Texts in Computational
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7

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Aslak Tveito • Hans Petter Langtangen
Bjørn Frederik Nielsen • Xing Cai

Elements of Scientific Computing

With 88 Figures and 18 Tables

Springer

Aslak Tveito
Hans Petter Langtangen
Xing Cai
Center for Biomedical Computing
Simula Research Laboratory
P.O. Box 134
1325 Lysaker
Norway
aslak@simula.no
hpl@simula.no
xingca@simula.no

and

Department of Informatics
University of Oslo
P.O. Box 1080 Blindern
0316 Oslo
Norway

Bjørn Frederik Nielsen
Department of Mathematical
Sciences and Technology
Norwegian University of Life Sciences
P.O. Box 5003
1432 Ås
Norway
bjorn.f.nielsen@umb.no

and

Center for Biomedical Computing
Simula Research Laboratory
P.O. Box 134
1325 Lysaker
Norway

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Preface

Science used to be experiments and theory; now it is experiments, theory, and computations. The computational approach to understanding nature and technology is currently expanding in many fields, such as physics, mechanics, geophysics, astrophysics, chemistry, biology, and most engineering disciplines. The computational methods used in these branches are very similar, and this book is a first introduction to such methods. Many books have been written on the subject. The present text aims to provide a gentle introduction, explaining the methods through examples taken from various fields of science.

As a computational scientist, you will work with other applications, models, and methods than those covered herein. The field is vast and it is impossible to capture more than a small fraction of it in a reasonably sized text. Therefore, we will teach principles and ideas. We believe that principles and ideas carry over from field to field, whereas particularly clever tricks tend to be application specific. We urge you to focus on the ideas and not to get too concerned about the context in which the models appear. We describe the context and provide examples merely to simplify the setting and make the text easier to read.

To read this text, you must know calculus (functions, differentiation, integration etc.) and the basics of linear algebra (vectors, matrices etc.), and you should be familiar with elementary programming. This book is just a gentle start to show what scientific computing is about and present some background that will simplify your future study of more advanced texts on numerical methods and their applications in science and engineering.

All the problems in the text have been solved, and the solutions are provided at

`http://www.ifi.uio.no/cs/`

where you can also find lecture slides for all the chapters.

We hope you enjoy reading this book as much as we have enjoyed writing it.

Fornebu
September 2010

Aslak Tveito
Hans Petter Langtangen
Bjørn Fredrik Nielsen
Xing Cai

Contents