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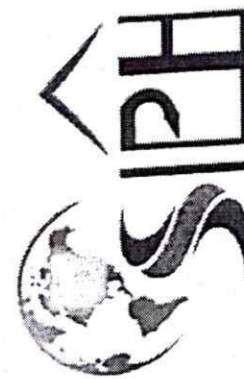
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Application of Synthetic Aperture Radar (SAR) based Control Algorithms for the Autonomous Vehicles Simulation Environment

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Abstract— The rise in popularity of self-driving cars can be attributed to advancements in modern technology. The surge in interest in self-driving cars has led to an increase in their development, but this has also brought some challenges. A large part of the solution to these problems is satellite remote sensing and GIS technology. Optical data remote sensing technologies alone have limited potential for long-term forest management sustainability. Active Synthetic Aperture Radar (SAR) remote sensing technology has grown in importance in forestry because of its uniqueness and rapid advancement. For example, SAR has an all-weather capability that is sun light independent, cloud and rain-resistant, and highly penetrating. SAR and optical, SAR and LiDAR, optical and LiDAR remote sensing have all been shown to be useful for accurate forest AGB estimation when compared to single sensor data. These types of sensor data integrations are becoming increasingly common. This is made possible by the fact that the scattering process heavily influences the polarimetric signatures that can be observed. The inclusion of SAR polarimetry improves classification and segmentation quality compared to conventional SAR with a single channel. Decomposition products' outputs have been classified.

Keywords— Synthetic Aperture Radar, LiDAR, Autonomous Vehicles,

I. INTRODUCTION

Because it makes use of microwaves, imaging RADAR technology known as Synthetic Aperture Radar (SAR) creates images with a high resolution and is able to capture RADAR images regardless of the weather. The speckle effect, which is induced by the coherent processing of backscattered signals, is to blame for the noisy appearance of SAR images. Speckles are a type of background noise that are present in every single SAR image. Before utilising the photographs, remove the background noise. The elimination of noise is one method for improving the appearance of digital photographs. The objective of the method is to lessen the amount of noise while maintaining the integrity of small details like edges. Soft computing methods are being more and more frequently used for the purpose of reducing noise in SAR images [1]. We have conducted research into a variety of methods for filtering speckle noise in SAR images, and we have presented speckle noise filters that are based on soft computing. A device that can detect and find things is known as a RADAR, which stands for radio detection and ranging. Vision in humans can be improved so that it works better in low light, rain, and other adverse conditions. The foundation of a RADAR system is

comprised of the antennas for both the transmitter and the receiver. The transmitter is responsible for emitting electromagnetic waves into space so that they can be used to pinpoint the target. The energy that was diverted by the target is brought into the receiving antenna so that it can be processed. The quantity of energy that an item reflects can be affected by a number of factors, including its physical properties, its structural properties, and its chemical properties [2]. There is a correlation between the radiation's strength, wavelength, and angle of incidence. [3] The receiver is responsible for processing the reflected energy, also known as echoes, in order to retrieve target identifying parameters such as range, velocity, and angular location. It wasn't until the early 1920s that RADAR was first put to use to spot ships and aero planes in the sky.

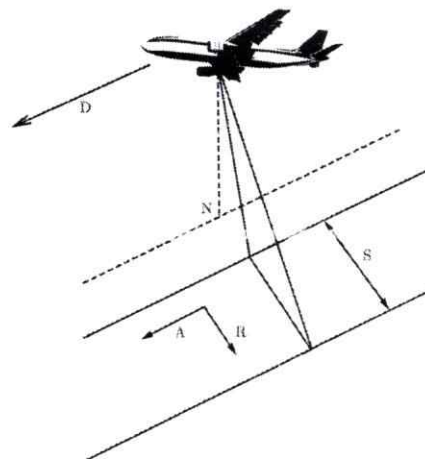
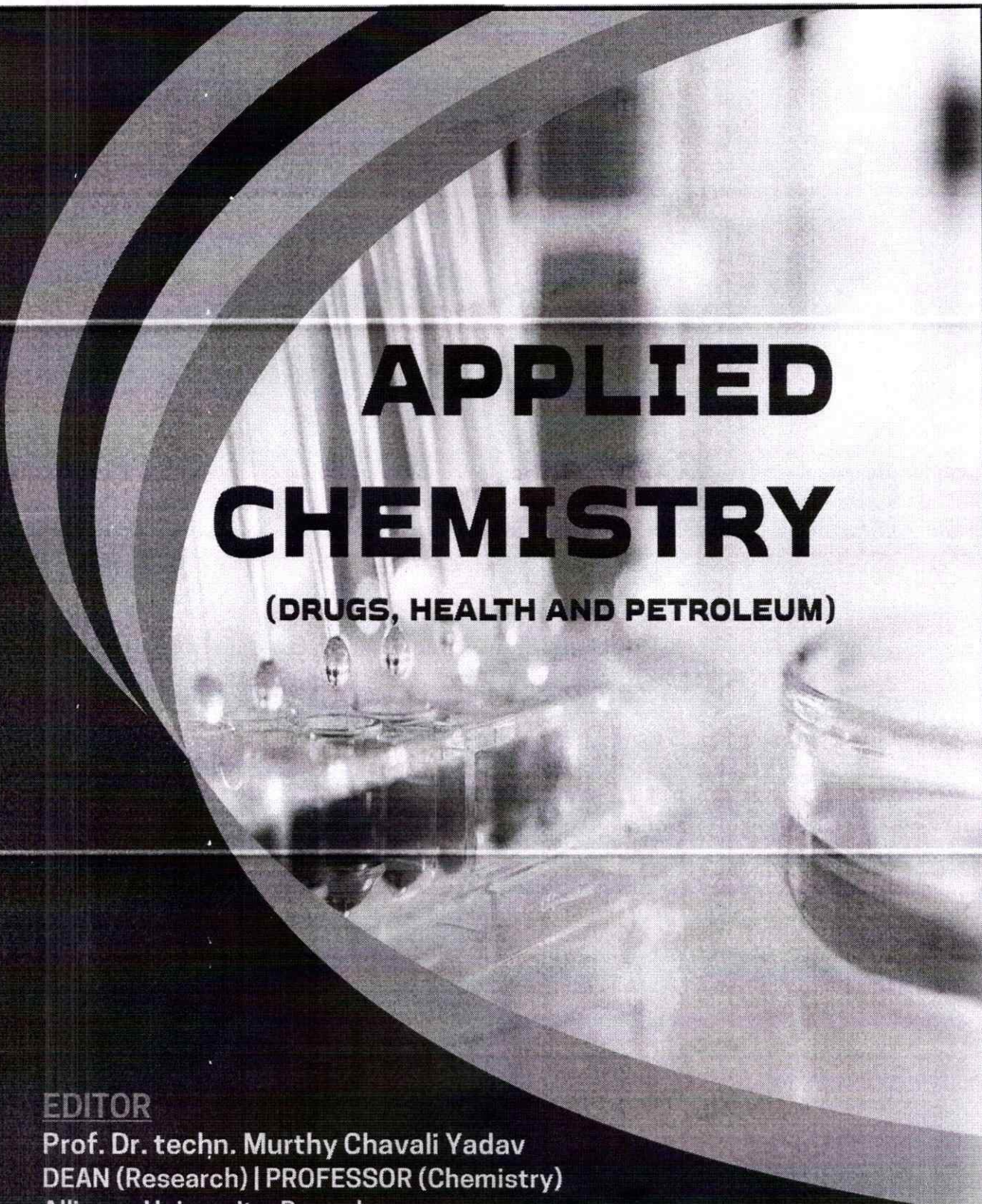


