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Department of Statistics, Malaysia
Dealing with Uncertainties: Unearthing Measures for Recovery

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NOWCASTING MALAYSIA'S GDP WITH MACHINE LEARNING

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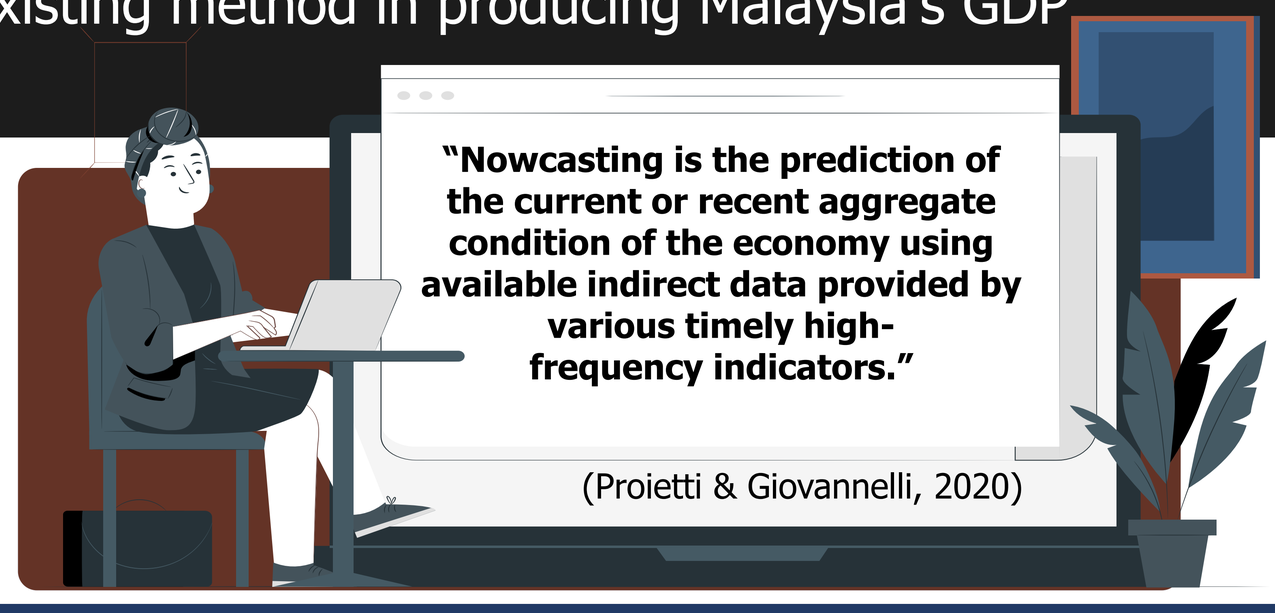
To identify a new potential approach in nowcasting Malaysia's GDP using machine learning (ML) & to complement the existing method in producing Malaysia's GDP advance estimates.

Abstract. This paper describes recent work to strengthen the nowcasting capacity at the Department of Statistics Malaysia. It motivates and compiles datasets of microeconomic variables. It applies several machine learning (ML) algorithms to nowcast Malaysia's GDP growth during normal and crisis times. ML models significantly outperform the AR (1) benchmark model. Some of the models tend to perform better during normal times while two ML models: XG Boost and Random Forest performed better at identifying turning points. Our approach is easily applicable to other countries and subject to data availability.



Related Works.

