

New era of Artificial intelligence in Pharmaceutical Sciences and Pharmaceutical Industry

Dhara Patel, Grishma Patel, Dhananjay
Meshram *Editors*

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Dhara Patel

Pioneer Pharmacy College, Sayajipura, Vadodara-390019,
Gujarat, India

Grishma Patel

Pioneer Pharmacy College, Sayajipura, Vadodara-390019,
Gujarat, India

Dhananjay Meshram

Pioneer Pharmacy College, Sayajipura, Vadodara-390019,
Gujarat, India



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Preface

The pharmaceutical business has gone beyond the traditional restriction of batch production and a one-fit-all-remedy in the rapidly changing world of 2026. It is this digital revolution that shall be mapped in the following chapters. We begin by the basic revolution that 3D printing has caused in the pharma sphere. New Delivery Systems (NDDS) and Digital Pills, i.e., pills that include ingestible sensors, are now printable, what used to be impossible to obtain due to a shift of manufacturing facilities to the point of care. The AI Revolution in Manufacturing, in which machine learning enhances production operations and real-time predictive analytics prevents the introduction of each batch that would not meet the Good Manufacturing Practice (GMP) standards, is the reflection of this physical breakthrough. We examine the Fundamentals of AI in Drug Discovery in the discovery sphere, where the generative design is significantly reducing the amount of time required in R&D. By applying AI-Driven Approaches in Liposomal Drug Delivery, this intelligence will move down to the molecular level and increase bioavailability as it can accurately calculate the behaviour of nanoscale carriers within the human body. The book explores the outside-of-the-lab patient-facing part of digital health. We discuss the use of Augmented Reality (AR) to transform the patient experience, make prescription of medicine more engaging and promote adherence, and the use of Virtual Reality (VR) as a non-pharmacological pain first line. We also underline the fact of smartphone-analytical chemistry, which offers a patient and a physician with portable tools of real-time medications analysis. Finally, there is the global demand of sustainability and safety. The technological approach of the paper encourages an extensive, technology-driven approach, starting with the application of AI to the diagnosis of diseases up to its vital role in Microplastic Pollution Detection within the pharmaceutical supply chain. We conclude by explaining why AI is of paramount importance in terms of pharmacovigilance, with automated signal detection ensuring that safety of medications is monitored with a speed and a level of accuracy that have never been heard of before. My greatest gratitude to the researchers, engineers, and clinical pharmacists who have contributed this book with their data. Hopefully, this book can be used as a textbook by the upcoming generation and a manifesto by those in charge of the industry who are willing to print the future of medicine.

Dr. Dhara Patel
Ms. Grishma Patel
Dr. Dhananjay Meshram

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