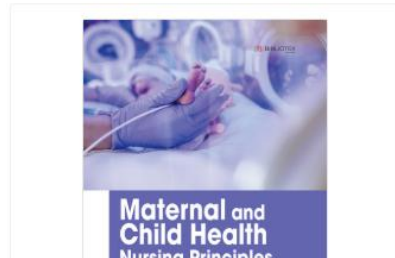
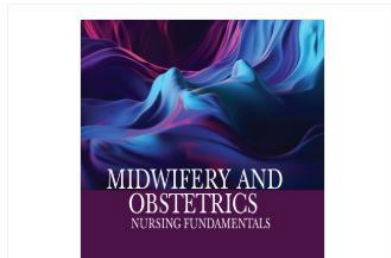
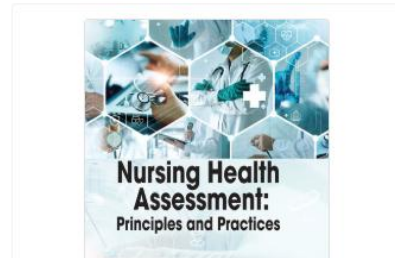


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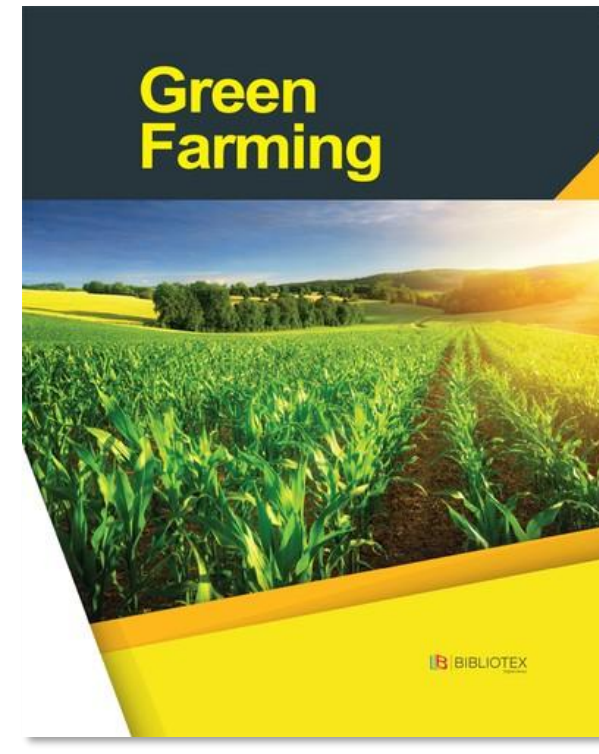
