(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :20/08/2025

(21) Application No.202511078855 A

(43) Publication Date : 05/09/2025

(54) Title of the invention : AI AND PARTIAL DIFFERENTIAL EQUATION BASED PK-PD MODEL FOR DRUG FORMULATION & DOSAGE OPTIMIZATION

(51) International classification :G06F0017130000, G06Q0010040000, A61B0005147300, G16C0020300000, G16H0020100000

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

(71)**Name of Applicant :**
1)DR. HARPREET SINGH
Address of Applicant :PROFESSOR, FACULTY OF PHARMACY, IFTM UNIVERSITY DELHI ROAD, NH-24, MORADABAD, LODHIPUR RAJPUT, UP-244102 ---------- ----------
2)DR. M. JEYACHITRA
3)DR. N. KRISHNARAJ
4)DR. N. NANDHAGOPAL
5)DR. R. NAGARATHINAM
6)DR. NIRAVKUMAR RAMESHCHANDRA JOSHI
7)DR. K. SURESH
8)KAJAL SAINI
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)DR. HARPREET SINGH
Address of Applicant :PROFESSOR, FACULTY OF PHARMACY, IFTM UNIVERSITY DELHI ROAD, NH-24, MORADABAD, LODHIPUR RAJPUT, UP-244102 ---------- ----------
2)DR. M. JEYACHITRA
Address of Applicant :ASSOCIATE PROFESSOR, DEPARTMENT OF MATHEMATICS, ER. PERUMAL MANIMEKALAI COLLEGE OF ENGINEERING, KRISHNAGIRI TO HOSUR HIGHWAYS, NALLAGANAKOTHAPALLI, NEAR KONERIPALLI, HOSUR, KRISHNAGIRI TAMILNADU-635117 ---------- ----------
3)DR. N. KRISHNARAJ
Address of Applicant :DEPARTMENT OF NETWORKING AND COMMUNICATIONS, SCHOOL OF COMPUTING, COLLEGE OF ENGINEERING AND TECHNOLOGY, SRM INSTITUTE OF SCIENCE AND TECHNOLOGY, KATTANKULATHUR, TAMILNADU-603203 ---------- ----------
4)DR. N. NANDHAGOPAL
Address of Applicant :PROFESSOR, DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, NANDHA COLLEGE OF TECHNOLOGY, PERUNDURAI MAIN ROAD, ERODE-638052 ---------- ----------
5)DR. R. NAGARATHINAM
Address of Applicant :PROFESSOR, DEPARTMENT OF MATHEMATICS, DR. MGR EDUCATIONAL AND RESEARCH INSTITUTE, CHENNAI-600095 ---------- ----------
6)DR. NIRAVKUMAR RAMESHCHANDRA JOSHI
Address of Applicant :ASSISTANT PROFESSOR, FACULTY OF MANAGEMENT, GANPAT UNIVERSITY, CENTRE FOR MANAGEMENT STUDIES AND RESEARCH, GANPAT UNIVERSITY, KHERVA MEHSANA, GUJARAT-384012 ---------- ----------
7)DR. K. SURESH
Address of Applicant :ASSISTANT PROFESSOR, ST. JOSEPH'S COLLEGE OF ENGINEERING, OMR, CHENNAI-600119 ---------- ----------
8)KAJAL SAINI
Address of Applicant :RESEARCH SCHOLAR, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF ALLAHABAD SENATE HOUSE CAMPUS, UNIVERSITY ROAD, OLD KATRA, PRAYAGRAJ, UP-211002 ---------- ----------

(57) Abstract :
The integration of Artificial Intelligence (AI) with Partial Differential Equations (PDEs) in pharmacokinetics-pharmacodynamics (PK-PD) modeling offers a transformative approach to drug formulation and dosage optimization. Traditional PK-PD models rely on PDEs to describe drug absorption, distribution, metabolism, and excretion (ADME), but they often struggle with parameter estimation and patient variability. Al techniques such as Physics-Informed Neural Networks (PINNs) enhance PDE-based models by improving predictive accuracy while maintaining physiological consistency. Additionally, Gaussian Processes (GPs) aid in uncertainty quantification, while Bayesian Optimization refines drug dosage dynamically based on real-time data. Reinforcement Learning (RL) further personalizes treatment by continuously learning optimal dosage regimens from patient responses, and Deep Neural Networks (DNNs) model complex drug interactions more effectively. This Al-driven PK-PD framework enhances treatment precision, minimizes adverse effects, and accelerates drug development by adapting dosages in real time. The proposed approach significantly outperforms conventional models, offering a robust solution for personalized medicine and optimized therapeutic outcomes.

No. of Pages : 10 No. of Claims : 10