Fig. 1. Geometry of SAR viewing

In the 1970s, search and rescue (SAR) technology was made accessible to the general population. The majority of the time, a SAR system will be mounted on either a spaceship or an aero plane [4]. It illuminates the surface being scanned in a direction perpendicular to its plane by means of a beam of coherent electromagnetic pulses. When the illuminated surface sends back an echo, the SAR receiver is able to pick it up, file it away in its memory, and then use it as input for image processing to produce an image of the target surface. Because it is impractical for a spaceship to carry a very large



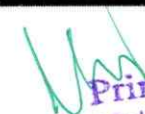
APPLIED CHEMISTRY

(DRUGS, HEALTH AND PETROLEUM)

EDITOR

Prof. Dr. tech. Murthy Chavali Yadav
DEAN (Research) | PROFESSOR (Chemistry)
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B. V. Subba Reddy, N. Bhasker, Silpi Sarkar,
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PREFACE

This new book, Applied Chemistry (Drugs, Health, Petroleum), examines studies on the petroleum processing sector, possibly useful pharmacological compounds, and medical data. The application of informatics technologies for applied chemistry, specifically towards petroleum research, drug molecule syntheses, and emergency health records management, is presented in this new book together with creative research, new concepts, and fresh advancements. Has several chapters on drugs, petroleum, and health.

Chemical engineers, researchers, graduate students, and those interested in the field of applied chemistry (drugs, health, petroleum), can all benefit from the knowledge provided. The synergistic methods to optimise oil and gas well cementing are discussed in the first chapter. The second chapter talks about the Optimized stimulation techniques in oil and natural gas production. The third and fourth chapters discuss about the Design, Synthesis, Molecular Docking and Biological Evaluation of 1-(Benzo[d]thiazol-2-Ylamino) (Phenyl)methyl) Naphthalen-2-ol Derivatives as antiproliferative agents and novel chalcone derivatives along with their QSAR studies. The fifth chapter explains the present scenario of electronic health records challenges in the Indian healthcare scenario towards data science application. The sixth chapter discusses the progress and challenges of hydraulic fracturing application. This volume will be a valuable resource for faculty and advanced students in petroleum engineering, drug synthesis, and health management as well as other researchers, scientists, and industry professionals in related areas.



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1. Studies on Synergistic Approaches to Optimize Oil and Gas Well Cementing

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Abstract:

Nano silica, when combined with cement slurry aids in improving its compressive strength even, reduces the wait-on-cement time for cement plugs. This study focuses on the combined effect of nano silica used in natural oil and gas well cementing. A comparative study is conducted on the performance of cement slurry (conventional 118 pcf (15.8 lbm/gal) with nano silica and cement slurry without nano-silica.

The cement slurry combined with nano-silica has shown an early compressive strength development in cement slurry at different concentration of silica fume at 10% and 20% by weight of cement. This study also focuses on other areas for improvement including slurry stability, free fluid reduction, lower fluid loss value, fine rheology, appropriate thickening time and higher ultimate compressive strength development. The cement slurry with nano-silica has shown improvement in the compressive strength due to the increased rate of hydration, thus thickening time was within 5hrs.

Keywords: Nano silica, Low density slurries, viscosity, cement thickening time, cement-compressive strength, formation permeability.

Dual-Facet Loaded Dual-Polarized Quad-band Dielectric Resonator-Rectenna for RF Energy Harvesting in Smart City Applications

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Abstract— The most widely used approach for replacing traditional batteries and extending battery life is radio frequency energy harvesting (RFEH). However, the power density in the immediate environment is low thus the antenna with multiband features is essential to gather a huge amount of RF power from the low-density atmosphere. This paper presented a multiband dual-polarized dielectric resonator antenna for smart city applications using RFEH technology. The proposed DR antenna covers the frequency bands of WLAN 5.2 GHz, Wi-Fi 5.8 GHz, and future 6 GHz Wi-Fi bands of 6.2 GHz and 6.6 GHz. A rectangular dielectric resonator (DR) is fabricated using a K10 material and it is designed on a low-cost epoxy FR4 substrate (having $\epsilon_r=4.4$). A coaxial probe feeding approach is used for excitation purposes. The substrate and DR material dimensions are 66 mm×68.2 mm×1.6 mm and 13.6 mm×11.4 mm×6.35 mm respectively. A spiral metallic coil is stuck on two faces (front and bottom) of a DR material to operate the antenna in the desired band of frequencies. The proposed technique is used to bring down the axial ratio (AR) value below 3dB level in two resonant bands. The maximum gain of 6.72 dB is observed experimentally at 5.2 GHz frequency.

Keywords— Radio frequency energy harvesting (RFEH), single-band antenna, circular polarization (CP), spiral facet, smart city

I. INTRODUCTION

A smart city brightens the city's efficiency and sustainability structurally and functionally, which assures the quality of citizens' health and life. To establish a smart city, widespread deployment of wireless networks that are integrated with sensing elements is essential to monitor our breathing surroundings, e.g., smart lighting system, health condition of the structural buildings, or the condition of weather report [1-5]. Besides, closely associated sensor nodes in the wireless sensor networks (WSNs) also helped in monitoring the sound, temperature, localization, and so on [6]. The most important task of the sensor nodes is monitoring the information from the ambient environments and sharing that information with an associated network [7]. These sensor nodes are depending on conventional batteries for powering themselves. The energy consumption increases with increasing sensing nodes connected in the WSN to perform various functions of the smart city. The lifetime of the conventional batteries is limited, and thus these batteries

are to be replaced periodically. However, frequent replacement of batteries may not be practicable all the time. To afford sustainable monitoring by maintaining an adequate energy supply for these sensing elements of a WSN in the smart city is an important issue [8]. To release this problem of driving the sensors in the WSNs of a smart city, green technology or energy harvesting techniques have been employed.

In energy harvesting (EH) technology, energy is collected from various ambient energy sources such as sun, wind, acoustic, motion, and electromagnetic (EM) energies, etc., and this collected energy is converted into a suitable form of electrical energy for energizing small electronic devices [9-10]. Among various EH approaches, RF energy harvesting approach has gained more popularity due to the creation of more radiating renewable resources [11]. Rectenna, also known as rectifying antenna, are specialized types of equipment used in the RFEH technique to gather electromagnetic (EM) energy from environmental sources and transform it into a form that can be used to power electronic devices. The antenna and rectifiers are the main elements of the rectenna system. Electromagnetic energy from the environment is collected using an antenna or aerial, and alternating energy is converted to direct current (DC) using a rectifier circuit. The rectenna's aerial gathering capability largely determines how well it performs.