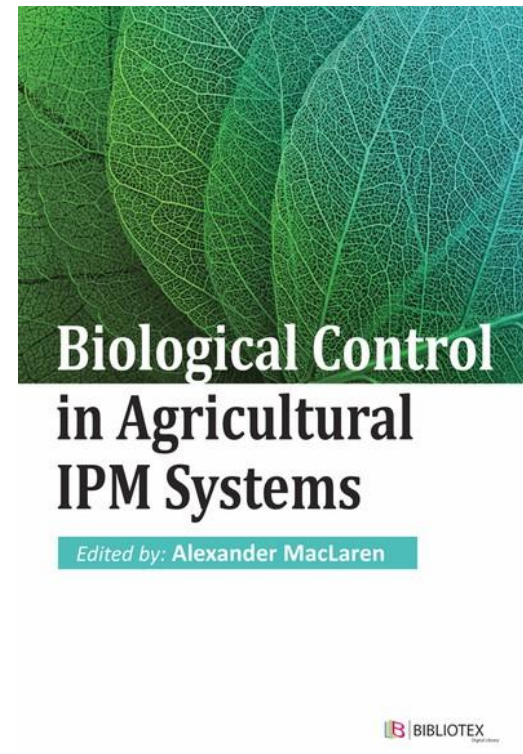
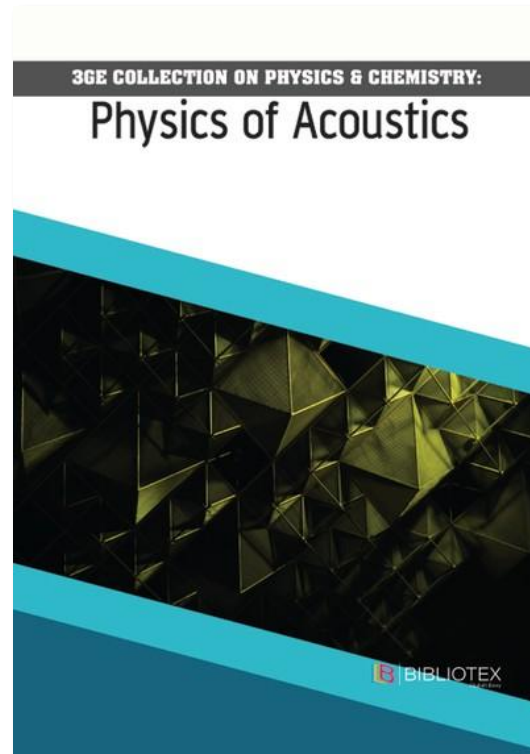
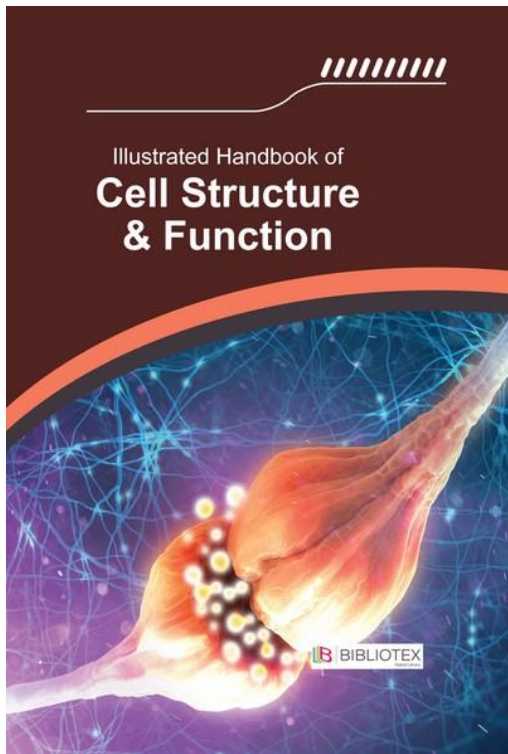
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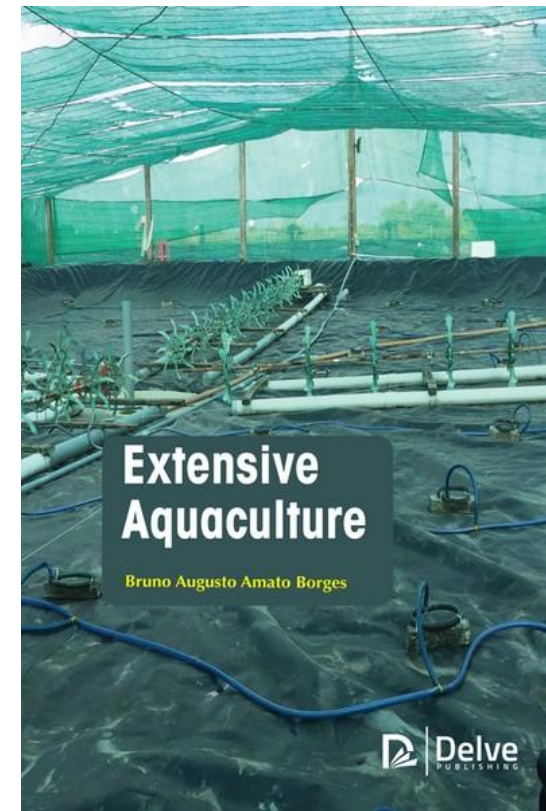
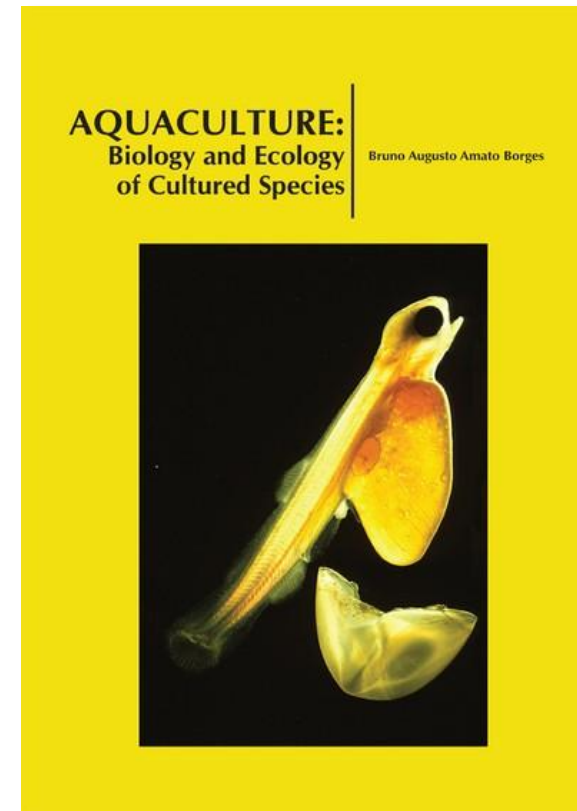
