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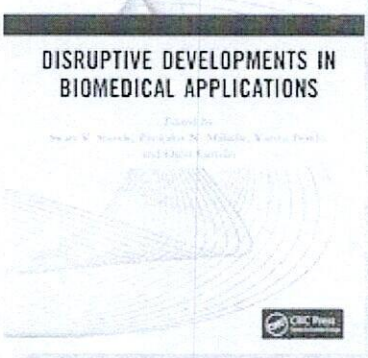

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Disruptive Developments in Biomedical Applications

Edited By Swati V. Shinde, Parikshit N Mahalle, Varsha Bendre, Oscar Castillo

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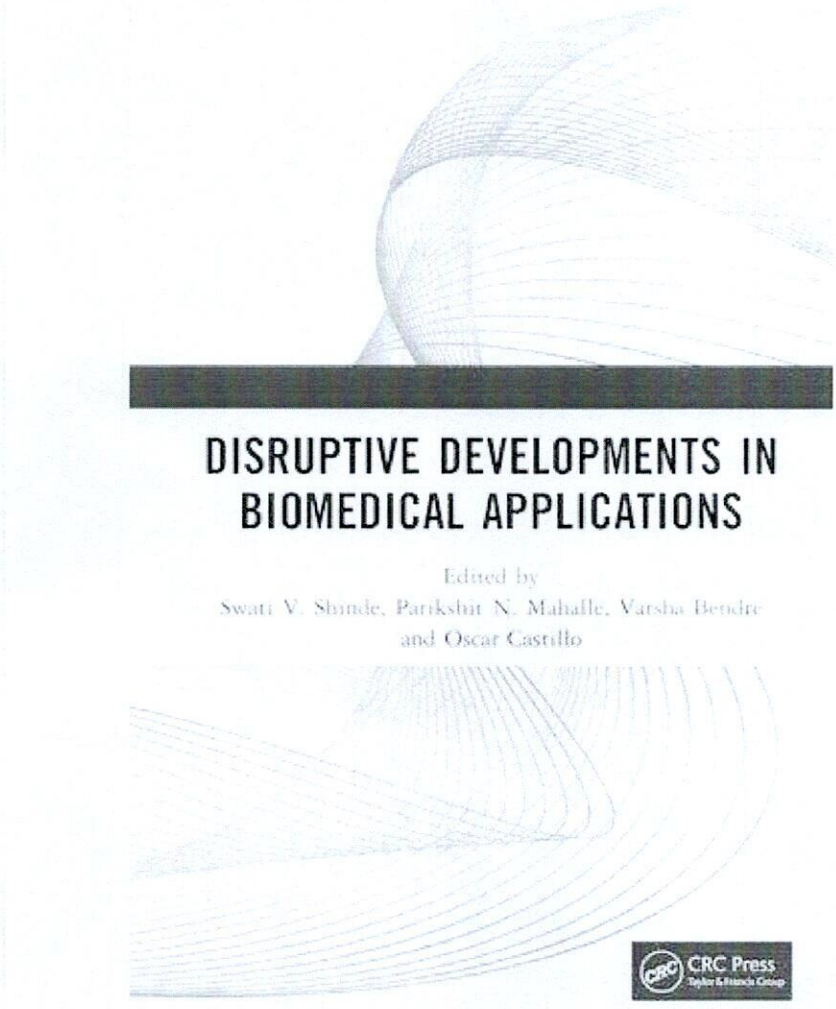

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14 Fetal Electrocardiogram Extraction Using Adaptive Filters Approach

Manjiri A. Ranjanikar, Sagar V. Joshi, Jaishri M. Waghmare, Swati V. Shinde, and Rachana Y. Patil

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14.1 INTRODUCTION

Congenital heart abnormalities are one of the primary birth defects and the main reason for death from birth defects. The shape of cardiac electrical signals shows up in almost all cardiac abnormalities. The non-invasive analysis of fetal cardiac signals can be a useful tool for monitoring the unborn heart's health. This could be used to detect heart problems early on. The electrical potential created in connection with heart action is represented graphically by the ECG signal. It is one of the primary used physiological signals in medical backgrounds. A FECG signal can be used to determine the well-being and status of the fetus, much as it can be done in adults. Fetal electrocardiography, Doppler ultrasound, and fetal magnetocardiography are non-invasive fetal monitoring procedures. Doppler ultrasound is the most often utilized approach since it is inexpensive and easy to use. However, because this approach generates an averaged heart rate, it cannot provide beat-to-beat variability.

