Undergraduate Topics in Computer Science

Robin Sharp

# Introduction to Cybersecurity

## A Multidisciplinary Challenge

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# Undergraduate Topics in Computer Science

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Robin Sharp

# Introduction to Cybersecurity

## A Multidisciplinary Challenge

Springer

Robin Sharp
Department of Applied Mathematics
and Computer Science (DTU Compute)
Technical University of Denmark
Kongens Lyngby, Denmark

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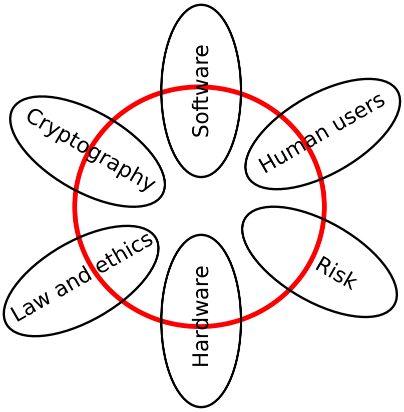
# Preface



This book gives an introduction to cybersecurity for people who would like to know more about the security risks which arise in the modern IT world, where computers and many other electronic devices communicate with one another through networks. The detailed requirements for cybersecurity vary from one application area to another, but in general terms are a matter of achieving some simple aims: that data must not be read, modified, deleted or made unavailable by persons who are not allowed to.

Achievment of such aims is a multidisciplinary challenge, as an IT system consists of both hardware, software and human users, all of which can contribute to the success or failure of efforts to maintain cybersecurity. In this book we therefore look at the most common, both technical and non-technical, ways in which cybersecurity may be threatened, at how you can protect yourself against such threats, and how to deal with situations where this protection fails.

An important topic in any discussion of cybersecurity is the rules which regulate behaviour in an Internet based world. A lack of cybersecurity can have dramatic consequences, both for individuals and for society as a whole. Some activities, such as terrorism or destruction of IT systems which are vital to society, are so harmful, that they must be considered as crimes. Others have consequences, such as disclosure of details of your private life, which are unpleasant but not necessarily illegal. In the last main chapter of the book we give an overview of some of the most important laws and regulations with relevance for cybersecurity.

The book is based on material developed for an elementary course on IT security for a group of students at the Technical University of Denmark (DTU) who were not IT specialists. It is intended particularly for readers starting on a course of study in computer science or engineering who require a general introduction to the subject.

It is assumed that readers have a certain knowledge of computers – at least as computer users. But many aspects of cybersecurity cannot be explained without going somewhat more into detail with technical aspects of IT systems which affect cybersecurity. The book therefore gives an introduction to what computer systems consist of, how networks of various types work, and what operating systems do. These parts of the book are especially intended for readers who do not have a suitable grounding in IT. Certain of the book's topics, especially modern cryptography, require a certain knowledge of mathematics, but not more than you should be able to get from a school-leaving exam. Interested readers can find some more detailed explanations of relevant mathematical topics in an appendix.

A problem for all readers, irrespective of their mother tongue, is that the whole area of cybersecurity is awash with acronyms, most of which are so accepted in technical circles that it is meaningsless to try to avoid using them. To help the reader, a short explanation of all the technical acronyms which are used in this book is provided in an appendix.

The book concludes with a numbered list of references to publicly available documents related to the topics presented in the main text. (References to these documents in the main text appear in square brackets – so for example [34] refers to reference number 34 in the list.)

To get the most out of the book, it is important that the reader doesn't just read the text. All the chapters contain exercises which illustrate important aspects of the topic dealt with in the chapter. There are both theoretical exercises and exercises which involve you in trying something out in practice on a computer. Here it is best if you have an experimental attitude to things, and are willing to throw yourself out into experiments if you do not completely understand what is happening. In this way you will get a much better understanding of how things hang together – and a smaller risk of just becoming a "desktop expert" without any useful practical experience.

The author would like to thank his many students and colleagues at DTU Compute and elsewhere for their helpful comments on various drafts of this book which have seen the light of day. Without their encouragement and feedback the book would never have been written.

Lyngby, *Robin Sharp*
July 2023.

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