The dielectric resonator antennas (DRAs) exhibit a wide bandwidth, flexibility in shapes and feeding techniques, and also exhibits a large radiation efficiency over microstrip patch antennas. A multilayer configuration of DRA's has been investigated for RFEH applications in [12-13]. Here this, the designed antenna operates at a single band of frequencies. A single band antenna can only receive a finite amount of ambient power, and because of its particular operating frequency, its biggest drawback is interoperability with all geographical regions. Thus, designing a multiband antenna with an enhanced harvesting ability is an important issue for energy harvesting applications. Agrawal et al. [14] have proposed a slot-loaded DRA with dual-band characteristics. The designed antenna suffers from a large antenna dimension, and it is a LP antenna. The polarization diversity approaches are more demanded over single polarized antenna

An Efficient Dielectric Resonator Antenna for Dual-Band Dual-Polarized RFEH Applications in Smart City Environment

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Abstract— This work presents a dual-polarized dielectric resonator antenna (DRA) operating over two frequency bands that cover LTE1800 and LTE2500 bands for radio frequency energy harvesting (RFEH) applications. An Eccostock HIK K10 material with a dielectric constant of 10 is used to create a DRA. The dimension of DRA is $9 \times 16.1 \times 5.5 \text{ mm}^3$ placed over the 1.6 mm thick FR4 substrate ($\epsilon_r = 4.4$). The area of the substrate material is optimized as $60 \times 50 \text{ mm}^2$. A Bow-tie-shaped slot is created into the ground plane to help bring down the resonant frequency to 1.95 GHz and also helps in increasing the reflection coefficient performance. One more resonance is observed by placing a reflecting plane having an equal dimension to the antenna substrate at a gap of 20 mm from the antenna ground plane. In addition to this, an improvement in the antenna gain is also observed with a reflecting surface. The reflecting plane helps to increase the gain value. The maximum possible gain value is 8.36 dB at 2.6 GHz frequency. The proposed antenna exhibits omnidirectional radiation properties, thus it is suitable to harvest ambient EM energies available at LTE bands.

Keywords— radio frequency energy harvesting (RFEH), dielectric resonator antenna (DRA), reflecting plane, Bow-tie shape of a slot

I. INTRODUCTION

The concept of smart cities is now becoming a reality: cities are increasingly associated and bright with smart cities, with fast advancements in distinct fields including sensing, municipal services, transportation, etc. These can allow facilities to be carried more reliably and efficiently, inspiring visitors' and dwellers' experiences, and the data created can be exploited for pioneering applications. While several sensing elements allow these applications can be grid-powered, there is an enhancing demand for independent sensing devices [1], [2]. Whereas these systems are usually driven by conventional batteries. But, conventional batteries suffer from a limited lifetime, hence the frequent replacement of batteries is needed which increases the system cost and complexity. An energy harvesting (EH) approach is found to be a good solution for energizing low-power devices [3], [4].

Energy Harvesting (EH) is a technique in which ambient energy emanated from various sources such as solar, acoustic, thermal, wind, mechanical, and radio frequency (RF), etc. is harvested using a receiving element, and it is converted into

the electrical form of energy as suitable to run low power devices. Based on the type of source used, they are classified as solar EH, acoustic EH, thermal EH, wind EH, mechanical EH, and RFEH. Each EH technique has some merits and demerits. However, the RFEH approach has more advantages over all other EH approaches due to its continuous accessibility and increasing availability due to the establishment of multiple RF transmitters, and especially the RFEH is suitable for operation in the indoor atmosphere also [5], [6].

The RFEH is the process of utilizing RF energy to enable low-power devices using rectenna. The rectenna avoids frequent replacement of the battery by extending the device lifetime, so maintenance cost reduces. In the RFEH, the rectenna (or antenna and the rectifier combinedly) is the basic and essential component. The overall performance is relying primarily on the antenna [7] and rectifying circuit [8]. The antenna captures the RF energy from the surrounding. Thus, the overall rectenna performance is determined by the power captured by the antenna. Usually, the power received by the antenna increases using a high-gain antenna. However, a high gain antenna is possible with a large antenna dimension [9], [10]. This increases the overall rectenna dimension too, which limits the applications of rectenna.

Alternatively, a multi-band configuration is suitable to increase the antenna received power. Many dual-band antennas have been reported for RFEH applications. A multilayer structure with a reflecting plane [11], an elliptically shaped slot-loaded circular microstrip patch antenna in [12], a multi-port dual-band differentially driven microstrip patch antenna in [13], and a quasi-yagi antenna with a split-ring resonator in [14] were designed for dual-band operation. The reported designs in [11-14] suffer from various limitations such as large antenna dimensions, complexity, and low gain. Besides this, However, losses associated with microstrip patch radiators are more due to the conductive portion involved. Thus, dielectric resonator antennas (DRA's) have attained more popularity. A pentagonal-shaped DRA has been proposed in [15]. A notch including a rectangular slot helps to achieve desired performance. However, the implemented antenna suffers from a large antenna dimension. In addition to the aforementioned specifications, the antenna having dual-polarized characteristics is an added advantage of receiving any polarized wave from the surrounding air. A dual-polarized dual-band DRA is reported in [16]. Crossed slots are etched in the ground plane below the dielectric resonator to help in achieving dual-polarized characteristics. However,

