

*Advances in  
Information  
Systems Science*

*Volume 1*

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<i>Ya. Z. Tsypkin (USSR)</i>	<i>Learning Systems</i>
<i>Herbert Freeman (USA)</i>	<i>Computer Graphics</i>
<i>Brian R. Gaines (England)</i>	<i>Stochastic Computing Systems</i>
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<i>J. W. De Bakker (Netherlands)</i>	<i>Semantics of Programming Languages</i>
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## *Preface*

Engineering has long been thought of by the public as a profession traditionally categorized into such branches as electrical, mechanical, chemical, industrial, civil, etc. This classification has served its purpose for the past half century; but the last decade has witnessed a tremendous change. A continuous transition from the practical to the theoretical has made technology overlap with science, and the enlargement of scope and broadened diversification have smeared the boundaries between traditional engineering and scientific fields. Engineering is rapidly becoming a diversified, multidisciplinary field of scientific endeavor. This has prompted us to regard modern engineering as a science, which has as its ingredients materials, energy, and information.

In our complex and technologically-oriented society organizations are flooded with an enormous amount of management information. We are now faced with problems concerning the efficient use of communicated knowledge. The steady growth in the magnitude and complexity of information systems necessitates the development of new theories and techniques for solving these information problems. We demand instant access to previously recorded information for decision making, and we require new methods for analysis, recognition, processing, and display. As a consequence, information science has evolved out of necessity.

Concerned with the theoretical basis of the organization, control, storage, retrieval, processing, and communication of information both by natural and artificial systems, information science is multidisciplinary in character. It covers a vast area of subject matter in the physical and biological sciences.

The proliferation of information in recent years has stimulated rapid development in a field which is achieving its own identity and playing a central role in modern engineering. Inasmuch as information science is the result of a confluence of many ideas, concepts, and principles derived from various fields and disciplines, engineers and scientists specializing in one aspect of this complex, highly diversified, and rapidly growing field find it imperative to keep well-informed about the most recent developments. This provides a strong motivation for the initiation of a serial publication. We hope that this comprehensive review series will grow to

become the focal point for research reference and education in this new field.

The aim of *Advances in Information Systems Science* is twofold: (1) to provide authoritative review articles on important topics which chart the field with some regularity and completeness, and (2) to organize the multidisciplinary core of knowledge needed to build a unified foundation. The articles will be prepared for a wide audience, from graduate students to practicing engineers and active research workers. We have therefore chosen the pedagogical viewpoint in the selection of topics and their treatment.

In addition to being an introduction to the field, this international series will provide a comprehensive account of the state of the art on topics of great current interest. Attempts will also be made to bring older topics into clearer focus. The subject areas to be emphasized are: (1) artificial intelligence and pattern recognition; (2) information systems theory; (3) natural and artificial language processing; (4) modern computer systems and novel applications; (5) information storage and retrieval; (6) man-machine systems; and (7) biological information processing.

In order to reach the maximum number of readers, we have attempted to separate clearly the technical material from the more basic aspects of the subject and have adopted a pedagogical point of view rather than a simple recital of recent results. Through this careful planning it is expected that the series may also be used as a basic or supplementary text for graduate courses.

Volume I emphasizes fundamental principles and mathematical techniques which hopefully will form a foundation for further advancement. Future volumes will cover both theoretical developments and engineering applications. A partial list of articles planned for future volumes is given on p. v. However, the prospective articles, together with those in this volume, are by no means intended to reflect any rigidity in our long-range aims. The editor eagerly welcomes suggested topics for the series as well as recommendations for suitable authors.

Volumes are scheduled to appear about once a year and to contain approximately six articles each. In order to keep the publication of timely reviews on schedule, we shall adopt the "stream" technique successfully employed for "advances series" in other fields. A backlog of well-planned future articles constitutes the primary source of the stream from which the articles for a given volume are derived. We feel that any attempt at a systematic classification of the reviews would result in considerable publication delays. As this series grows we plan to add companion volumes devoted

to topics tangentially related to information science, to be edited by guest editors.

The editor wishes to express heartfelt thanks to the authors of the present volume for their cooperation in its rapid completion. In fact, many more contributed to the book than those whose names appear in the contents. Much credit is due to colleagues who have already given advice and to invited reviewers of the articles, who have provided invaluable comments and constructive suggestions.

Julius T. Tou  
Gainesville, Florida  
November 1968



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