

**DETEKSI ANOMALI REALTIME MENGGUNAKAN PROBABILISTIC
EXPONENTIAL WEIGHTED MOVING AVERAGE PADA DATA
STREAM DENGAN APACHE KAFKA STUDI KASUS: ANALISIS
POLUSI CAHAYA**

SKRIPSI

Diajukan untuk Memenuhi sebagian dari
Syarat Memperoleh Gelar Sarjana Komputer
Program Studi Ilmu Komputer



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ALAM
UNIVERSITAS PENDIDIKAN INDONESIA
BANDUNG
2023

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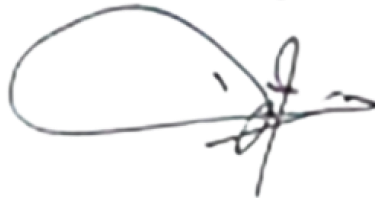
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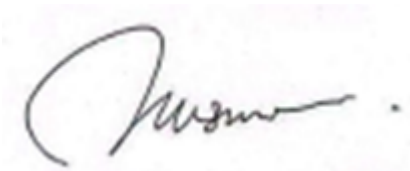
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ABSTRAK

Polusi cahaya adalah masalah yang mempengaruhi banyak aspek kehidupan manusia dan ekologi, termasuk menghambat pengamatan astronomi. Dalam penelitian ini, penulis mengusulkan pendekatan yang inovatif untuk mendeteksi anomali dalam data kecerahan langit malam yang diukur menggunakan *Sky Quality Meter* (SQM). Perangkat ini telah digunakan secara luas dalam penelitian polusi cahaya di seluruh dunia dan telah menghasilkan sejumlah besar data. Namun, selama proses pengumpulan data, ada potensi untuk mengalami anomali atau pencilan yang disebabkan oleh berbagai fenomena alam atau kesalahan pengukuran. Penelitian ini berfokus pada penerapan algoritma PEWMA untuk melakukan deteksi anomali pada data SQM yang didapat dari Observatorium Timau. Dengan memanfaatkan teknologi Apache Kafka untuk mensimulasikan proses streaming pada data SQM. Pada akhirnya, penelitian ini berharap dapat memberikan wawasan baru tentang dinamika kecerahan langit malam dan polusi cahaya. Hasil ini dapat membantu dalam pengembangan strategi dan kebijakan untuk mengurangi polusi cahaya di masa depan. Dari hasil penelitian ini diperoleh hasil akurasi algoritma PEWMA sebesar 0.78, 0.87 dan 0.96. Jika dibandingkan dengan algoritma *isolation forest* dan *Elliptic Envelope* hasil ini masih kalah unggul dan perlu pengembangan lebih lanjut.

Kata Kunci : *Kafka, Light Pollution, Real Time Anomaly Detection, SQM*

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ABSTRACT

Light pollution is a problem that affects many aspects of human life and ecology, including hindering astronomical observations. In this study, the authors propose an innovative approach to detect anomalies in night sky brightness data measured using a Sky Quality Meter (SQM). This device has been widely used in light pollution research around the world and has generated a large amount of data. However, during the data collection process, there is the potential to experience anomalies or outliers caused by various natural phenomena or measurement errors. This research focuses on applying the PEWMA algorithm to perform anomaly detection on SQM data obtained from Timau Observatory. By utilising Apache Kafka technology to simulate the streaming process of SQM data, this research hopes to provide new insights into the dynamics of night sky brightness and light pollution. Through the anomaly detection approach, the authors were able to identify and analyse unique or suspicious phenomena that may have previously gone undetected. From the results of this study, the accuracy of the PEWMA algorithm is 0.78, 0.87 and 0.96. When compared to the isolation forest and Elliptic Envelope algorithms these results are still less superior and need further development.

Keywords : Kafka, Light Pollution, Real Time Anomaly Detection, SQM

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Zulfikar Ali Yunara Putra, 2023

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