

## GENERALIZED SPACE-TIME AUTOREGRESSIVE (GSTAR) FOR FORECASTING AIR POLLUTANT INDEX IN SELANGOR (Autoregressive Ruang Masa Teritlak (GSTAR) untuk Meramal Indeks Pencemaran Udara di Selangor)

NUR MAISARA MOHAMED, NUR HAIZUM ABD RAHMAN\* & HANI SYAHIDA ZULKAFLI

### ABSTRACT

This study presents the Generalized Space-Time Autoregressive (GSTAR) model, a multivariate time series approach that integrates spatial and temporal observations for data forecasting. This study's primary objective is to develop and apply the GSTAR model to forecast the Air Pollutant Index (API), which exhibits spatial-temporal dependencies between locations and time. Three areas in Selangor have been used in this study: Banting, Petaling, and Shah Alam. The model employs uniform and inverse distance weights to consider spatial relationships. The forecasting performance is assessed using Root Mean Square Error (RMSE). Although both weight methods yield comparable results, the GSTAR model with inverse distance weight is promising for API data forecasting with consistently low RMSE values. The result of this study emphasises the significance of location-based information in generating more efficient and informed solutions.

*Keywords:* GSTAR; forecasting; uniform weight; inverse distance weight; Air Pollutant Index

### ABSTRAK

Kajian ini membentangkan model Generalized Space-Time Autoregressive (GSTAR), pendekatan siri masa berbilang yang mengintegrasikan pemerhatian spatial dan temporal untuk peramalan data. Objektif utama kajian ini adalah untuk membangunkan dan menggunakan model GSTAR untuk meramalkan Indeks Pencemaran Udara (IPU), yang mempamerkan kebergantungan spatial-temporal antara lokasi dan masa. Tiga lokasi di Selangor telah digunakan dalam kajian ini: Banting, Petaling, dan Shah Alam. Model ini menggunakan pemberat seragam dan jarak songsang untuk mempertimbangkan perhubungan spatial. Prestasi ramalan dinilai menggunakan Ralat Min Kuasa Dua (RMSE). Walaupun kedua-dua kaedah berat menghasilkan hasil yang setanding, model GSTAR dengan berat jarak songsang menjanjikan peramalan data IPU dengan nilai RMSE rendah secara konsisten. Hasil kajian ini menekankan kepentingan maklumat berasaskan lokasi dalam menjana penyelesaian yang lebih cekap dan bermaklumat.

*Kata kunci:* GSTAR; ramalan; pemberat seragam; pemberat jarak songsang; Indeks Pencemaran Udara (IPU)

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*Department of Mathematics and Statistics*

*Faculty of Science*

*Universiti Putra Malaysia*

*43400 UPM Serdang*

*Selangor DE, MALAYSIA*

*E-mail: 201112@student.upm.edu.my, nurhaizum\_ar@upm.edu.my\*, hsyahida@upm.edu.my*

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\*Corresponding author