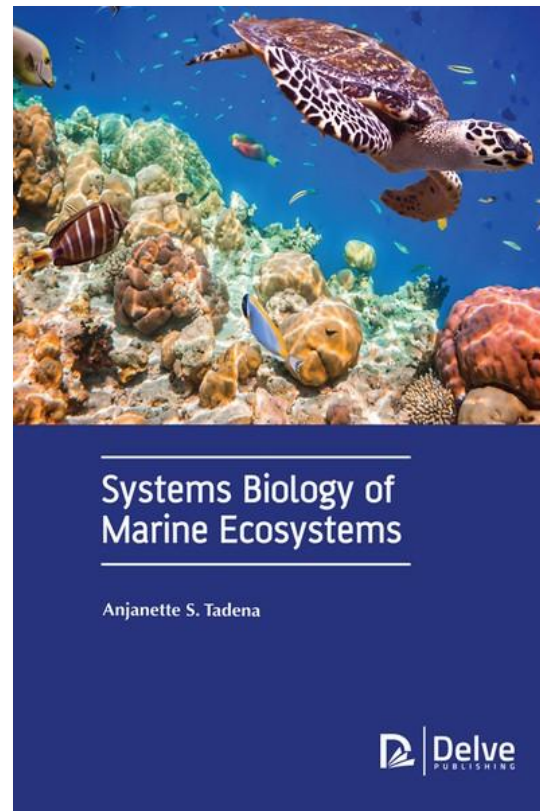
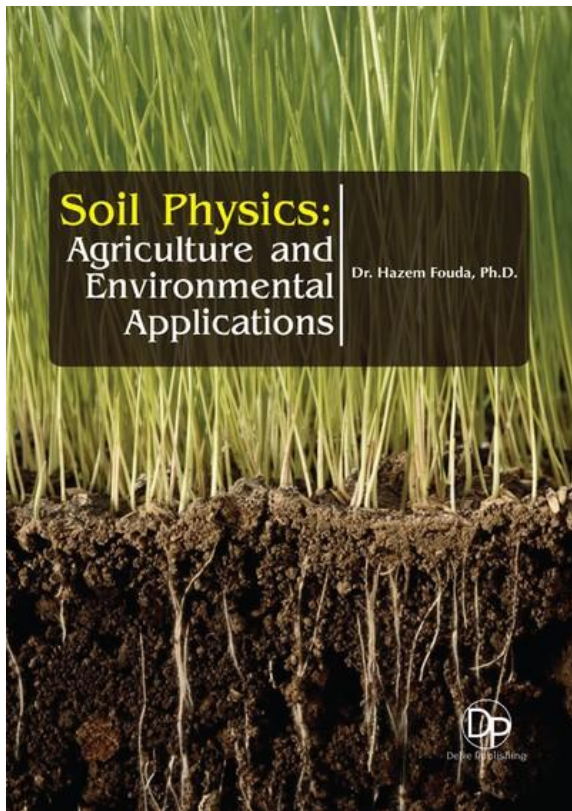
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¹Department of Urology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubai, China