The advantage of a fetal ECG is that it can detect beat-to-beat variability. There are numerous procedural issues with non-invasive FECG extraction. Different forms of interference, such as maternal electrogram (MEMG), maternal electrocardiogram (MECG), baseline drift, and power line interference of 50 Hz contaminate the FECG signal. The extraction of FECG is stimulating because of the low amplitude of the signals, various forms of noise, and overlapping frequencies of the mother and FECG. The basic goals of electronic fetal monitoring are to abstract and examine the FECG signal. Digital signal processing methods were used extensively in the extraction of the neonatal ECG signal. The abdominal ECG signal (AECG) is thought to be a nonlinear mixture of the MECG, FECG signal, and numerous interference signals. The FECG is derived from two signals collected on the mother's skin in the thoracic and abdominal regions. The thoracic electrocardiogram (TECG) is thought to be nearly entirely maternal, but the abdominal electrocardiogram

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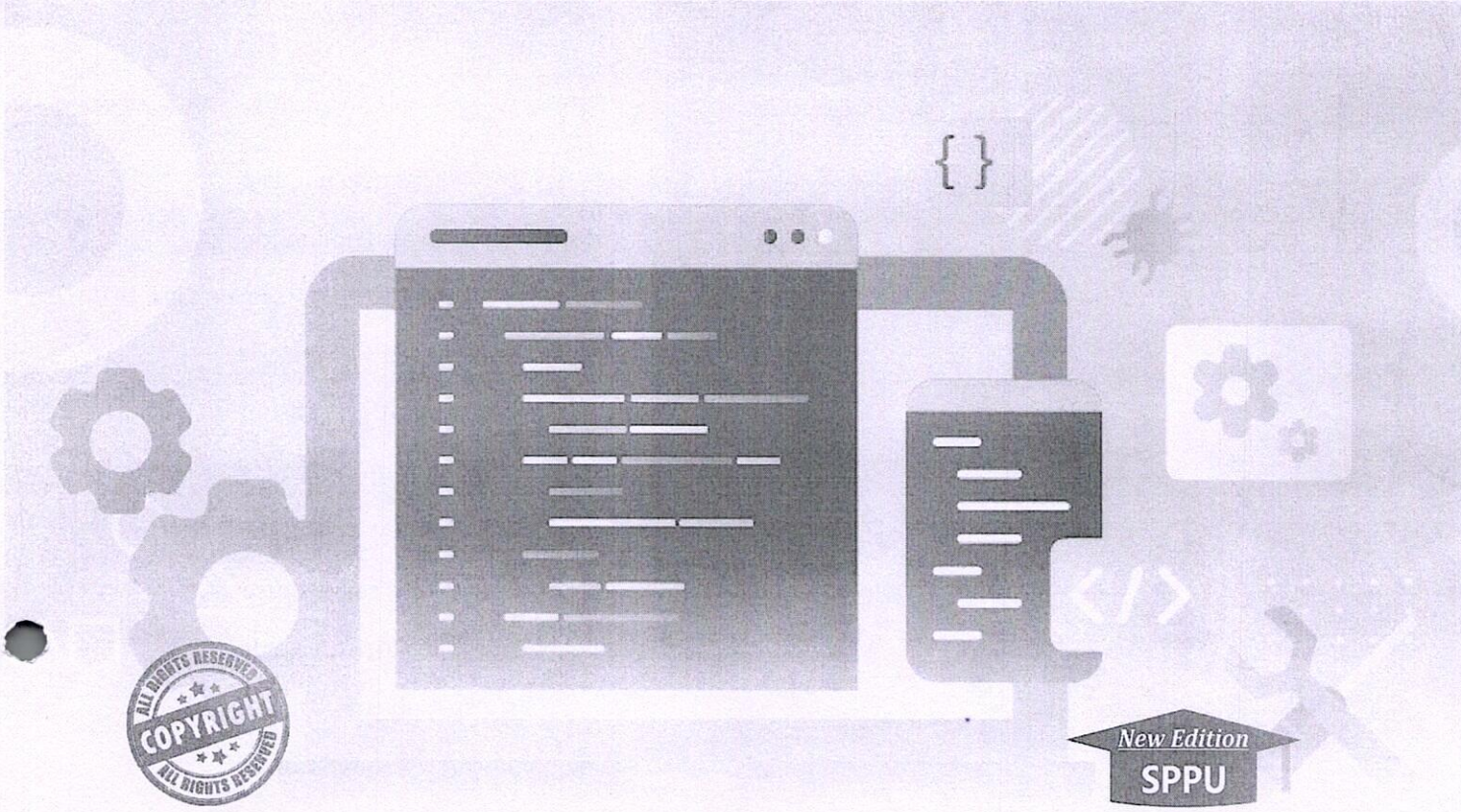

