

AI: APPLICATIONS AND TOOLS



Dr. S. Manimekalai
Ms. B. Iswariya Lakshmi
Dr. Monalisa Hati
Dr. Shilpa B S



Publisher
Innovation Online Training Academy

AI: Applications and Tools

Chief Editor

Dr. S. Manimekalai

Dean CS & Associate Professor
Department of Computer Science
Theivanai Ammal College for Women (Autonomous)
Villupuram.

Associate Editors

Ms. B. Iswariya Lakshmi

Assistant Professor
Department of Computer Science Engineering
Selvam College of Technology, Namakkal

Dr. Monalisa Hati

Assistant Professor
Department of Computer Science and Engineering.
Amity University, Mumbai
Raigad, Mumbai

Dr. Shilpa B S

Associate Professor
Department of Civil Engineering
Vidyavardhaka College of Engineering
Mysuru, Karnataka.



Publisher

Innovation Online Training Academy

11, Brindha Layout
Krishna Nagar, Coimbatore-01.
www.iotacademy.in/bookpublish
Contact - 7825007500

Title: AI: Applications and Tools

Editors – Dr. S. Manimekalai, Ms. B. Iswariya Lakshmi, Dr. Monalisa Hati, Dr. Shilpa B S

First Published – August, 2025

This edition published on August, 2025 by Innovation Online Training Academy

Hardcopy

Font Size: 12

Font Style: Cambria

Number of Pages: 232

Price: 500 INR

Publisher Address

Innovation Online Training Academy (IOTA) Publishers

11C, Brindha Layout,

Krishna Nagar

Coimbatore-1,

Tamilnadu.

email: iotacbe@gmail.com

www.iotacademy.in

Contact Number: 7825007500

ISBN: 978-93-48990-74-7



ISBN Number: 978-93-48990-74-7

Copyright © Innovation Online Training Academy Publishers

All rights reserved. No part of this publication may be reproduced, stored in or introduced into a retrieval system, or transmitted, in any form, or by any means (electrical, mechanical, photocopying, recording or otherwise) without the prior written permission of the publisher. Any person who does any unauthorised act in relation to this publication may be liable to criminal prosecution and civil claims for damages.

Typeset by IOTA Printers, Coimbatore



visit us at for further information

www.iotacademy.in

Preface

Artificial Intelligence has transformed from a futuristic concept to a driving force behind modern innovation, reshaping industries, economies, and daily life. *AI: Applications and Tools* is designed to bridge theoretical foundations with practical implementation, offering readers a comprehensive guide to the technologies and methodologies defining this revolution. This book explores cutting-edge AI applications—from machine learning and natural language processing to computer vision and robotics—while demystifying the tools and frameworks that power them. Each chapter combines conceptual clarity with real-world case studies, making complex topics accessible to students, professionals, and enthusiasts alike. Whether you're a developer, researcher, or business leader, this book equips you with actionable insights to harness AI's potential responsibly and creatively. As AI continues to evolve, understanding its capabilities and ethical implications becomes imperative. We hope this resource inspires curiosity, fosters innovation, and empowers you to contribute to AI's transformative journey.