²Department of Pathology, Microbiology, and Immunology, University of South Carolina School of Medicine, Columbia, SC, USA

INTRODUCTION

The Kruppel-like factor family is a group of zinc finger containing transcription factors, which are highly homologous with the *Drosophila* Kruppel protein. The feature that distinguishes the KLF family from other zinc finger containing transcriptional factors is the presence of three highly conserved C2H2 containing zinc finger motifs at the C-terminus [1-3]. These fingers enable KLFs to bind to the GC-box or CACCC-boxes on DNA with different affinities [4]. KLF4, as a member of KLF family, expresses in a wide range of tissues in mammals, and plays a critical role in regulating a diverse array of cellular processes including proliferation, differentiation, development, maintenance of normal tissue homeostasis and apoptosis. KLF4 can also acts either as a tumor suppressor or an

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CHAPTER 9

AMPHIBIANS ON THE HOTSPOT: MOLECULAR BIOLOGY AND CONSERVATION IN THE SOUTH AMERICAN ATLANTIC RAINFOREST

Cesar R. L. Amaral¹, Anna C. S. Chaves¹, Vitor N. T. Borges Júnior¹, Filipe Pereira², Bruna M. Silva¹, Dayse A. Silva¹, António Amorim^{3,4}, Elizeu F. Carvalho¹, and Carlos F. D. Rocha¹

¹Departamento de Ecologia, Instituto de Biologia Roberto Alcântara Gomes, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil

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⁴Faculdade de Ciências, Universidade do Porto, Porto, Portugal

ABSTRACT

Amphibians are the focus of a recent debate and public attention owing to the global decline in their populations worldwide. Amphibians are

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Hazem Shawky Fouda has a PhD. In Agriculture Sciences, obtained his PhD. From the Faculty of Agriculture, Alexandria University in 2008. He is working in Cotton Arbitration & Testing General Organization (CATGO).



Dr. Sandra El Hajj, Ph.D. in Health Sciences from Nova Southeastern University, Florida, USA is a health professional specialized in Preventive and Global Health. With her 12 years of education obtained from one of the most prominent universities in Beirut, in addition to two leading universities in the State of Florida (USA), Dr. Sandra made sure to incorporate interdisciplinary and multicultural approaches in her work. Her long years of studies helped her create her own miniature world of knowledge linking together the healthcare field with Medical Research, Statistics, Food Technology, Environmental & Occupational Health, Preventive Health and most noteworthy her precious last degree of Global Health. Till today, she is the first and only doctor specialized in Global Health in the Middle East area.



Dan Piestun (PhD) is currently a startup entrepreneur in Israel working on the interface of Agriculture and Biomedical Sciences and was formerly president-CEO of the National Institute of Agricultural Research (INIA) in Uruguay. Dan is a widely published scientist who has received many honours during his career including being a two-time recipient of the Amit Golda Meir Prize from the Hebrew University of Jerusalem, his areas of expertise includes stem cell molecular biology, plant and animal genetics and bioinformatics. Dan's passion for applied science and technological solutions did not stop him from pursuing a deep connection to the farmer, his family and nature. Among some of his interest and practices counts enjoying working as a beekeeper and onboard fishing.



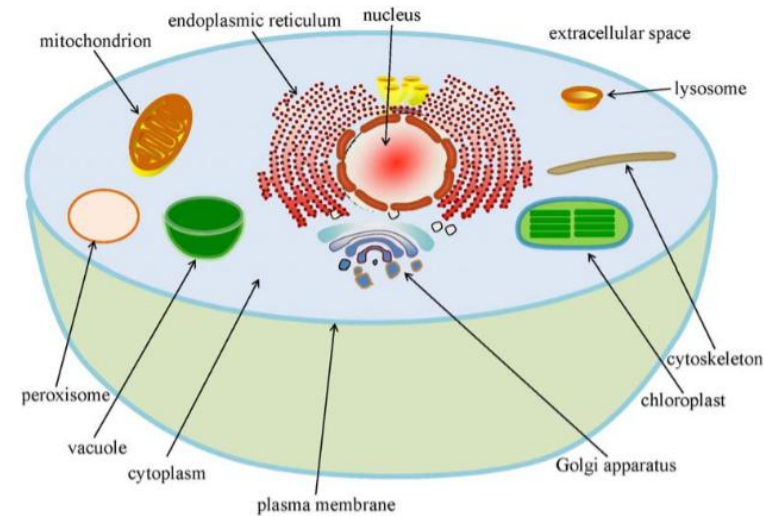
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Foziya Parveen has a Dphil in Sustainable Water Engineering from the University of Oxford. Prior to this she has received MS in Environmental Sciences from National University of Science and Technology (NUST), Islamabad Pakistan and BS in Environmental Sciences from Fatima Jinnah Women University (FJWU), Rawalpindi.

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Mitochondria

Mitochondria produce energy and synthesize large amounts of ATP by aerobic respiration. This process requires cooperation between two energy production pathways—the citric acid cycle in the soluble portion of the mitochondria and the electron transport chain on the inner membrane. The number of mitochondria in the cell and the degree of development of the inner membrane differ from cell to cell. In liver cells, which require a high amount of energy, many mitochondria are present, and the inner membrane is well developed. Moreover, since energy production is important for the activities of life, abnormalities in mitochondria often cause serious diseases.