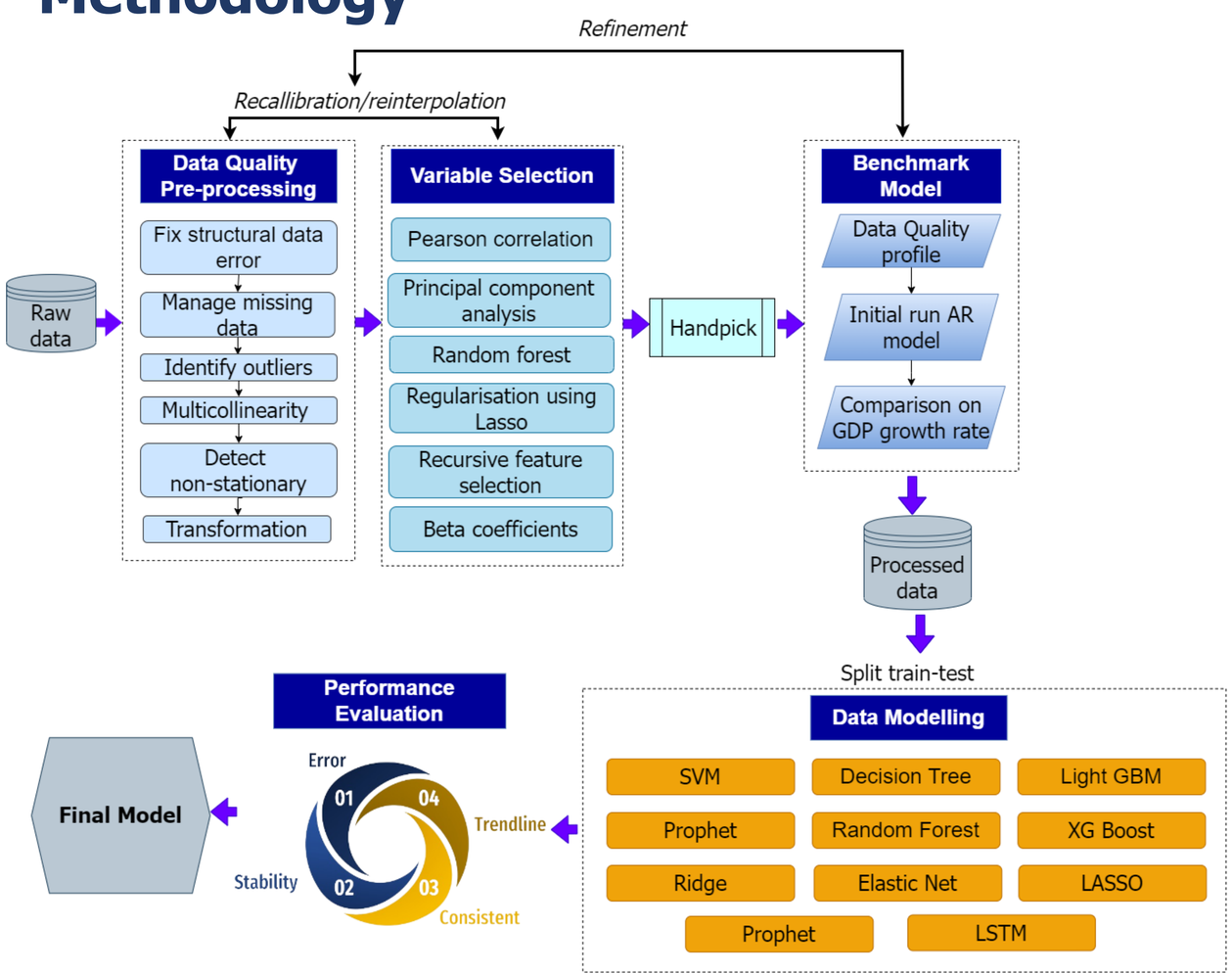
	Selected ML Models	Best Model
United Kingdom	LASSO, MIDAS, Random Forest, SVM, Neural Net, LSTM, DFM	**LASSO**
Canada	SVM, DFM, Elastic Net, Random Forest, and Gradient Boosting	**SVM**
China	Ridge, LASSO,Elastic-Net, Random Forest and Factor-Augmented autoregressive	**Ridge**
USA	LSTM, Bayesian VAR, Ridge, MIDAS, MLP, Random Forest, DFM, Gradient Boost, Decision Tree, MF-VAR	**LSTM & Bayesian VAR**

Contributions.

It adds to the growing literature on nowcasting in several ways. First, it motivates and compiles datasets over 111 variables consisting of indexes, SITC-single digit code, services, banking, exchange rate and labour market data. Second, employ 11 ML algorithms to nowcast GDP growth. Third, the paper compares the performance of ML algorithms in dealing with and capturing extreme signal (s) by experimenting with different time frames

Full data: Q12005 - Q42021
COVID-19 exclude vaccination rollout: Q12020 – Q12021
COVID-19 include vaccination rollout: Q12021 – Q42021