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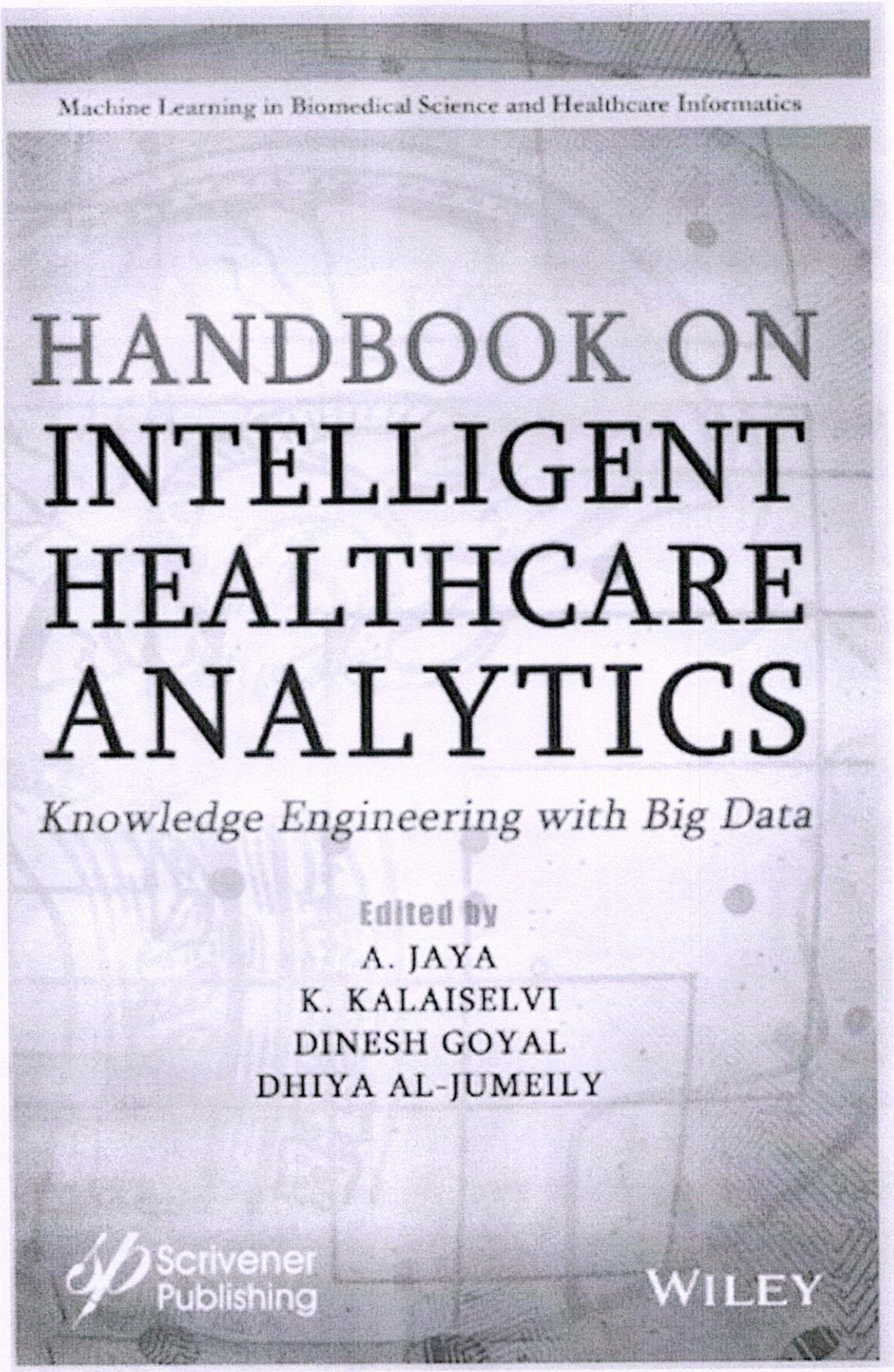

