1. Record Nr. UNINA9911019149303321 Autore Dahiya Neelam Titolo Artificial Intelligence in Remote Sensing for Disaster Management Pubbl/distr/stampa Newark:,: John Wiley & Sons, Incorporated,, 2025 ©2025 **ISBN** 1-394-28722-4 1-394-28721-6 Edizione [1st ed.] Descrizione fisica 1 online resource (318 pages) Altri autori (Persone) SinghGurwinder SinghSartajvir SharmaApoorva 658.4/056 Disciplina Soggetti Artificial intelligence **Emergency management** Lingua di pubblicazione Inglese **Formato** Materiale a stampa Livello bibliografico Monografia Note generali Includes index. Cover -- Series Page -- Title Page -- Copyright Page -- Contents --Nota di contenuto Preface -- Chapter 1 Introduction to Natural Hazards, Challenges, and Managing Strategies -- 1.1 Introduction -- 1.2 Terminology Used --1.2.1 Hazard -- 1.2.2 Mitigation -- 1.2.3 Vulnerability -- 1.2.4 Disaster -- 1.2.5 Risk -- 1.3 Classification of Natural Hazards -- 1.3.1 Biological Natural Hazards -- 1.3.2 Geological Hazards -- 1.3.3 Hydrological Hazards -- 1.3.4 Meteorological Hazards -- 1.4 Challenges and Risks of Natural Hazards -- 1.4.1 Loss of Life -- 1.4.2 Property Damage and Economic Losses -- 1.4.3 Disruption of Critical Infrastructure -- 1.4.4 Health Risks and Disease Outbreaks -- 1.4.5 Environmental Degradation -- 1.4.6 Social and Economic Disparities --1.4.7 Psychosocial Impacts -- 1.5 Strategies to Prevent Natural Hazards -- 1.5.1 Planning and Regulation for Reducing Risk on Land -- 1.5.1.1 Zoning Regulations -- 1.5.1.2 Building Codes and Standards -- 1.5.1.3 Setback Requirements -- 1.5.1.4 Erosion Control Measures -- 1.5.1.5 Floodplain Management -- 1.5.2 Environmental Conservation and Restoration -- 1.5.2.1 Protecting Natural Ecosystems -- 1.5.2.2 Restoring Degraded Ecosystems -- 1.5.2.3 Floodplain Management --1.5.2.4 Coastal Protection -- 1.5.2.5 Sustainable Land Management --

