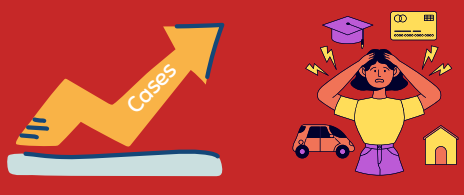
TECH-SHARING: INSIGHTS FROM NEW ZEALAND'S COVID-19 CASE STUDY FOR MALAYSIA



INTRODUCTIONS

COVID-19 began since 2020, it reshaped the global by introducing the lock down measures, work from home practices and herd immunities. The global community has also faced challenges in implementing preventive measures and mitigating economic crisis caused by the pandemic.

INNOVATIONS

A novel deep learning architecture, Attention-based Multiresolution Graph Neural Networks (ATMGNN), effectively predicts the future dynamics of the pandemic in New Zealand by combining spatial graph information with temporal data along with the existing dataset from England, France, Italy and Spain.

DATA COLLETIONS & PREPROCESSING

Datasets:

- New Zealand COVID-19 dataset that focuses on year 2020

Data Preprocessing & EDA:

- Filter the data for confirmed cases and restructure the format
- Construct a graph-based representation of regions within the country using the data, assigning edge weights based on the connectivity between regions
- Perform descriptive analysis to identify trends

MODEL TRAINING

- Train and evaluate graph-based temporal models, such as the ATMGNN, MPNN+LSTM and MPNN to predict future COVID-19 case counts
- Fine-tuning hyperparameters and model parameters to achieve better results

EVALUATIONS

Compare the performance metrics of the selected models with statistical time-series models and neural network models, including MAE, RMSE, and R-square. From the results, the overall best performances are MPNN+LSTM and ATMGNN models.

★ MPNN+LSTM ★ ATMGNN

☑ MAE ☑ RMSE ☑ R2

CONCLUSION

- The graph neural network (GNN) based models outperform every other baseline model in terms of performance metrics and performance decay over time.
- Adapting the GNN models to Malaysia's COVID-19 data based on the successful New Zealand study provides a powerful tool for predicting the future dynamics of the pandemic.
- By leveraging this approach, Malaysia can make informed decisions and implement effective public health policies and interventions to combat the spread of the virus.

References:

New Zealand Covid-19 Dataset: https://github.com/HySonLab/pandemic_tgnn

Nguyen, V. B., Hy, T. S., Tran-Thanh, L., & Nghiem, N. (2023, May 12). Predicting covid-19 pandemic by spatio-temporal graph neural networks: A New Zealand's study. https://arxiv.org/abs/2305.07731

Name: Kar Hong Sam

Matric No: S2191926

WQD7001 – Alternative Assessment 2 Q1

The paper suggested that for its future work, "we plan to extend our work for real-time prediction and global scale". Explain TWO possible issues that they will face in extending this work. List down THREE ethical guidelines, which need to be followed by the researchers.

Two possible issues that the researchers may face in extending their work for real-time prediction and global scale are:

1. **Data availability and quality**: Both the accuracy and reliability of the prediction models can be affected by the availability and quality of data, which can differ significantly across different regions and nations. Real-time data collection and processing can sometimes be challenging, particularly in environments with limited resources.

2. **Generalizability of the models**: Due to differences in population demographics, healthcare systems, and public health policies, the models created for a particular region or country may not be directly transferable to other regions or countries. Therefore, before adapting their models to new circumstances, the researchers should carefully evaluate the generalizability of their models.

Three ethical guidelines that need to be followed by the researchers are:

1. **Informed consent**: The researchers need to obtain informed consent from the participants whose data is being used for the study. The participants should be fully informed about the purpose of the study, the data collection process, and the potential risks and benefits of participating in the study.

2. **Data privacy and confidentiality**: The researchers must make sure that the data gathered for the study are kept private and are not disclosed to unauthorised parties. Only authorised individuals should have access to the data, which should be securely stored.

3. **Transparency and accountability**: The researchers must be transparent about their methodology and findings, and they must take responsibility for the accuracy and reliability of their predictions. Additionally, they should disclose any potential conflicts of interest and refrain from taking any actions that would harm the participants or anyone else.