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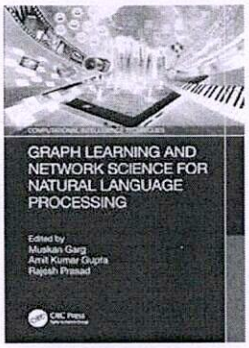

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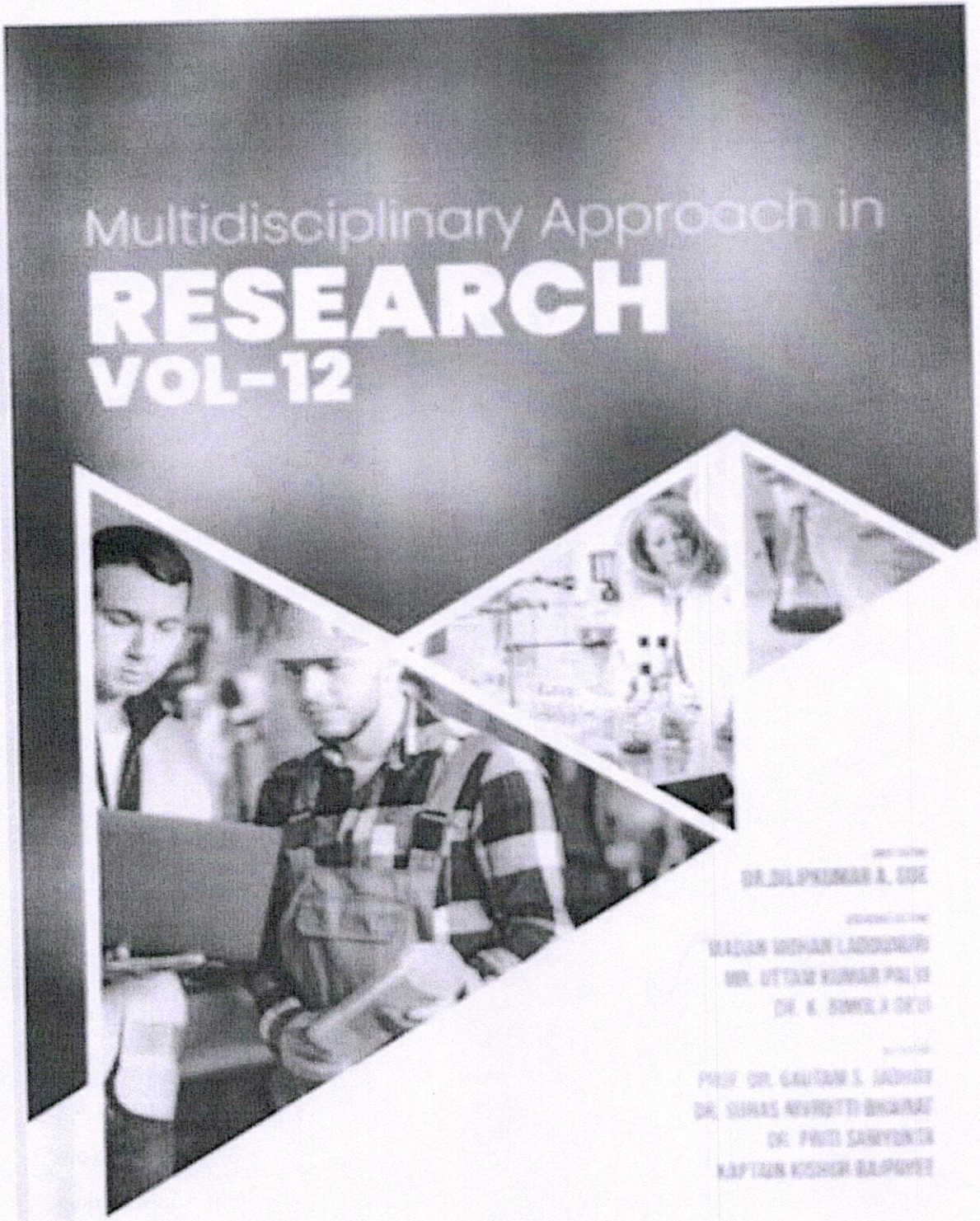