1.5.3 Early Warning Systems and Preparedness -- 1.5.3.1 Hazard Monitoring and Forecasting -- 1.5.3.2 Risk Assessment and Planning -- 1.5.4 Education and Awareness -- 1.5.4.1 Understanding Hazards and Risks -- 1.5.4.2 Promoting Risk Reduction Measures -- 1.5.4.3 School Curriculum Integration -- 1.5.5 Climate Change Mitigation --1.5.5.1 Reducing Greenhouse Gas Emissions -- 1.5.5.2 Promoting Renewable Energy -- 1.5.5.3 Enhancing Energy Efficiency -- 1.6 Role of Remote Sensing Device to Prevent Natural Disasters -- 1.6.1 Hazard Detection and Monitoring -- 1.6.2 Early Warning Systems. 1.6.3 Risk Assessment and Vulnerability Mapping -- 1.6.4 Environmental Monitoring -- 1.6.5 Mapping and Damage Assessment -- 1.7 Conclusion -- Acknowledgments -- References -- Chapter 2 Role of Remote Sensing for Emergency Response and Disaster Rehabilitation -- 2.1 Introduction -- 2.2 Method -- 2.3 Disaster Management -- 2.4 Result and Discussion -- 2.4.1 Floods -- 2.4.2 Earthquakes -- 2.4.3 Drought -- 2.4.4 Landslides -- 2.4.5 Land/Forest Fire -- 2.4.6 Volcanic Eruption -- 2.5 Conclusion -- References --Chapter 3 Fundamentals of Disaster Management Using Remote Sensing -- 3.1 Introduction -- 3.2 Importance of Remote Sensing in Disaster Management -- 3.2.1 Role in Emergency Response -- 3.2.2 Impact on Disaster Rehabilitation -- 3.2.3 Remote Sensing Taxonomy -- 3.3 Remote Sensing Applications in Emergency Response -- 3.3.1 Damage Assessment -- 3.3.1.1 Techniques and Methods -- 3.3.1.2 Integration with Other Data Sources -- 3.3.1.3 Feature Extraction from Pre- and Post- Disaster Imagery -- 3.4 Acquisition of Disaster Features -- 3.4.1 Acquisition of Tsunami Features with Remote Sensing -- 3.4.2 Acquisition of Earthquake Features with Remote Sensing -- 3.4.3 Acquisition of Wildfire Features with Remote Sensing -- Conclusion --References -- Chapter 4 Remote Sensing for Monitoring of Disaster-Prone Region -- 4.1 Introduction -- 4.2 Related Existing Work -- 4.3 Comparison Table -- 4.4 Graphical Analysis -- 4.5 Conclusion and Future Scope -- Acknowledgments -- References -- Chapter 5 Artificial Intelligence Tools in Disaster Risk Reduction and Emergency Management -- 5.1 Introduction -- 5.1.1 Role of Al Tools and Technologies -- 5.1.2 Purpose and Objectives of the Research Paper --5.2 Al Tools and Technologies in Disaster Risk Reduction -- 5.3 Ethical and Social Implications of Using AI Tools in Disaster Management. 5.4 Impact and Effectiveness of Al Tools and Technologies -- 5.5 Al for Dismantling Difficulties in Disaster Management -- 5.6 Future Directions and Recommendations -- 5.7 Conclusion --Acknowledgments -- Funding -- References -- Chapter 6 Al Tools and Technologies in Disaster Risk Reduction and Management -- 6.1 Introduction -- 6.2 Al Tools in Different Phases of Disaster Management -- 6.2.1 Before Disaster -- 6.2.2 During Disaster -- 6.2.3 After Disaster -- 6.3 Use of Geospatial Technologies and AI in Disaster Management -- 6.4 Future Challenges and Goals with AI -- 6.5 Conclusions -- Acknowledgment -- References -- Chapter 7 Al-Based Landslide Susceptibility Evaluation -- 7.1 Introduction -- 7.2 Principle of Support Vector Machines (SVM) -- 7.3 Conclusion --Acknowledgments -- References -- Chapter 8 Navigating Risk: A Comprehensive Study of Landslide Susceptibility Mapping and Hazard Assessment -- 8.1 Introduction -- 8.1.1 Challenges in Factor Selection and Weighting -- 8.1.2 Combination of Subjective and Objective Approaches -- 8.2 Factors Responsible for Landslides -- 8.2.1 External -- 8.2.2 Internal -- 8.3 Types of Landslides -- 8.4 Landslide Detection Techniques -- 8.5 Landslide Monitoring Techniques -- 8.6 Use of Machine Learning in Landslide Mapping -- 8.7 Use of Deep Learning in Landslide Mapping -- 8.8 Use of Ensemble Techniques -- 8.9