Editors

CONTENTS

S. No	Title	Page No.
1.	EXPLORING VANET ARCHITECTURE AND COMPONENTS WITH FOCUS ON ROUTING, SECURITY AND DATA DISSEMINATION <i>Dr. M. Soranamageswari and Mrs. K. Lakshmi</i>	1
2.	ETHICAL, LEGAL AND SOCIAL IMPLICATIONS OF ARTIFICIAL INTELLIGENCE <i>Mrs. V. Queen Jemila</i>	14
3.	AN ANALYSIS OF THE POSITIVE EFFECT OF ARM ROBOTS USING FUZZY COGNITIVE MAP <i>Dr. Mary Mejrullo Merlin</i>	21
4.	MACHINE LEARNING ALGORITHMS AND THEIR ENGINEERING APPLICATIONS <i>Ms. Pooja Chavan</i>	27
5.	ARTIFICIAL INTELLIGENCE AND INTELLECTUAL PROPERTY: NAVIGATING LEGAL, ETHICAL, AND GLOBAL FRONTIERS <i>Dr. R. Alagesan</i>	32
6.	AI IN SERVICE OF SOCIETY: IMPACT ON HEALTHCARE, EDUCATION, GOVERNANCE, AND PUBLIC INFRASTRUCTURE <i>Dr. S. Sharmila</i>	43
7.	A STUDY ON TOOLS AND APPLICATION OF AI IN SUPPLY CHAIN MANAGEMENT <i>Dr. M. Sakthivel</i>	51
8.	A STUDY ON APPLICATIONS OF AI IN HUMAN RESOURCE MANAGEMENT <i>Dr. P. Anbuoli</i>	60
9.	DETECTING THE DETECTOR: A REVIEW OF AI-BASED TOOLS FOR MONITORING AI BIAS AND FAIRNESS <i>Ms. Shaziya Jabeen Maharooof</i>	68
10.	AI IN THE SKY: WEATHER RECOGNITION FROM IMAGE USING TRANSFORMERS AND CNN <i>Ms. Sona Sunoj K</i>	77
11.	AI-ENHANCED BIOMETRIC-ENABLED SMART HOME SECURITY: A CONTEMPORARY SURVEY OF IOT AND AI INTEGRATED SYSTEMS <i>Ms. Pooja Rajan</i>	85
12.	A SYSTEMATIC REVIEW OF CREDIT CARD FRAUD DETECTION TECHNIQUES: CLASSICAL, DEEP LEARNING, AND EMERGING APPROACHES <i>Ms. Aiswarya JP</i>	93
13.	GREEN CLOUD COMPUTING: A CONTEMPORARY SURVEY OF DATA CENTER ENERGY OPTIMIZATION TECHNIQUES <i>Ms. Rahma Jumana P and Ms. Anna Jacob</i>	103
14.	BEYOND TRADITIONAL ML: A SYSTEMATIC REVIEW OF AI's EVOLUTION IN PHISHING DETECTION <i>Ms. Nidha Ibrahim and Ms. Savitha. S. V</i>	114
15.	PROBLEM SOLVING AND SEARCH STRATEGIES IN ARTIFICIAL INTELLIGENCE <i>Mrs. R. Kayalvizhi</i>	120

AI IN SERVICE OF SOCIETY: IMPACT ON HEALTHCARE, EDUCATION, GOVERNANCE, AND PUBLIC INFRASTRUCTURE

Dr. S. Sharmila

Assistant Professor, UG Department of Computer Science,
Nallamuthu Gounder Mahalingam College, Pollachi, Coimbatore.

1. Introduction

Artificial Intelligence (AI) is rapidly transforming the foundational structures of society, offering unprecedented opportunities to enhance human well-being and institutional efficiency. This explores the multifaceted impact of AI in critical public domains healthcare, education, governance, and public infrastructure with a focus on its potential to drive equity, accessibility, and innovation. In healthcare, AI technologies enable early disease detection, predictive analytics, personalized treatment, and improved patient outcomes, especially in underserved regions. In the field of education, AI-powered adaptive learning systems, intelligent tutoring, and administrative automation are reshaping the learning experience, making it more inclusive and responsive to diverse learner needs.

Governance is witnessing a shift toward data-driven public policy and e-governance platforms that enhance transparency, efficiency, and citizen engagement. Meanwhile, public infrastructure is becoming smarter and more resilient through AI-enabled systems for urban planning, traffic management, energy optimization, and disaster preparedness.

2. AI in Healthcare

2.1 Predictive Analytics and Disease Prevention

Predictive analytics in healthcare involves the use of AI and machine learning (ML) techniques to analyze historical and real-time health data to anticipate potential health outcomes, including disease outbreaks, patient deterioration, and chronic disease progression [1].

- **Machine Learning Models:** Algorithms trained on large datasets to detect patterns and predict future events, such as heart attacks or diabetic complications.
- **Electronic Health Records (EHRs):** Digitized patient data used to forecast disease risks based on medical history and lifestyle.