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OPERATING SYSTEMS

DEVELOPMENT OF
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SYSTEMS

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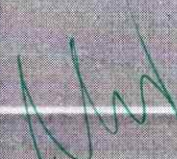
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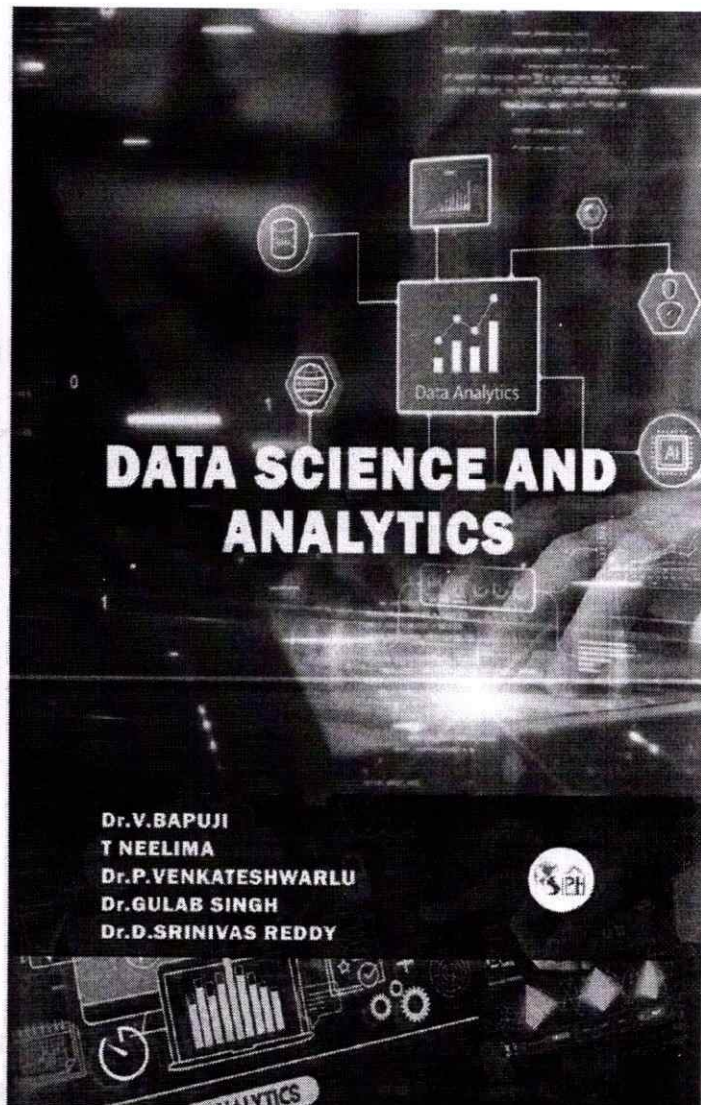
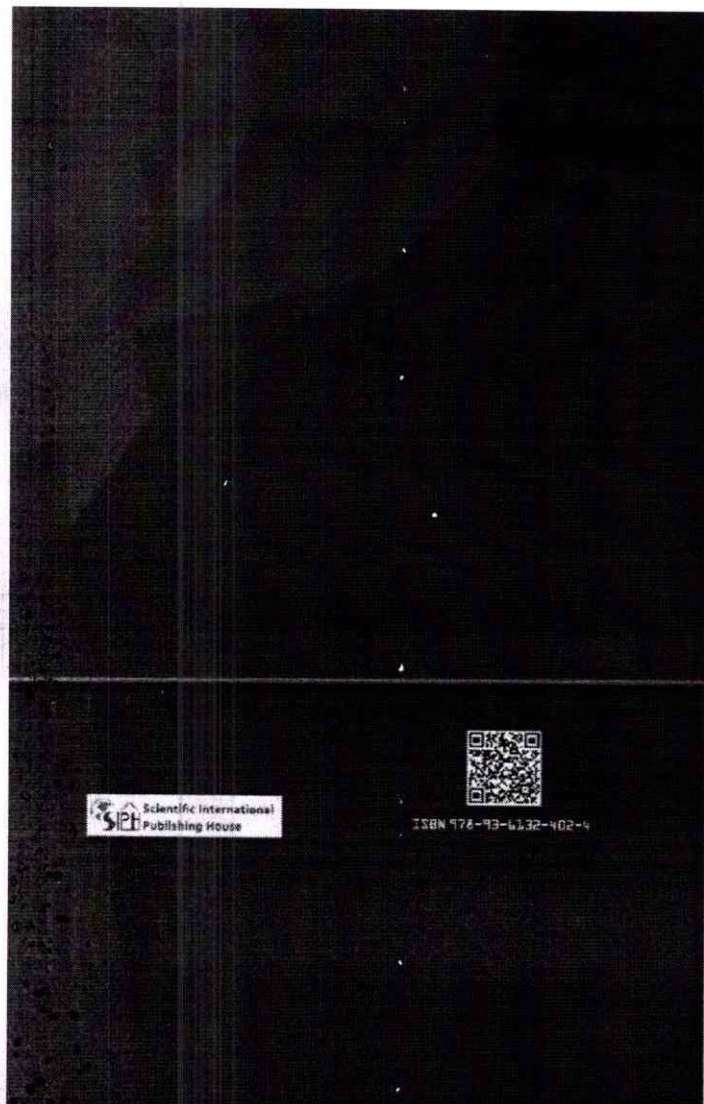


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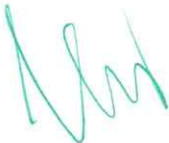
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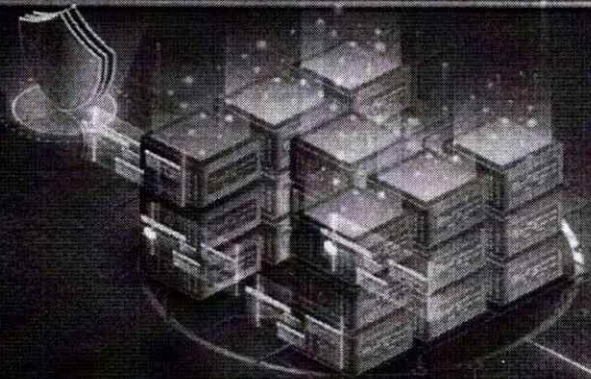
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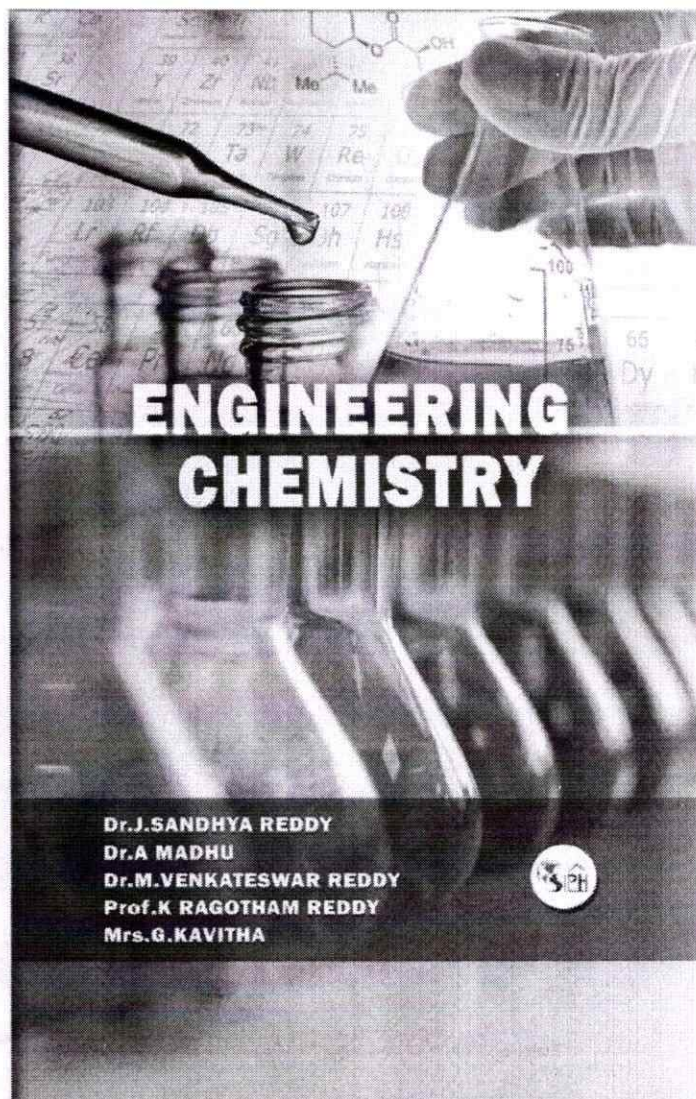