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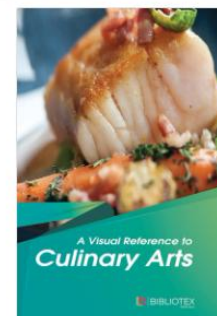


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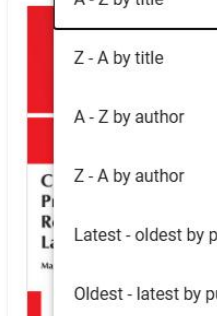


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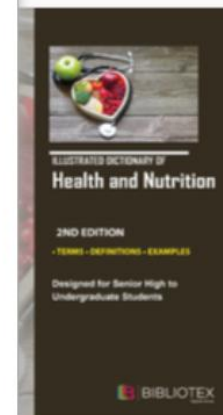
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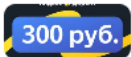
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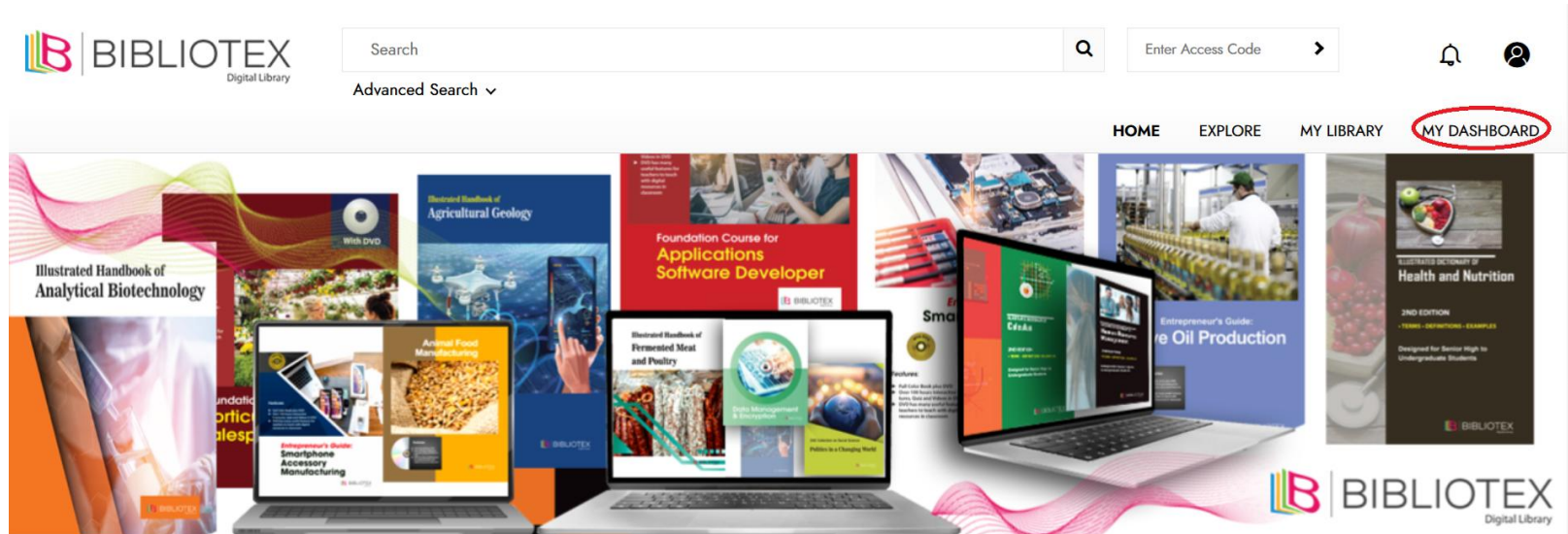
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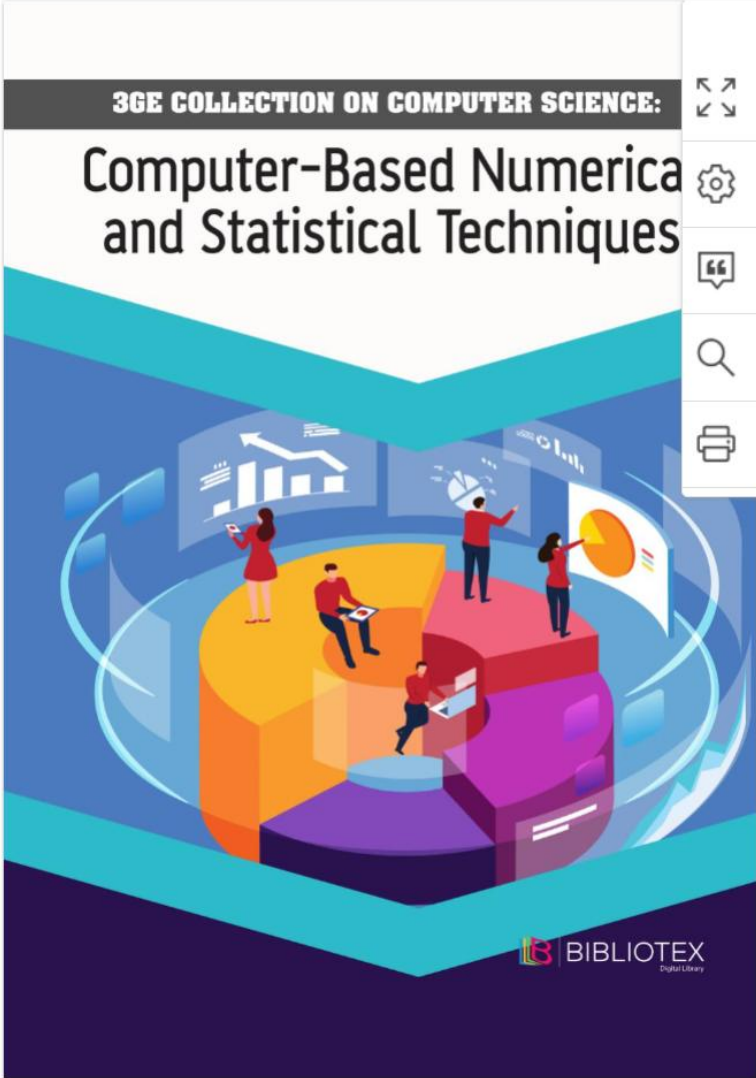
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ERRORS IN NUMERICAL ANALYSIS