Methodology

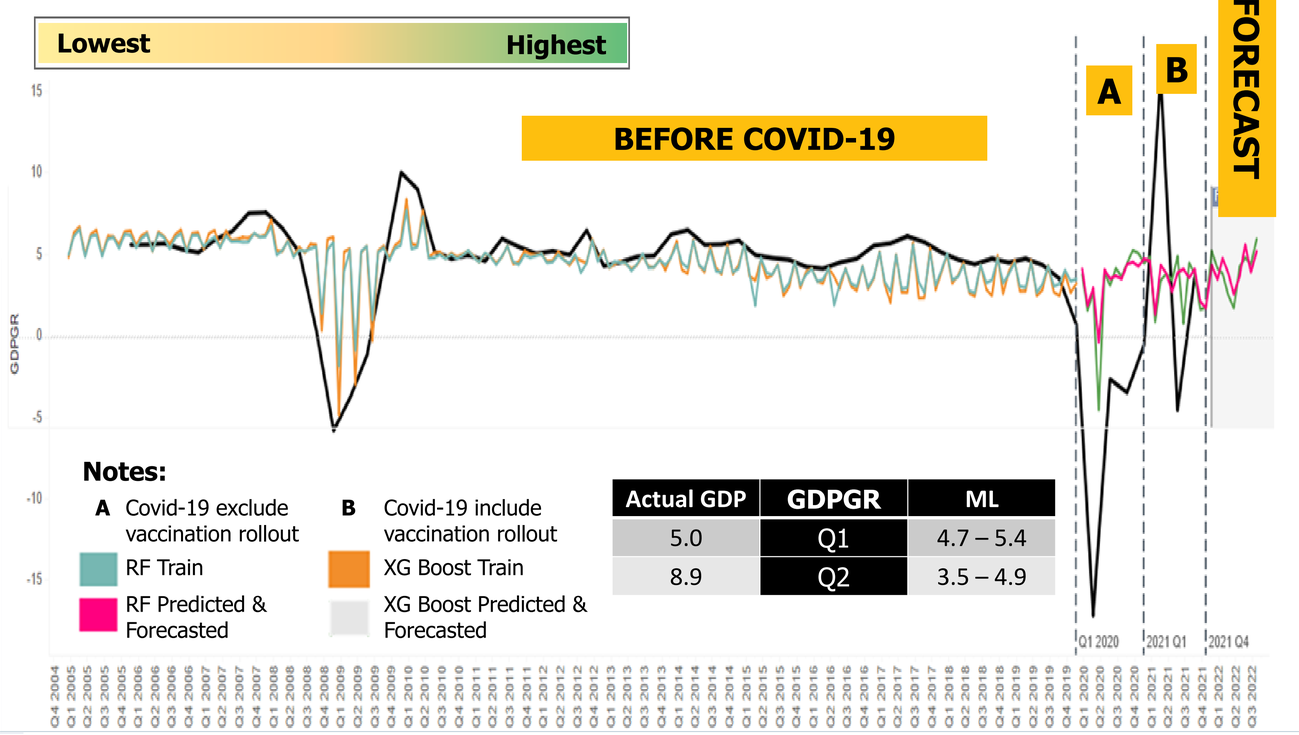


Results

With rolling	Q1,2005-Q4,2021		Q1,2020-Q1,2021		Q1,2021-Q4,2021	
	RMSE	MAE	RMSE	MAE	RMSE	MAE
AR	5.86	3.68	6.64	3.52	5.17	2.68
XG Boost	5.41	4.07	5.14	3.49	4.92	3.73
Random Forest	5.45	4.21	5.93	3.92	5.28	3.84
Prophet	6.24	3.89	7.10	4.46	5.45	3.55
Light GBM	6.48	4.18	6.95	4.29	4.86	3.67
Elastic Net	6.53	4.67	7.59	4.88	5.74	4.94
Lasso	6.64	4.67	7.51	4.84	5.53	4.69
LSTM	6.69	4.63	7.59	4.84	6.34	4.98
SVM	6.71	4.76	7.42	4.81	5.62	4.49
Decision Tree	6.73	4.73	7.63	4.93	5.84	4.89
Ridge	6.78	4.99	7.49	5.26	5.82	4.67
KNN	6.90	4.84	7.41	4.56	5.52	4.25

Model performance improves when applying the rolling window method.

The top two models with RMSEs lower than the AR benchmark are **XG Boost and Random Forest**.



Conclusion

- **ML models outperformed** benchmark model (AR) in nowcasting Malaysia's GDP.
- **XGBoost & Random Forest** perform better than other ML models with shorter time series datasets and they are able to capture extreme values or uncertainties in Malaysia's GDP.
- The use of ML algorithms is indispensable in giving **innovative solutions** to complement the existing method in producing Malaysia's GDP advance estimates.

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4. Dauphin, M. J.-F., Dybczak, M. K., Maneely, M., Sanjani, M. T., Suphaphiphat, M. N., Wang, Y., & Zhang, H. (2022). Nowcasting GDP-A Scalable Approach Using DFM, Machine Learning and Novel Data, Applied to European Economies. International Monetary Fund.
5. Dauphin, M. J.-F., Dybczak, M. K., Maneely, M., Sanjani, M. T., Suphaphiphat, M. N., Wang, Y., & Zhang, H. (2022). Nowcasting GDP-A Scalable Approach Using DFM, Machine Learning and Novel Data, Applied to European Economies. International Monetary Fund.

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