SIGNIFICANT PAPER PRESENTATION

GROUP 6
BALIVADA-LAGISETTY-SHA-VICHARE

DISASTER AND PANDEMIC MANAGEMENT USING MACHINE LEARNING [2021]

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INTRODUCTION

Disasters and pandemics have a profound impact on human lives, the environment and economies. Today, machine learning technologies play a crucial role in assisting in disaster management tasks such as early warning, determining crowd evacuation route and handling the post-disaster situation.

This paper provides a detail survey review on how ml algorithms can contribute to disaster management in different stages.

KEY LEARNINGS

- Various ML algorithms can be employed in disaster and pandemic management.
  Such as Random Forest, Naïve Bayes and Logistic Regression, SVM, K-means clustering.
  a random forest for flood detection; SVM, K-means clustering and PCA for flood areas detection

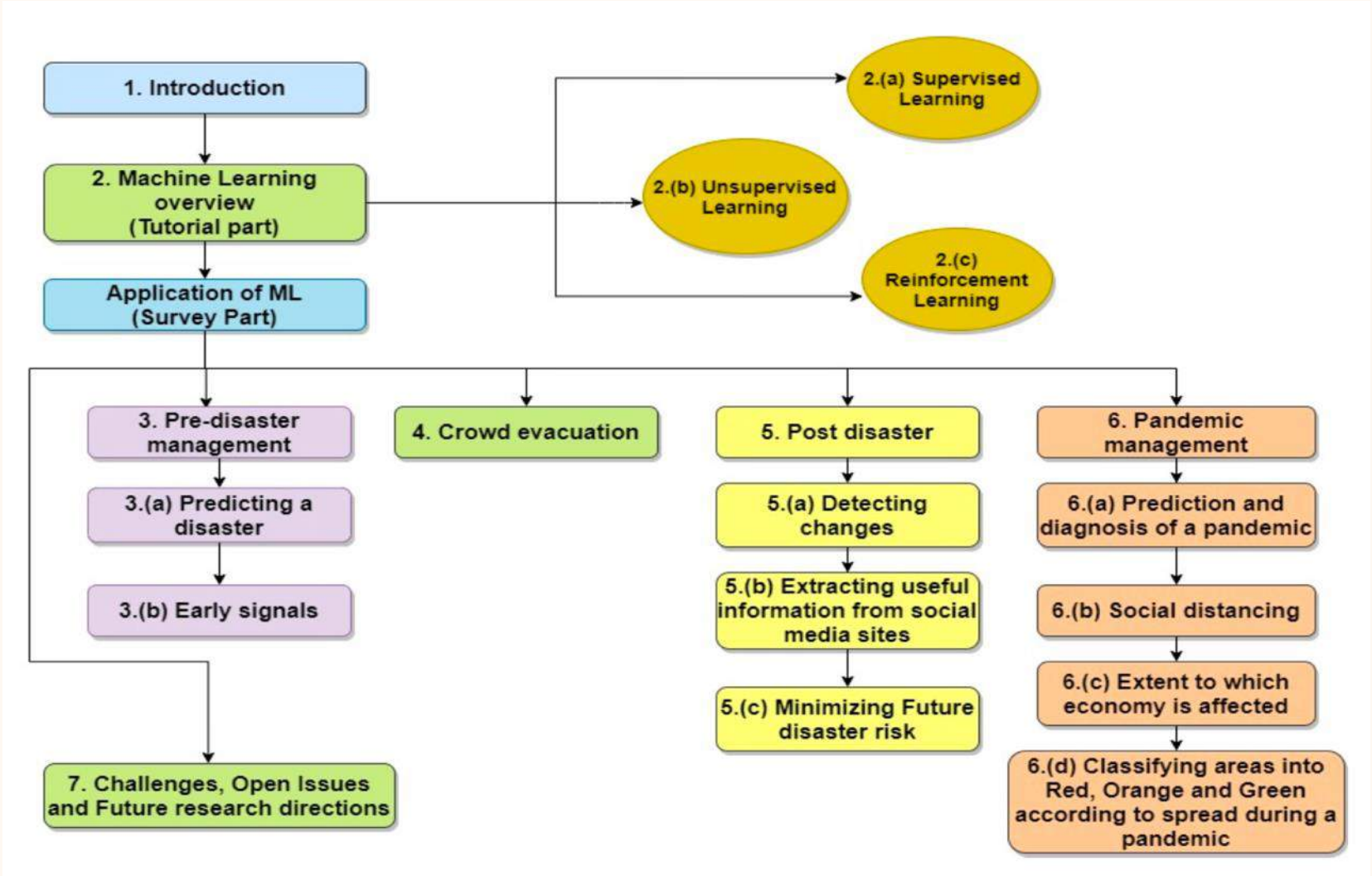
- ML technologies can be useful in different phases of the natural disaster.
  Prevention and Preparedness, Immediate Response, Recovery and Mitigation.

- ML technologies can be applied in various aspects of the pandemic.
  Prediction and Diagnosis, Pandemic Risk Zoning

- Integrating ML-based models with IoT devices can improve accuracy and effectiveness of various models.
  Sensors collect data over a network without human interference ensuring data accuracy

- Discussion on various challenges, open issues and, directions for future research.