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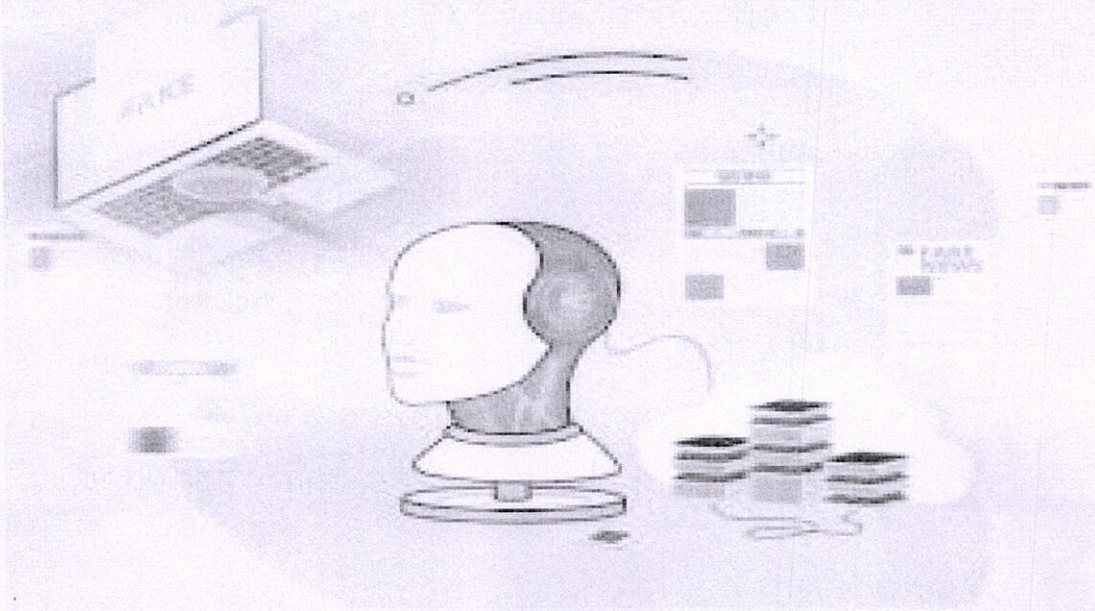

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