- **Natural Language Processing (NLP):** Extracting meaningful insights from clinical notes, lab reports, and radiology findings.
- **Big Data Integration:** Combining population-level data, environmental factors, and genomics for more comprehensive risk prediction.

2.1.1 Applications

1. Chronic Disease Management

- Early detection of diabetes, hypertension, or cardiovascular risks.
- Personalized prevention plans based on lifestyle and genetic risk.

2. Infectious Disease Surveillance

- Tracking and predicting outbreaks (e.g., COVID-19, influenza).
- Identifying hotspots and vulnerable populations.

3. Hospital Readmission Reduction

- Predicting which patients are at high risk of readmission and implementing targeted interventions.

4. Cancer Risk Prediction

- Identifying patients with high probabilities of developing specific cancers through genetic and diagnostic data.

2.2 AI in Medical Imaging and Diagnostics

Artificial Intelligence (AI) is revolutionizing medical imaging and diagnostics by enhancing the speed, accuracy, and consistency of image interpretation. Using deep learning and computer vision, AI systems can detect patterns in medical images such as X-rays, CT scans, MRIs, and ultrasounds that may be difficult for the human eye to discern [2]. These tools assist radiologists, pathologists, and clinicians in diagnosing diseases earlier and with greater precision.

Deep Learning (Convolutional Neural Networks - CNNs): Specially designed to analyze visual data and detect abnormalities [3].

Computer Vision: Enables AI to interpret and analyze image content.

Natural Language Processing (NLP): Assists in interpreting diagnostic reports and integrating imaging with clinical data.

Radiomics: Extraction of high-dimensional data from images to support diagnosis and prognosis.

2.2.1 Applications

1. Cancer Detection and Classification

- Early detection of lung cancer, breast cancer, prostate cancer, etc.
- Identifying tumor size, type, and progression from CT or MRI scans.

2. Neurological Diagnosis

- AI-assisted diagnosis of Alzheimer's, Parkinson's, stroke, and brain tumors through MRI analysis.
- Prediction of disease progression based on brain imaging biomarkers.

3. Ophthalmology

- Diagnosis of diabetic retinopathy, glaucoma, and age-related macular degeneration using retinal scans.

4. Cardiology

- AI systems detect arrhythmias, heart failure, and coronary artery disease using echocardiograms and cardiac MRIs.

5. COVID-19 and Infectious Disease Detection

- Chest X-ray and CT scan analysis for identifying COVID-19 pneumonia.
- Speeding up triage and resource allocation during pandemics.

3. AI in Education

3.1 Adaptive Learning Systems and Personalized Education

Adaptive learning systems powered by Artificial Intelligence (AI) are transforming traditional education by offering personalized, learner-centered experiences. These systems dynamically adjust the content, pace, and instructional approach based on individual students' needs, learning styles, performance, and behaviour. By leveraging real-time data, AI creates a tailored path for each learner improving engagement, retention, and outcomes across diverse educational settings [5].

3.1.1 Applications

1. Personalized Curriculum Delivery

- AI adjusts lesson plans, quizzes, and multimedia content based on individual pace and preferences.

2. Real-Time Feedback and Support

- Automated systems provide instant feedback on assignments and assessments.
- Virtual tutors help clarify concepts outside classroom hours.

3. Early Warning Systems

- Identifies at-risk students by analysing behaviour patterns, enabling timely intervention by teachers or mentors.

4. Skill Mastery and Competency-Based Learning

- Focuses on ensuring learners master concepts before progressing, avoiding learning gaps.

5. Inclusive Education

- Supports learners with disabilities or language barriers through customized content and assistive technologies.

3.2 AI in Educational Assessment and Analytics

AI in educational assessment and analytics is revolutionizing how we measure student learning, track progress, and improve instructional strategies [6]. By leveraging machine learning, natural language processing, and predictive analytics, AI systems can perform automated assessments, provide real-time feedback, and generate actionable insights for educators and institutions.