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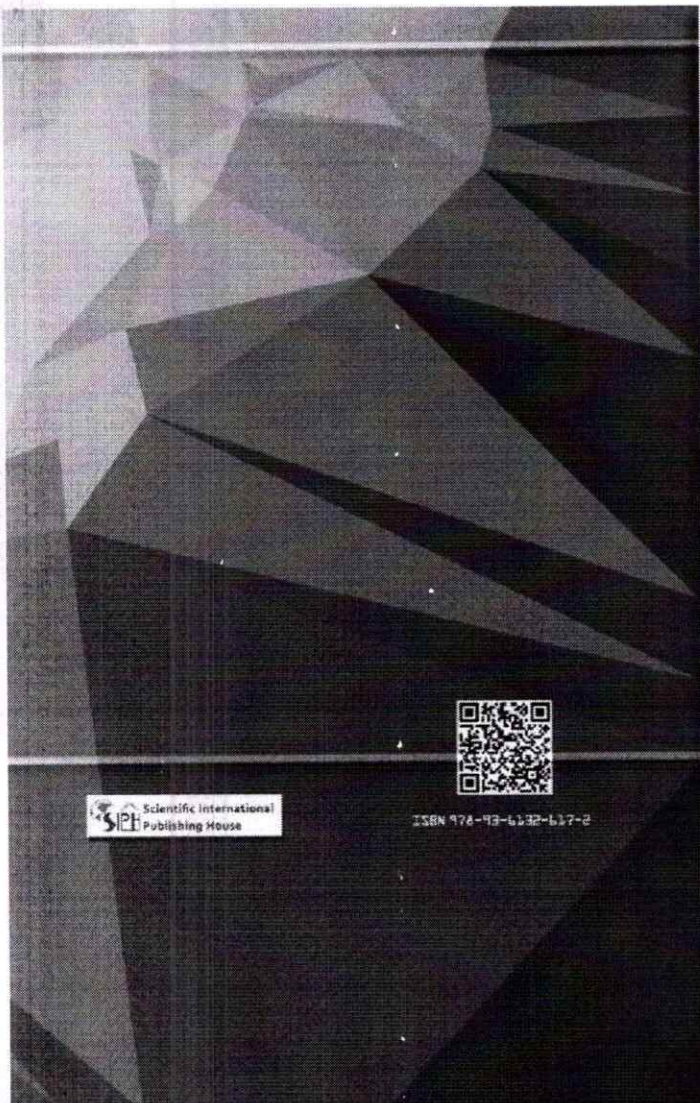
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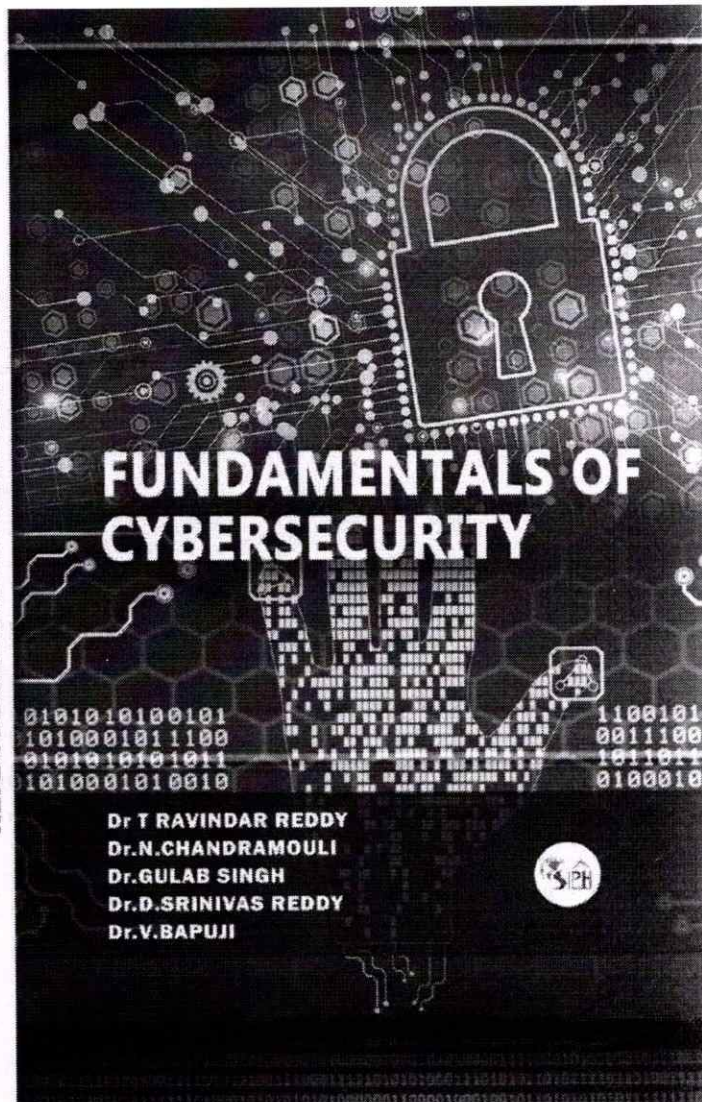
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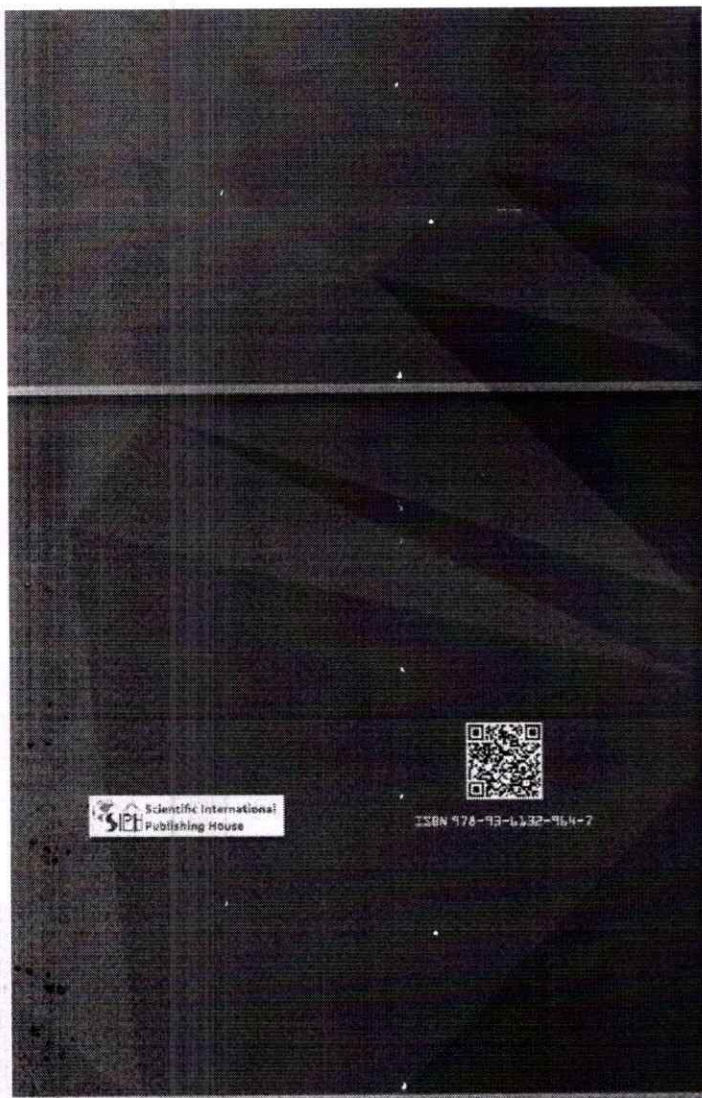