INTRODUCTION

Numerical analysis is the area of mathematics and computer science that creates, analyzes, and implements algorithms for solving numerically the problems of continuous mathematics. Such problems originate generally from real-world applications of algebra, geometry, and calculus, and they involve variables which vary continuously. These problems occur throughout the natural sciences, social sciences, medicine, engineering, and business. Beginning in the 1940's, the growth in power and availability of digital computers has led to an increasing use of realistic mathematical models in science, medicine, engineering, and business; and numerical analysis of increasing sophistication has been needed to solve these more accurate and complex mathematical models of the world. The formal academic area of numerical analysis varies from highly theoretical mathematical studies to computer science issues involving the effects of computer hardware and software on the implementation of specific algorithms.

Numerical analysis provides a variety of techniques to represent (store) and compute approximations to mathematical numerical values. Errors arise from a trade-off between efficiency (space and computation time) and precision, which is limited anyway, since (using common floating-point arithmetic) only a finite amount of values can be represented exactly. The discrepancy between the exact

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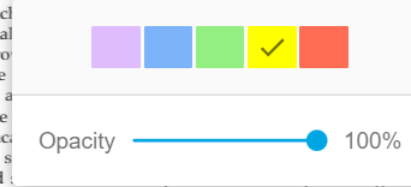
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ERRORS IN NUMERICAL ANALYSIS

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mathematical value and the stored/computed value is called the approximation error.

2.1 ERRORS AND THEIR ANALYSIS

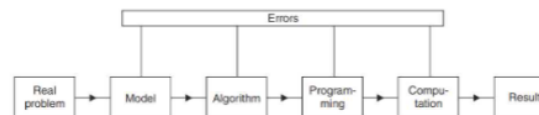
When using numerical methods or algorithms and computing with finite precision, errors of approximation or rounding and truncation are introduced. It is important to have a notion of their nature and their order. A newly developed method is worthless without an error analysis. Neither does it make sense to use methods which introduce errors with magnitudes larger than the effects to be measured or simulated. On the other hand, using a method with very high accuracy might be computationally too expensive to justify the gain in accuracy.

2.1.1 Sources of Errors

Following

- **Input errors.** The input data is rarely exact since it comes from the experiments and any experiment can give results of only limited accuracy. Moreover, the quantity used can be represented in a computer for only a limited number of digits.
- **Algorithmic errors.** If direct algorithms based on a finite sequence of operations are used, errors due to limited steps don't amplify the existing errors, but if infinite algorithms are used, exact results are expected only after an infinite number of steps. As this cannot be done in practice, the algorithm has to be stopped after a finite number of steps and the results are not exact.
- **Computational errors.** Even when elementary operations such as multiplication and division are used, the number of digits increases greatly so that the results cannot be held fully in a register available in a given computer. In such cases, a certain number of digits must be discarded. Furthermore, the errors here accumulate one after another from operation to operation, changing during the process and producing new errors.

