



FOUNDATIONS OF COMPUTER SCIENCE

THEORY, NETWORKS, AND SECURITY

Dr. Siddhartha Sankar Biswas



Foundations of Computer Science:

Theory, Networks, and Security



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Foundations of Computer Science: Theory, Networks, and Security

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Preface

The discipline of Computer Science stands as one of the most transformative and rapidly evolving fields in the modern era. Its theoretical foundations, network architectures, and security frameworks form the basis of innovation that drives contemporary society. The present volume, “Foundations of Computer Science: Theory, Networks, and Security”, has been developed with the objective of providing a comprehensive and cohesive understanding of these fundamental domains.

This book is intended to serve as both a conceptual and practical resource for students, educators, and researchers. It aims to integrate theoretical knowledge with applied aspects of computer science, thereby bridging the gap between abstract principles and real-world implementation. The chapters are organized systematically, beginning with the core theories of computation and algorithms, progressing through the intricacies of data communication and networking, and culminating in the principles and practices of computer security.

Each section is structured to foster analytical reasoning and critical thinking. The topics are presented with mathematical rigor where appropriate, while maintaining clarity and accessibility for readers at varying levels of expertise. The inclusion of case studies, illustrative examples, and review exercises is intended to enhance comprehension and encourage deeper engagement with the material.

It is my sincere aspiration that this work contributes meaningfully to the academic discourse in computer science and serves as a valuable reference for both teaching and research.

Acknowledgement

The successful completion of this volume has been made possible through the guidance, encouragement, and contributions of many distinguished individuals and institutions.

I extend my profound gratitude to my academic mentors and colleagues for their valuable insights, constructive criticism, and intellectual support during the preparation of this manuscript. Their scholarly engagement has been instrumental in shaping the depth and direction of this work.

I am deeply indebted to the reviewers and subject experts whose feedback helped refine the structure and clarity of the content. Appreciation is also due to the publishing team and editorial staff for their professionalism and dedication throughout the production process.

My heartfelt thanks go to my family and friends for their patience, motivation, and unwavering belief in my endeavors. Their constant support has been a source of strength throughout this journey.

Finally, to the readers, students, and researchers—your pursuit of knowledge gives purpose to this work. It is my hope that this book will inspire further exploration, inquiry, and innovation in the vast field of computer science.

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ABOUT THE BOOK

Foundations of Computer Science: Theory, Networks, and Security provides an integrated framework for understanding the essential pillars of computer science. The text is designed to meet the academic requirements of undergraduate and postgraduate programs, while also serving as a reference for scholars and professionals engaged in computational research and system development.

The book is organized into three comprehensive sections:

Theory – This section covers the conceptual underpinnings of computer science, including computation theory, algorithms, data structures, programming paradigms, and formal languages.

Networks – It examines the architecture, design, and operation of computer networks. Topics include communication models, protocols, data transmission techniques, network security, and emerging trends such as cloud computing and IoT-based connectivity.

Security – This section focuses on the foundational principles of information security, cryptographic mechanisms, system vulnerabilities, threat modeling, and the ethical and legal aspects of cybersecurity.

Throughout the text, emphasis is placed on the interrelation of theory and practice. The material has been carefully curated to align with modern academic curricula and industry standards, making it a valuable contribution to computer science education and research.



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