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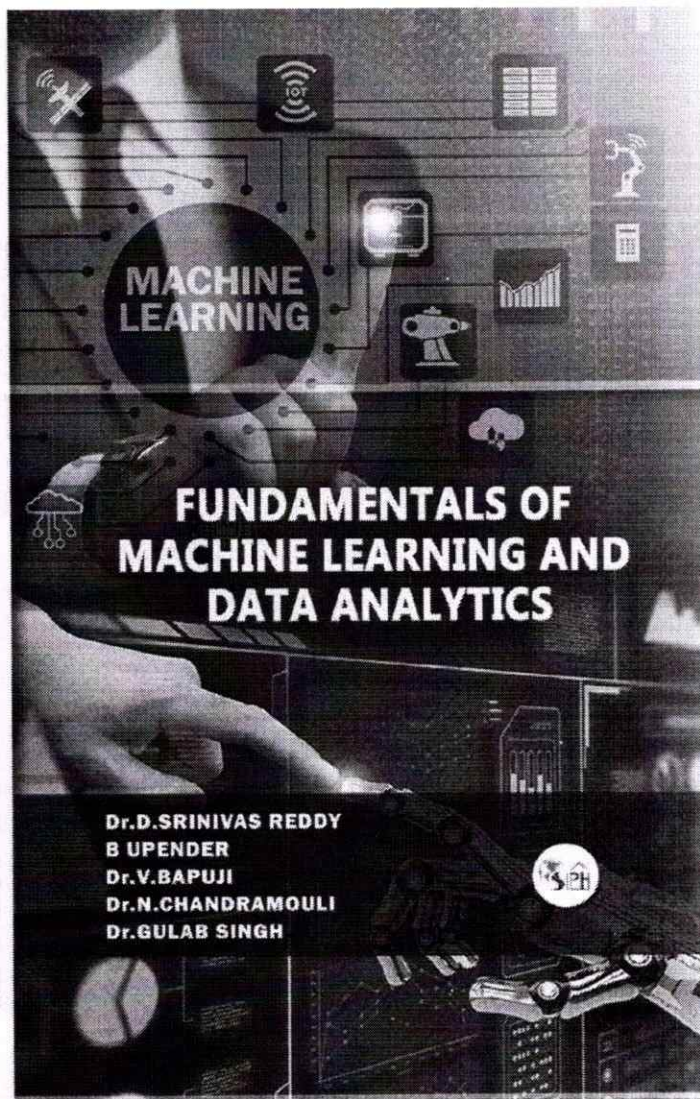
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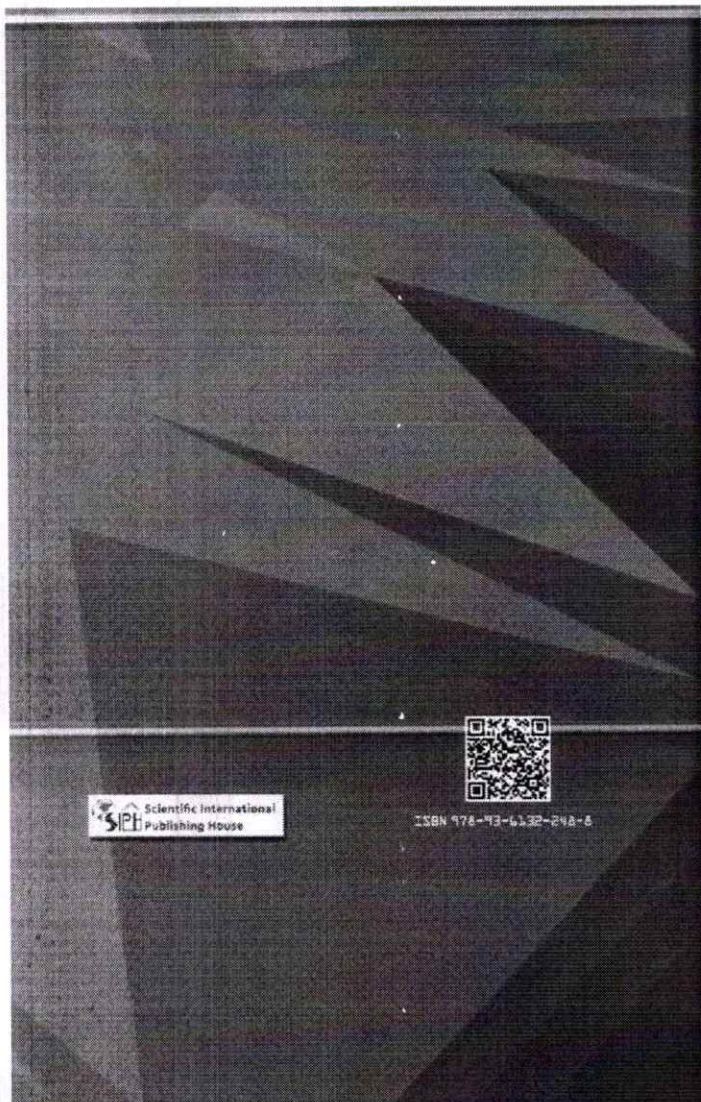
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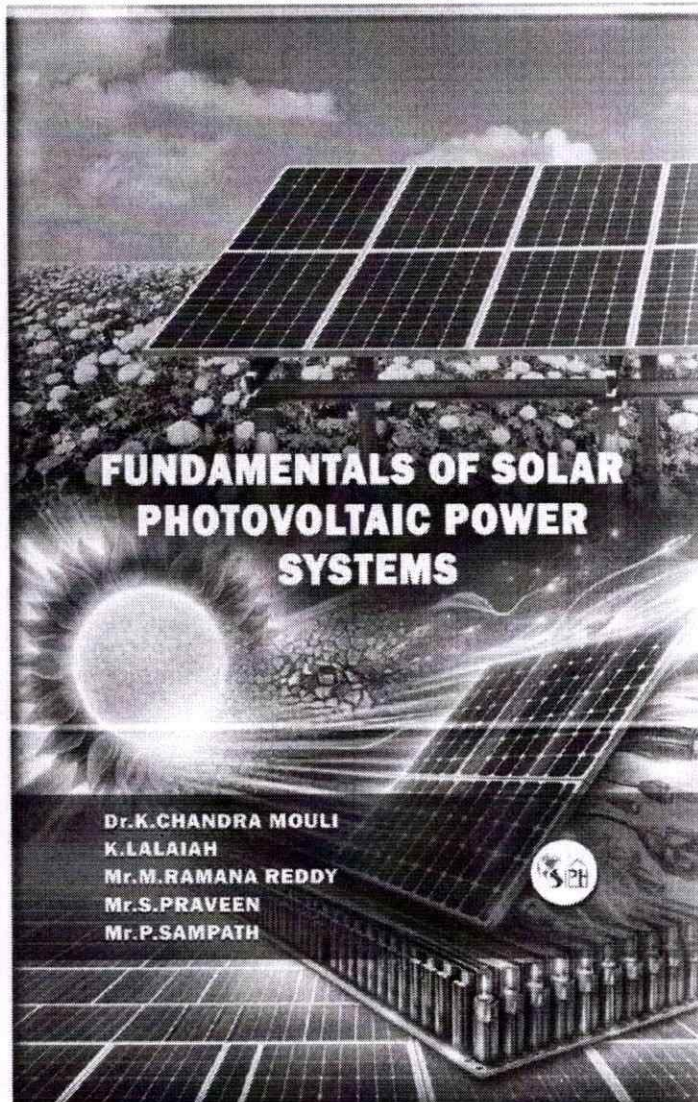
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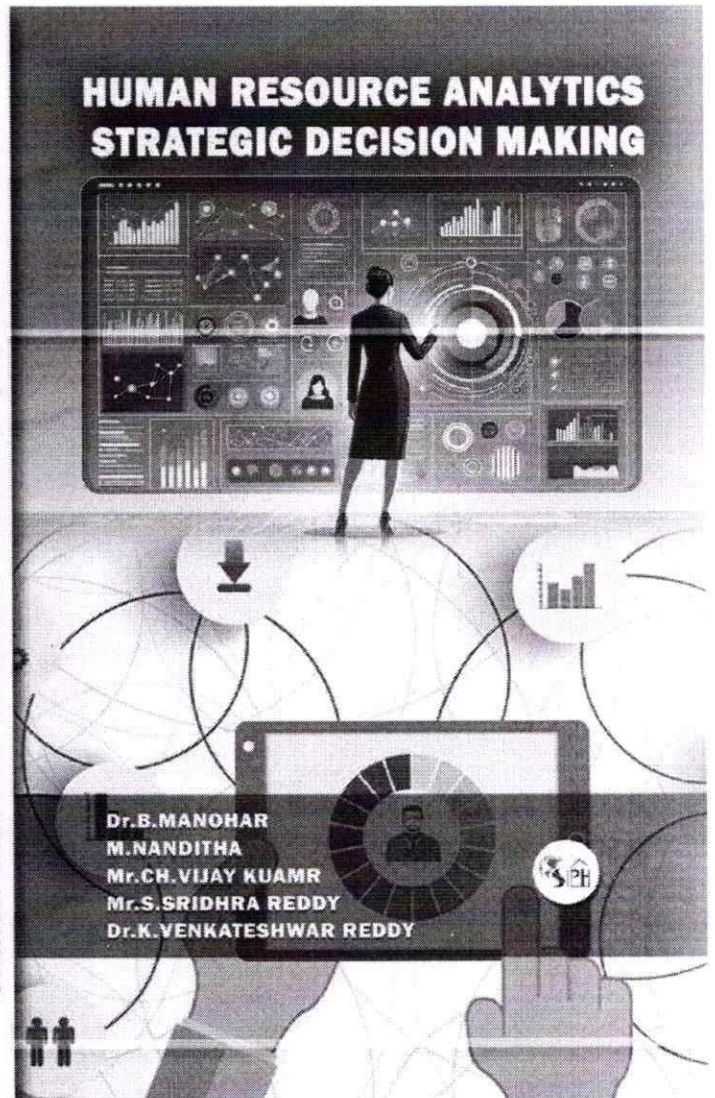
