, but they can be easily skipped by those with less background in mathematics. Furthermore, each chapter is completed with many illustrations, a list of easily accessible additional reading material and a glossary. This set-up is intended to make the book suited for self-study, but also for use in classroom lectures.

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