3.2.1 Key Technologies

- **Natural Language Processing (NLP):** Used to automatically assess essays, written responses, and speech.
- **Machine Learning Models:** Analyze patterns in student responses and predict academic performance or dropout risk.
- **Computer Vision:** Supports analysis of handwritten work or proctoring in online exams.
- **Learning Analytics Dashboards:** Visualize learner performance and engagement metrics.

3.2.2 Applications

A. Automated Assessment

1. Grading of Essays and Open-Ended Questions

- AI systems evaluate coherence, grammar, structure, and content relevance.

2. Adaptive Testing Platforms

- Dynamically adjust question difficulty based on real-time performance.

3. Speech and Language Assessments

- Tools assess pronunciation, fluency, and comprehension in language learning.

B. Learning Analytics

1. Student Performance Monitoring

- Track participation, scores, and time-on-task for individualized feedback.

2. At-Risk Student Identification

- Predict dropout risks or failure likelihood using behavioral and historical data.

3. Curriculum Effectiveness Analysis

- Evaluate learning content impact on outcomes to inform instructional design.

C. Feedback and Personalization

1. Instant Feedback Mechanisms

- Help students learn from errors immediately, reinforcing concepts.

2. Teacher Dashboards

- Highlight trends, anomalies, and individual learner profiles for intervention.

3. Institutional Analytics

- Guide decision-making in course offerings, resource allocation, and policy planning.

4. AI in Governance

4.1 AI for Policy Decision Support and Public Administration

AI is emerging as a transformative tool in policy decision-making and public administration, enabling governments and agencies to make data-driven, efficient, and transparent decisions. By analyzing vast datasets, identifying patterns, and simulating policy outcomes, AI supports policymakers in designing evidence-based interventions. It also streamlines administrative functions, enhances citizen engagement, and improves service delivery [7].

4.1.1 Key Technologies

- **Predictive Analytics:** Used to forecast social, economic, and environmental trends.
- **Natural Language Processing (NLP):** Analyzes policy documents, public feedback, and legislative texts.
- **Machine Learning Models:** Identify patterns in public behavior, fraud detection, and resource allocation.
- **Decision Support Systems (DSS):** Help policymakers evaluate the impact of alternative policy scenarios.

4.1.2 Applications

A. Decision Support for Policymakers

1. Policy Simulation and Forecasting

- AI models simulate economic policies, health interventions, and environmental regulations to predict long-term effects.

2. Evidence-Based Policymaking

- Mining data from census, health records, and social programs to inform policy design.

3. Public Sentiment Analysis

- Analyzing social media, surveys, and public comments to gauge public opinion on key issues.

B. Administrative Efficiency and Automation

1. Smart Resource Allocation

- AI supports optimal budgeting and logistics planning in areas like disaster management or infrastructure development.

2. Fraud Detection and Compliance

- Identifying anomalies in public expenditure, tax filings, or social welfare programs.

3. Automated Service Delivery

- Virtual agents for issuing licenses, processing applications, or registering grievances.

C. Enhancing Transparency and Citizen Engagement

1. Open Data Analytics

- AI helps visualize and explain complex datasets to the public and policymakers.

2. Civic Tech Tools

- Intelligent platforms that allow citizens to participate in planning, reporting, and decision-making processes.

3. Language Translation and Accessibility

- AI tools provide multilingual access to public information and services.

5. AI in Public Infrastructure

5.1 Smart City Development and Urban Planning

The concept of smart cities involves leveraging digital technologies particularly Artificial Intelligence (AI) to create urban environments that are more efficient, sustainable, inclusive, and livable. In the context of urban planning, AI plays a crucial role in analyzing complex urban data, optimizing infrastructure, predicting trends, and enabling real-time responses to city dynamics [8]. Smart cities aim to enhance quality of life by integrating AI into systems like transportation, energy, waste management, public safety, housing, and governance [9].

