Identifying the Key Determinants for a 3D-CNN/GCN Model for COVID-19 Mass Casualty Incidents (MCI) Triage Recommendation

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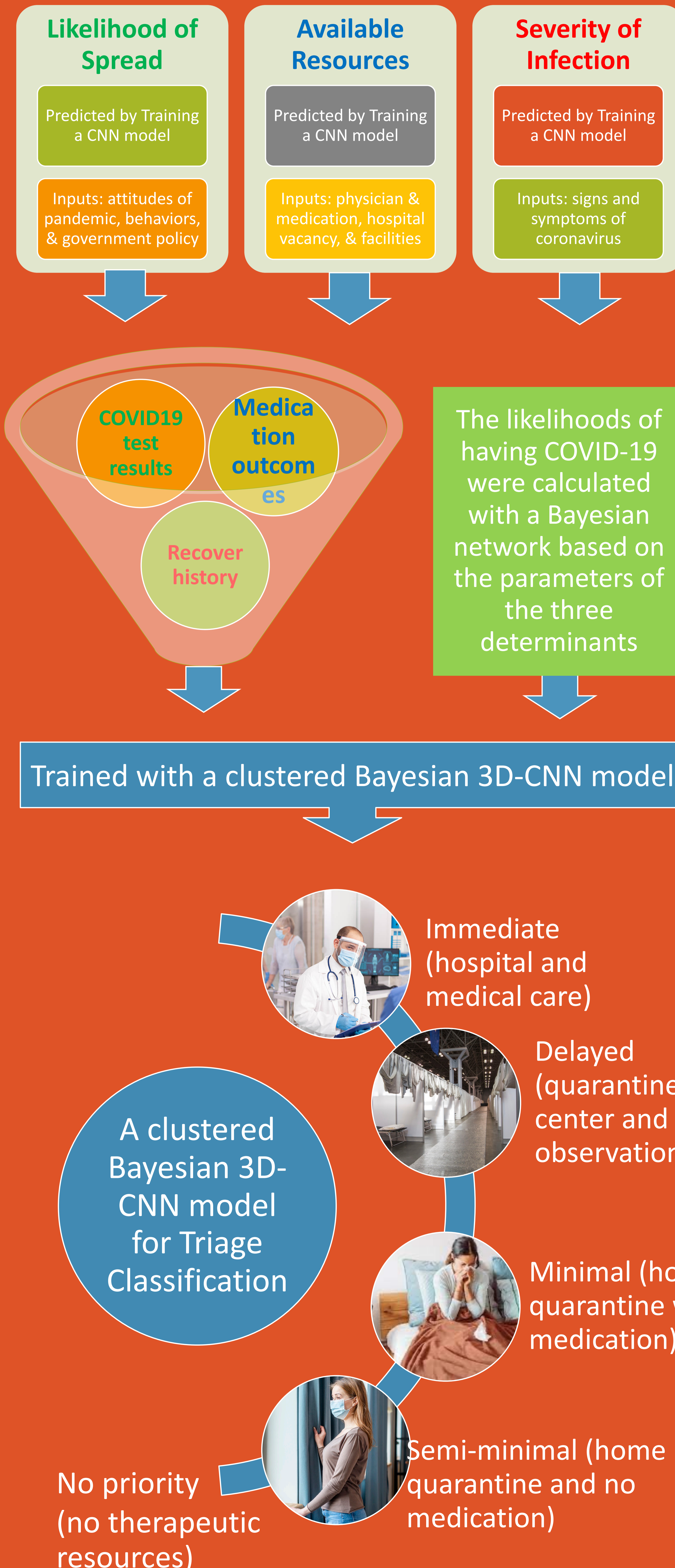601 E John St, Champaign, IL, USA 61820.

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INTRODUCTION

- COVID19 pandemic is the recent disaster medicine and causes a great impact to the worldwide medical systems, economy, and society.
- Pandemic continuously spreading, shortage of physicians, limited medication, poor healthcare and nursing services have made the medical systems in worldwide totally collapsed.
- In order to reduce the impacts of pandemic, an AI-based mass casualty incidents (MCI) triage recommendation system was recommended to classify the individual into different healthcare facilities to optimize the disaster medicine resources.

OBJECTIVES

This research identified the key determinants and designed a novel Bayesian three-dimension convolution neural network (3D-CNN) for COVID-19 mass casualty incidents (MCI) triage recommendation.

✓ **35 out of 109 articles between 2019 and 2022 from MEDLINE databases were archived and used.**

✓ **Three key determinants were found for Triage Decisions.**

Likelihood of Spread	**Available Resources**	**Severity of Infection**
Predicted by Training a CNN model	Predicted by Training a CNN model	Predicted by Training a CNN model
Inputs: attitudes of pandemic, behaviors, & government policy	Inputs: physician & medication, hospital vacancy, & facilities	Inputs: signs and symptoms of coronavirus

COVID19 test results

Medication outcomes

Recover history

The likelihoods of having COVID-19 were calculated with a Bayesian network based on the parameters of the three determinants

Trained with a clustered Bayesian 3D-CNN model

A clustered Bayesian 3D-CNN model for Triage Classification

Immediate (hospital and medical care)

Delayed (quarantine center and observation)

Minimal (home quarantine with medication)

Semi-minimal (home quarantine and no medication)

No priority (no therapeutic resources)

METHODS

- 109 articles between 2019 and 2022 were archived from MEDLINE databases.
- An empirical review and content analysis were done to find out the triage determinants
- A Bayesian 3-D CNN model was designed for triage recommendation.

RESULTS

- 35 out of 109 articles were used.
- The **severity of infection** (signs and symptoms of coronavirus), **likelihood of spreading** (attitudes of pandemic spreading, personal behaviors, and government policy), and **available resources** (physician and medication availability, hospital vacancy, and evacuation assets) are the identified determinants.
- The **COVID19 test result, recover history, and medication outcomes** are predicted **with three CNN models.**
- **The likelihoods of having COVID-19** are calculated with a **Bayesian network** based on the output parameters of the three determinants.
- **All these data** are trained with a novel **clustered Bayesian 3D-CNN model** for triage classification.

CONCLUSIONS

The future work is to validate the model.