The following diagram gives a schematic sequence for solving a problem using a digital computer pointing out the sources of errors.



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2.1 ERRORS AND THEIR ANALYSIS

When using numerical methods or algorithms and computing with finite precision, errors of approximation or rounding and truncation are introduced. It is important to have a notion of their nature and their order. A newly developed method is worthless without an error analysis. Neither does it make sense to use methods which do not take into account the order of magnitude of the errors.

2.1 Errors and Their Analysis

Following are some of the sources of errors in computer arithmetic.

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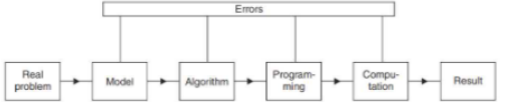
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INTRODUCTION

Numerical analysis is the area of mathematics and computer science that creates, analyzes, and implements algorithms for solving numerically the problems of continuous mathematics. Such problems originate generally from real-world applications of algebra, geometry, and calculus, and they involve variables which vary continuously. These problems occur throughout the natural sciences, social sciences, medicine, engineering, and business. Beginning in the 1940's, the growth in power and availability of digital computers has led to an increasing use of realistic mathematical models in science, medicine, engineering, and business; and numerical analysis of increasing sophistication has been needed to solve these more accurate and complex mathematical models of the world. The formal academic area of numerical analysis varies from highly theoretical mathematical studies to computer science issues involving the effects of computer hardware and software on the implementation of specific algorithms.

Numerical analysis provides a variety of techniques to represent (store) and compute approximations to mathematical numerical values. Errors arise from a trade-off between efficiency (space and computation time) and precision, which is limited anyway, since (using common floating point arithmetic) only a finite amount of values can be represented exactly. The discrepancy between the exact

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2.1 ERRORS

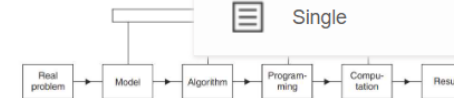
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mathematical value and the stored/computed value is called the approximation error.

2.1 ERRORS AND THEIR ANALYSIS


When using numerical methods or algorithms and computing with finite precision, errors of approximation or rounding and truncation are introduced. It is important to have a notion of their nature and their order. A newly developed method is worthless without an error analysis. Neither does it make sense to use methods which introduce errors with magnitudes larger than the effects to be measured or simulated. On the other hand, using a method with very high accuracy might be computationally too expensive to justify the gain in accuracy.

2.1.1 Sources of Errors

Following are the sources of errors:

- **Round-off errors.** These are introduced when a number is represented in a limited number of bits. The error introduced is called the round-off error.
- **Truncation errors.** These are introduced when a function is approximated by a finite number of terms of its power series expansion. The error introduced is called the truncation error.
- **Computational errors.** Even when elementary operations such as multiplication and division are used, the number of digits increases greatly so that the results cannot be held fully in a register available in a given computer. In such cases, a certain number of digits must be discarded. Furthermore, the errors here accumulate one after another from operation to operation, changing during the process and producing new errors.

The following diagram gives a schematic sequence for solving a problem using a digital computer pointing out the sources of errors.



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CHAPTER 2

ERRORS IN NUMERICAL ANALYSIS

INTRODUCTION

Numerical analysis is the area of mathematics and computer science that creates, analyzes, and implements algorithms for solving numerically the problems of continuous mathematics. Such problems originate generally from real-world applications of algebra, geometry, and calculus, and they involve variables which vary continuously. These problems occur throughout the natural sciences, social sciences, medicine, engineering, and business. Beginning in the 1940's, the growth in power and availability of digital computers has led to an increasing use of realistic mathematical models in science, medicine, engineering, and business; and numerical analysis of increasing sophistication has been needed to solve these more accurate and complex mathematical models of the world. The formal academic area of numerical analysis varies from highly theoretical mathematical studies to computer science issues involving the effects of computer hardware and software on the implementation of specific algorithms.

Numerical analysis provides a variety of techniques to represent (store) and compute approximations to mathematical numerical values. Errors arise from a trade-off between efficiency (space and computation time) and precision, which is limited anyway, since (using common floating-point arithmetic) only a finite amount of values can be represented exactly. The discrepancy between the exact

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When using numerical methods or algorithms and computing with finite precision, errors of approximation or rounding and truncation are introduced. It is important to have a notion of their nature and their order. A newly developed method is worthless without an error analysis. Neither does it make sense to use methods which introduce errors with magnitudes larger than the effects to be measured or simulated. On the other hand, using a method with very high accuracy might be computationally too expensive to justify the gain in accuracy.