5.1.1 Key Technologies

- **Machine Learning (ML):** Predicts urban growth patterns, energy consumption, and traffic flow.
- **Geospatial AI (GeoAI):** Combines AI with geographic information systems (GIS) for land use, zoning, and environmental monitoring.

- **Computer Vision:** Monitors traffic, public safety, and infrastructure condition via video surveillance.

- **Internet of Things (IoT):** Sensors collect real-time urban data (e.g., air quality, noise, foot traffic) [10].

5.1.2 Applications

1. Urban Infrastructure Planning

- AI analyzes historical and real-time data to recommend locations for new schools, hospitals, roads, and utilities.
- Predictive models forecast population growth and urban sprawl, aiding in sustainable zoning and development.

2. Smart Transportation Systems

- AI enables traffic prediction, congestion management, and dynamic signal control.
- Optimizes public transportation schedules and ride-sharing services.
- Supports planning for electric vehicle infrastructure and autonomous mobility.

3. Environmental Monitoring & Sustainability

- AI monitors pollution levels, waste generation, and energy use to guide eco-friendly planning.
- Supports green infrastructure development, such as rain gardens and solar grids.

4. Public Safety and Emergency Response

- AI-enhanced surveillance helps detect crimes, accidents, and crowd movement.
- Predictive systems assist in disaster risk mapping and emergency resource allocation.

5. Housing and Land Use Management

- AI identifies informal settlements, vacant plots, or underutilized land.
- Helps in planning affordable housing projects based on demographic trends.

6. Conclusion

Artificial Intelligence (AI) is playing a transformative role in improving healthcare, education, governance, and public infrastructure. It helps doctors diagnose diseases more accurately, supports personalized learning in classrooms, and enhances government services through automation and data-driven decision-making. AI also contributes to building smarter, more efficient cities and infrastructure systems. However, its use must be guided by ethical standards to ensure fairness, transparency, and inclusiveness. With responsible implementation, AI can significantly improve quality of life and promote sustainable social development.

References

1. Abdallah, S., Sharifa, M., Almadhoun, M. K. I. K., Khawar Sr, M. M., Shaikh, U., Balabel, K. M., Ekomwereren, O. (2023), "The impact of artificial intelligence on optimizing diagnosis and treatment plans for rare genetic disorders", *Cureus*, 15(10).
2. Ahmadi, A. (2024), "Digital Health transformation: leveraging ai for monitoring and disease management".
3. Alshamrani, M. (2022), "IoT and artificial intelligence implementations for remote healthcare monitoring systems: A survey", *Journal of King Saud University-Computer and Information Sciences*, 34(8), 4687-4701.
4. chwalbe, N., & Wahl, B. (2020), "Artificial intelligence and the future of global health", *The Lancet*, 395(10236), 1579-1586.
5. Agrawal, J.S. Gans, A. Goldfarb, "What to expect from artificial intelligence", *MIT Sloan Manag. Rev.* 58 (3) (2017) 23–26.
6. Li, S. J., Wang, C. L., & Gu, X. Q. (2022), "Artificial Intelligence Education Governance: Logical Mechanisms and Practical Approaches". *Journal of East China Normal University (Educational Science Edition)*, 40, 55-66.
7. Shen, G. C., & Shen, H. N. (2023), "Artificial Intelligence Empowers the Modernization of University Governance: Connotation, Vision and Path", *Modern Educational Technology*, 33, 5-13.
8. Ke CHEN, Xiaojie ZHOU, Zhikang BAO, Mirosław Jan SKIBNIEWSKI, Weili FANG, "Artificial intelligence in infrastructure construction: A critical review".
9. Anca Florentina Vatamanu * and Mihaela Tofan, "Integrating Artificial Intelligence into Public Administration: Challenges and Vulnerabilities", April 2025 15(4):149, DOI:10.3390/admsci15040149.
10. Radosław Wolniak and Kinga Stecuła, "Artificial Intelligence in Smart Cities—Applications, Barriers, and Future Directions: A Review", *Smart Cities* 2024, 7(3), 1346-1389; <https://doi.org/10.3390/smartcities7030057>.