PAPER STRUCTURE



Source: paper

DISASTER PREDICTION AND EARLY SIGNALS

Category	Reference	Target issue	Technology used	Hardware/API used	Case studies
IoT and ML	[63], 2020	Floods prediction	Convolution neural network	Hadoop MapReduce	Surat, India
	[65], 2019	Rainfall prediction	ANN and Logistic regression	LoraWan	UEM Campus
	[66], 2016	Forecast flood risk	Artificial Neural Networks	ZigBee,WSN	None
ML and Object sensing	[37], 2011	Prediction of floods	Random forest classifier	None	Momance River — Haiti and Wenchuan town — China
	[88], 2017	Classification of land cover	Random forest classifier and SVM	None	Scopus databases
ML	[32], 2018	Sandstorm detection	CART decision tree, Naïve Bayes and Logistic Regression	None	Riyadh, Dammam, and Jeddah
	[40], 2017	Flood and landslide detection	Convolutional Neural Network	None	Japan and Thailand
	[42], 2014	Storm intensity	Symbolic Aggregate Approximation (SAX) and Artificial Neural Network (ANN)	Satellite-image data	Typhoon and Tropical cyclones
	[25], 2016	Disaster recognition	BB-SVM	ERESS	Kansai University

Source: paper

CROWD EVACUATION DURING A DISASTER

Category	Reference	Target issue	Technology used	Hardware/API used	ML involved	Case studies
ML	[115], 2015	Activating Contraflows	Decision trees	Weka (Data mining software)	Yes	Hurricanes
	[109], 2013	Prevent crowd disasters	SVM, Linear regression and Gaussian model	GPS Sensors	Yes	San Francisco
	[25], 2016	Determine an evacuation route	BB-SVM, Dijkstra's algorithm and Depth first search (DFS)	ERESS	Yes	Kansai university
	[44], 2019		Deep Neural networks	Raspberry Pi-3 and spectrum analyzer	Yes	Ritsumeikan university
	[56], 2019		K-medoids and Reinforcement learning	None	Yes	Office scenario
	[116], 2017		LSTM model	Spatio and temporal features	Yes	Kumamoto earthquakes
	[117], 2014		Naive Bayes	None	Yes	Fire hazard
	[21], 2018		SVM and Fuzzy logic	None	Yes	Hajj (A Muslim pilgrimage event)
	[53], 2018		K-means and hierarchial clustering	Alarms	Yes	An office building
	[39], 2016	Classification of crowd situation	Deep CNN and Random Forest	None	Yes	UMN, UCSD and Pets2009
	[54], 2019		CNN classifier and K-means	None	Yes	Video data
	[60], 2018	Planning evacuation route	Reinforcement learning	None	Yes	Hong Kong fire outbreak

Source: paper

POST DISASTER RECOVERY AND FUTURE DISASTER RISK REDUCTION

Category	Reference	Target issue	Technology used	Hardware/API used	ML involved	Case studies
ML	[35], 2018	Detecting damages to buildings	Random forest	None	Yes	Haiti (Earthquake)
	[49], 2018	Evaluating future disaster risk	CNN	None	Yes	Floods and Landslides
	[34], 2017	Detect changes post-disaster	Simple Linear Iterative Clustering algorithm (SLIC) and Random forest	Aerial images by GeoEye1	Yes	Japan (Earthquake and Tsunami)
	[130], 2019	Classify areas into positive and negative recovery	SVM	Land cover data	Yes	Tacloban,Phillipines (Typhoons)
	[52], 2019	Detect which areas were damaged and affected by flood	K-means clustering	Optical ASTER images	Yes	Tohoku (Tsunami)
Social media	[28], 2018	Extracting useful information	Logistic regression, SVM and Voting classifier	Twitter data	Yes	Chennai (Rainfall)
	[41], 2019	Predict returning pattern for people who left	Gradient Boosting		Yes	New Jersey (Hurricane Sandy)
	[29], 2019	Identifying which tweets could be used for useful information	Logistic regression and Naive bayes		Yes	Hurricane Florence and Hurricane Michael
	[134], 2019	Relation of tweets between disaster affected and not affected people	Dirichlet regression and Dynamic Query Expansion (DQE)		Yes	New York City (Hurricanes)

Source: paper

CHALLENGES AND LIMITATIONS

- Data Quality and Availability
- Limited Testing with Real-World Data
- Complexity and Unpredictability of Natural Disasters
- Privacy Concerns

FUTURE DIRECTION AND ENHANCEMENT

- Models need to be adaptable to real-world changes
- Laboratory models undergo validation with real-world data.
- Combining various technologies with ML algorithms improves accuracy.

APPENDIX

Criteria	Comments
Source of the Significant Paper. Is it from a reputed journal or conference?	Yes, the paper is published in **IEEE Internet of Things Journal** Impact Factor : 10.6
Key Learnings Students summarized what they learned and the learnings are substantial.	There is a slide about key learnings from the paper. It highlights the most valuable insights from the paper.
Topic and contents of the paper. Are the contents relevant and significant to the course work?	Yes, the paper is about using ml to do disaster and pandemic management.(disaster prediction, responses, recovery) It introduce the ml algorithms and applications.
Presentation Q&A	Yes, we have Q&A part
Relation to Project Did the project build upon the significant paper?	Yes, the paper is highly related to our project. giving us a specific idea how ml can help in disaster management.
Quality of slides	Good readability

THANK YOU
AND ANY QUESTIONS?