2.1.1 Sources of Errors

Following are the broad sources of errors in numerical analysis:

- Input errors.** The input information is rarely exact since it comes from the experiments and any experiment can give results of only limited accuracy. Moreover, the quantity used can be represented in a computer for only a limited number of digits.
- Algorithmic errors.** If direct algorithms based on a finite sequence of operations are used, errors due to limited steps don't amplify the existing errors, but if infinite algorithms are used, exact results are expected only after an infinite number of steps. As this cannot be done in practice, the algorithm has to be stopped after a finite number of steps and the results are not exact.
- Computational errors.** Even when elementary operations such as multiplication and division are used, the number of digits increases greatly so that the results cannot be held fully in a register available in a given computer. In such cases, a certain number of digits must be discarded. Furthermore, the errors here accumulate one after another from operation to operation, changing during the process and producing new errors.

The following diagram gives a schematic sequence for solving a problem using a digital computer pointing out the sources of errors.

```
graph LR; RP[Real problem] --> M[Model]; M --> A[Algorithm]; A --> P[Programming]; P --> C[Computation]; C --> R[Result]; E[Errors] --- M; E --- A; E --- P; E --- C;
```

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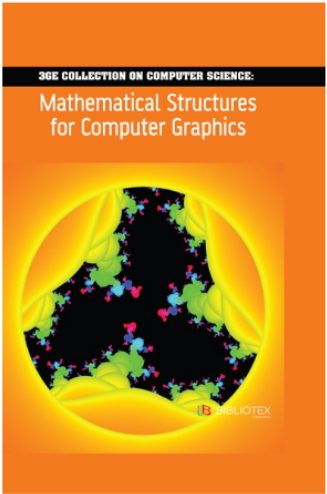
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


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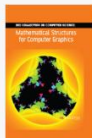

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
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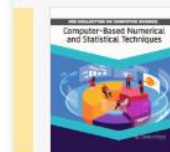
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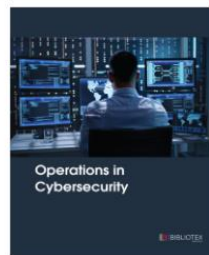
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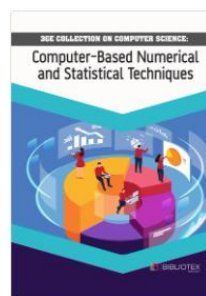
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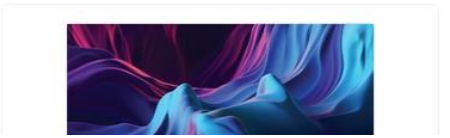
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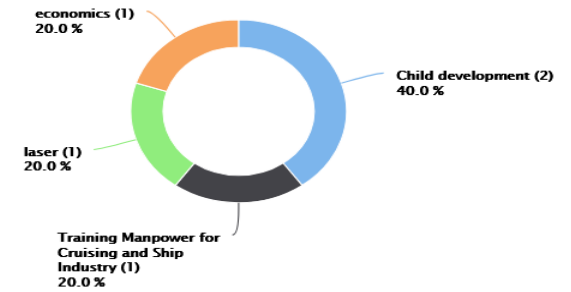
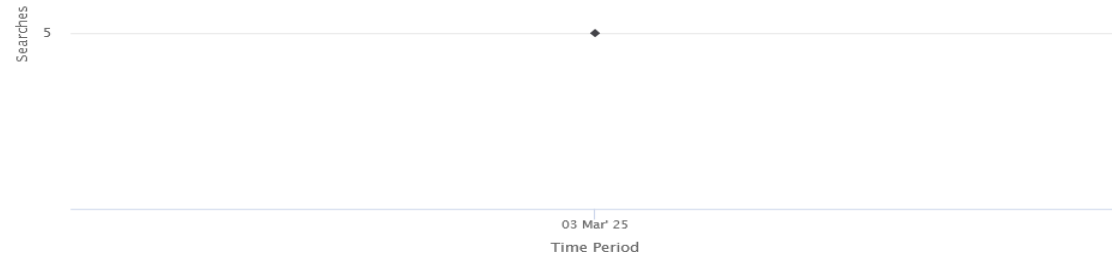
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