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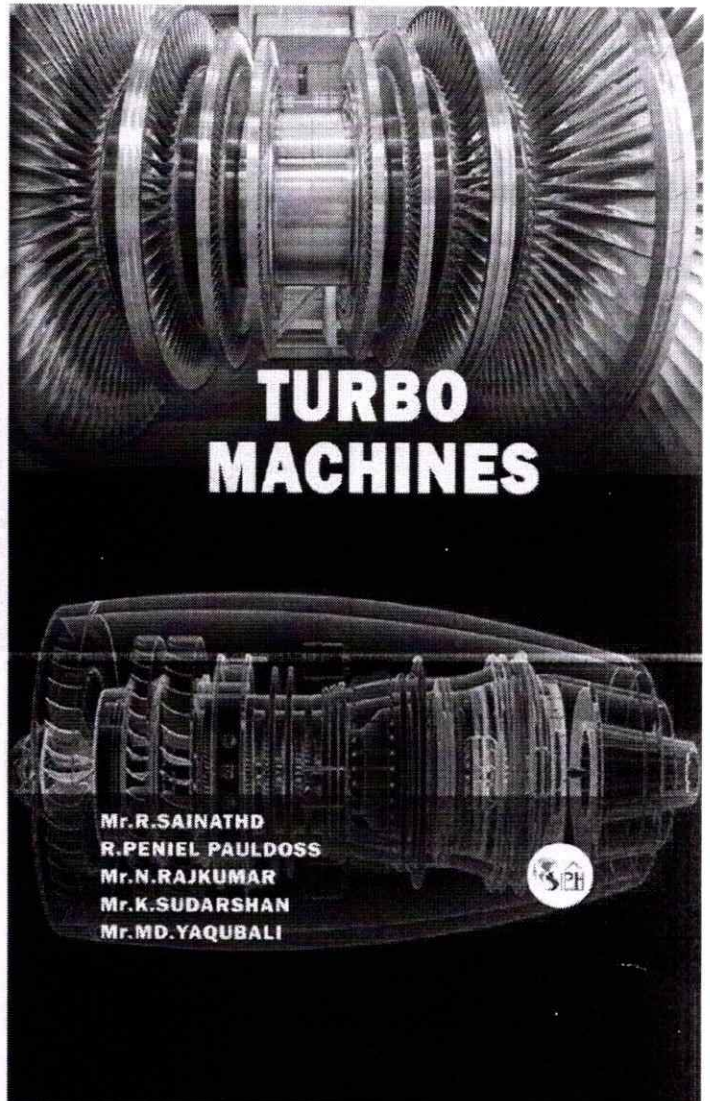
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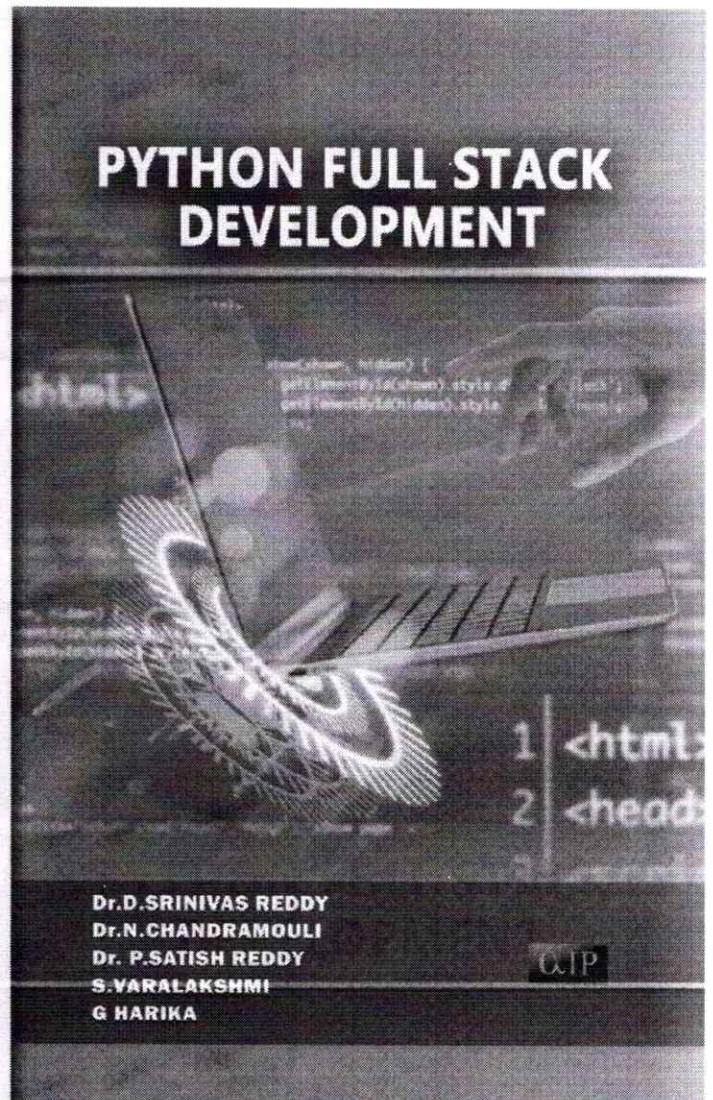
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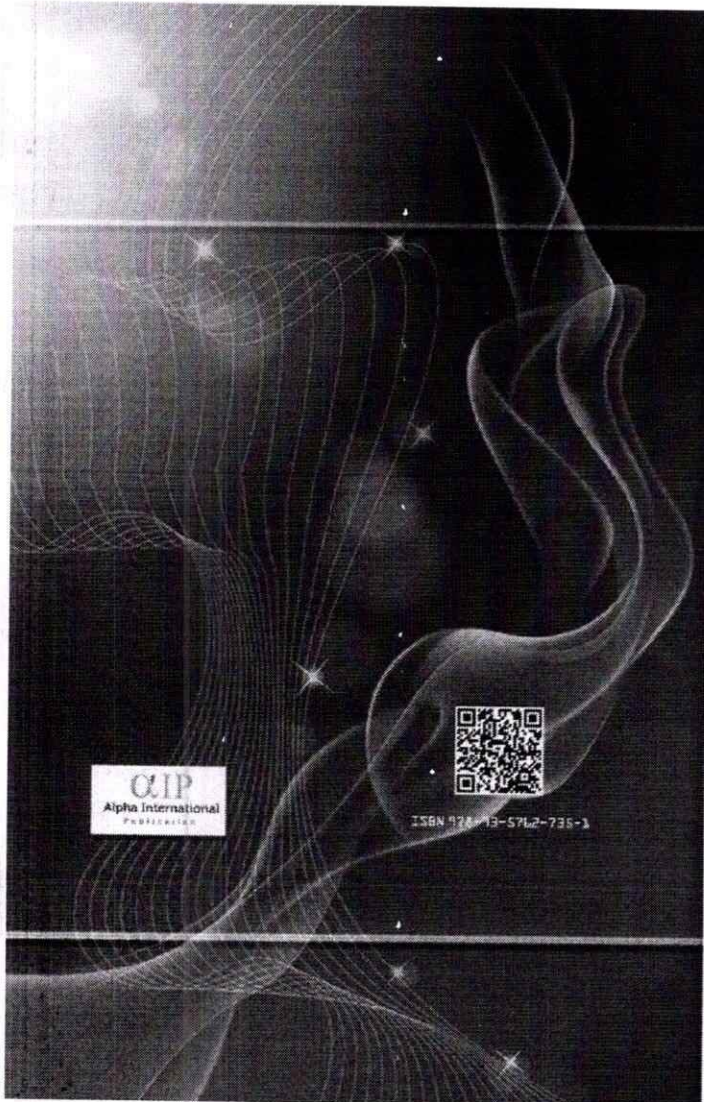