Limitations of Existing Algorithms -- 8.10 Dataset Used -- 8.11 Model Architecture -- 8.12 Results and Discussion -- Acknowledgment --References -- Chapter 9 Application of Geospatial Technology for Disaster Risk Reduction Using Machine Learning Algorithm and OpenStreetMap in Batticaloa District, Eastern Province, Sri Lanka -- 9.1 Introduction -- 9.1.1 Geospatial Technology in DRR -- 9.1.2 MLAs in DRR -- 9.1.3 OSM in DRR -- 9.1.4 Integrated Approach of Geospatial Technology, Machine Learning, and OSM. 9.2 Significance of the Study -- 9.3 Objectives -- 9.4 Methodology --9.4.1 Study Area -- 9.4.2 Data Collection -- 9.4.2.1 MLAs for DRR --9.4.2.2 Integration with OSM -- 9.5 Results and Discussion -- 9.6 Conclusion and Recommendations -- References -- Chapter 10 Landslide Displacement Forecasting With Al Models -- 10.1 Introduction -- 10.1.1 Technology Classifications for Remote Sensing -- 10.1.2 Architecture of Risk Management -- 10.2 Artificial Intelligence-Based Forecasting of Landslide Displacement -- 10.3 Performance Metrics -- 10.4 Limitations in Assessing the Al Models for Landslide Displacement Prediction -- 10.5 Technologies Integrated with Al Models -- 10.6 Conclusion -- References -- Chapter 11 Estimation of Snow Avalanche Hazardous Zones With Al Models -- 11.1 Introduction -- 11.2 Study Site and Data -- 11.3 Methodology -- 11.4 Results and Discussion -- 11.5 Conclusion -- References -- Chapter 12 Predicting and Understanding the Snow Avalanche Event -- 12.1 Introduction -- 12.2 Snow Avalanche -- 12.2.1 Types of Snow Avalanche -- 12.2.1.1 Sluff Avalanche -- 12.2.1.2 Slab Avalanche --12.2.2 Basic Reason Behind Snow Avalanche -- 12.2.3 Role of Remote Sensing in Snow Avalanche Prediction -- 12.3 Contributory Factors --12.3.1 Terrain -- 12.3.2 Precipitation -- 12.3.2.1 Snow Accumulation -- 12.3.2.2 Formation of Weak Layers -- 12.3.2.3 Load and Stress Increases -- 12.3.2.4 Rain-on-Snow Effect -- 12.3.3 Wind Temperature -- 12.3.4 Snowpack Stratigraphy -- 12.4 Remote Sensing and Avalanche Prediction -- 12.4.1 Basic Principle Behind Radar-Based Remote Sensing -- 12.4.2 Need for Remote Sensing -- 12.5 Methodology -- 12.5 Conclusion and Future Scope -- References --Chapter 13 A Systematic Review on Challenges and Opportunities in Snow Avalanche Risk Assessment and Analysis -- 13.1 Introduction. 13.2 Advanced Tools for Snow Avalanche Monitoring System -- 13.3 Snow Avalanche Risk Assessment and Analysis -- 13.4 Challenges in Snow Avalanche Risk Assessment and Analysis -- 13.5 Opportunities in Snow Avalanche Risk Assessment and Analysis -- 13.6 Summary --References -- Chapter 14 Al-Based Modeling of GLOF Process and Its Impact -- 14.1 Introduction -- 14.1.1 The Andes -- 14.1.2 High Mountain Asia (HMA) -- 14.1.3 Other Regions -- 14.2 Artificial Intelligence and GLOF -- 14.2.1 Modeling the GLOF Process -- 14.2.2 Impact Assessment -- 14.2.3 Benefits of Using AI -- 14.2.4 AI Techniques for the Prediction of GLOF -- 14.2.4.1 Machine Learning (ML) -- 14.2.4.2 Deep Learning (DL) -- 14.2.4.3 Time Series Analysis -- 14.2.4.4 Integration with Other Techniques -- 14.3 Machine Learning Techniques for GLOF -- 14.3.1 Use of Supervised Learning in GLOF -- 14.3.1.1 Data Preparation -- 14.3.1.2 Feature Engineering --14.3.1.3 Model Training -- 14.3.1.4 Prediction -- 14.3.1.5 Benefits of Using Supervised Learning for GLOF Prediction -- 14.3.1.6 Various Supervised Algorithms for the GLOF Process -- 14.3.1.7 Choosing the Right Algorithm -- 14.3.2 Use of Unsupervised Learning in GLOF --14.3.2.1 Anomaly Detection -- 14.3.2.2 Feature Discovery -- 14.3.2.3 Data Preprocessing -- 14.3.2.4 Unsupervised Learning Algorithms for GLOF Analysis -- 14.3.2.5 Choosing the Right Algorithm -- 14.3.2.6 Objective -- 14.3.2.7 Data Characteristics -- 14.3.2.8 Benefits of Using

Unsupervised Learning for GLOF -- 14.3.2.9 Challenges and Considerations -- 14.4 Deep Learning for GLOF Modeling -- 14.4.1 Convolutional Neural Networks (CNNs) -- 14.4.2 Recurrent Neural Networks (RNNs) -- 14.4.3 Combining Different Deep Learning Techniques -- 14.5 Existing Models for GLOF Modeling: A Comparison -- 14.5.1 Statistical Models -- 14.5.2 Machine Learning Models -- 14.5.3 Deep Learning Models. 14.5.4 Comparison.

Sommario/riassunto

Invest in Artificial Intelligence in Remote Sensing for Disaster Management to gain invaluable insights into cutting-edge Al technologies and their transformative role in effectively monitoring and managing natural disasters. Artificial Intelligence in Remote Sensing for Disaster Management examines the involvement of advanced tools and technologies such as Artificial Intelligence in disaster management with remote sensing. Remote sensing offers cost-effective, quick assessments and responses to natural disasters. In the past few years, many advances have been made in the monitoring and mapping of natural disasters with the integration of AI in remote sensing. This volume focuses on Al-driven observations of various natural disasters including landslides, snow avalanches, flash floods, glacial lake outburst floods, and earthquakes. There is currently a need for sustainable development, near real-time monitoring, forecasting, prediction, and management of natural resources, flash floods, sea-ice melt, cyclones, forestry, and climate changes. This book will provide essential guidance regarding Al-driven algorithms specifically developed for disaster management to meet the requirements of emerging applications.