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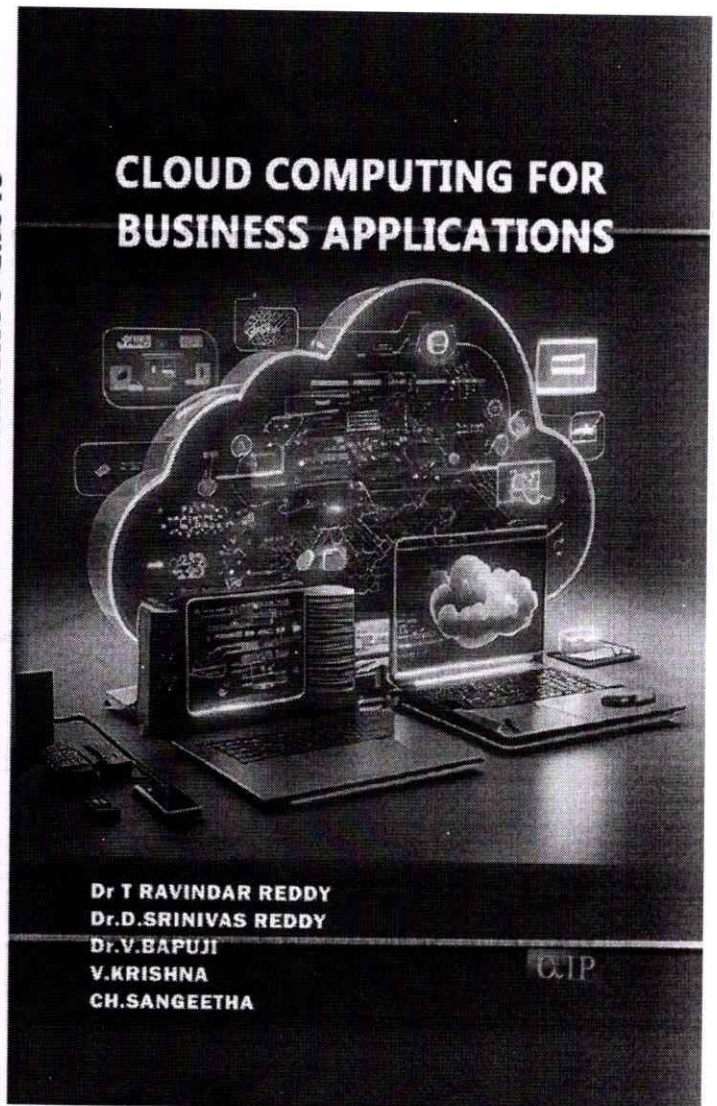
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CLOUD COMPUTING FOR BUSINESS APPLICATIONS

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CLOUD COMPUTING FOR BUSINESS APPLICATIONS

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