**Rivera-García, M. O., Reyna, M. A., Camarillo-Ramos, M. A., Reyna-Vargas, M. A., Avitia, R. L., Cuevas-González, D., & Osornio Vargas, A. R. (2023). Cyclone Separator for Air Particulate Matter Personal Monitoring: A Patent Review. *Atmosphere*, *14*(4), 624.**

<https://www.mdpi.com/2073-4433/14/4/624>

This article conducts an in-depth review of patents on vortex separation technology to improve personal air monitoring devices. This method involves using meshed terms and database searches to identify relevant patents that meet predetermined inclusion criteria. A total of 29 patents were analyzed, focusing on patent trends and technological advances. The study explores the geographic distribution of patent filings. The results highlight the importance of cyclone technology in improving measurement accuracy and efficiency, and highlight ongoing efforts to minimize power consumption and promote miniaturization cost-effective PM sensors. This method has limitations, including predetermined inclusion criteria that potentially exclude relevant patents, reliance on the Google Patent Database, and WIPO which can over other criteria and variations in patent documents affect the analysis. The study mainly focused on quantitative analysis, ignoring qualitative aspects, and despite efforts to find a comprehensive search strategy. Overall, this study provides valuable insights into the evolving landscape of environmental monitoring technologies.

**Kim, M., Park, M. S., Im, J., Park, S., & Lee, M. I. (2019). Machine learning approaches for detecting tropical cyclone formation using satellite data. *Remote Sensing*, *11*(10), 1195.**

**<https://www.mdpi.com/2072-4292/11/10/1195>**

Abstract:

This study compares machine learning (ML) and linear discriminant analysis (LDA) algorithms to detect tropical cyclone (TC) formation using WindSat satellite data in the western North Pacific Duong (2005-2009). ML models (decision trees, random forests, support vector machines) have higher hit rates (94-96%) but slightly higher false alarm rates (21-28%) than LDA ( ~77%) %, ~13% respectively), TC detection. 26 to 30 hours earlier.This method involves k-fold cross-validation and resampling to equally represent the noise types. Limitations include satellite sampling limitations and the dependence of ML on specific predictors. The results demonstrate the superiority of ML models in early TC detection, suggesting future research directions for improved ML models.

**Chen, R., Zhang, W., & Wang, X. (2020). Machine learning in tropical cyclone forecast modeling: A review. *Atmosphere*, *11*(7), 676.**

**<https://www.mdpi.com/2073-4433/11/7/676>**

This study aims to explore the latest advances and persistent challenges in tropical cyclone (TC) forecasting, with a particular focus on the integration of machine learning methods. By leveraging machine learning, researchers seek to overcome existing bottlenecks in TC forecasting by using data-driven models or improving numerical models. The method includes a comprehensive search of academic databases and relevant sources, followed by data synthesis and analysis to identify trends and limitations of machine learning-based TC predictions. The paper discusses advances in the origin, path, intensity, and forecasting of severe weather and storm surge, as well as improving numerical forecast models using automated learning methods. However, several limitations hinder the widespread application of machine learning in TC prediction, including the interpretability of deep learning models, short-term forecasting, scarcity of data for training, and lack of consistency. value of supervised learning d. Addressing these challenges requires additional research and testing.

**Lee, J., Im, J., Cha, D. H., Park, H., & Sim, S. (2019). Tropical cyclone intensity estimation using multi-dimensional convolutional neural networks from geostationary satellite data. *Remote Sensing*, *12*(1), 108.**

<https://www.mdpi.com/2072-4292/12/1/108>

This study aims to explore the latest advances and persistent challenges in tropical cyclone (TC) forecasting, with a particular focus on the integration of machine learning methods. By leveraging machine learning, researchers seek to overcome existing bottlenecks in TC forecasting by using data-driven models or improving numerical models. Through a systematic literature review, relevant studies were identified, focusing on methods, data sets and results. The method includes a comprehensive search of academic databases and relevant sources, followed by data synthesis and analysis to identify trends and limitations of machine learning-based TC predictions. The paper discusses advances in the origin, path, intensity, and forecasting of severe weather and storm surge, as well as improving numerical forecast models using automated learning methods. However, several limitations hinder the widespread application of machine learning in TC prediction, including the interpretability of deep learning models, short-term forecasting, scarcity of data for training, and lack of consistency. value of supervised learning d. Addressing these challenges requires additional research and testing.

**Cui, H., Tang, D., Liu, H., Sui, Y., & Gu, X. (2023). Composite Analysis-Based Machine Learning for Prediction of Tropical Cyclone-Induced Sea Surface Height Anomaly. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *16*, 2644-2653.**

<https://ieeexplore.ieee.org/abstract/document/10049845/>

This study presents a novel random forest (RF) approach based on meta-analysis to predict daily sea surface height anomalies (SSHA) due to tropical cyclones (TCs ) causes, an important indicator for understanding the structure of the ocean temperature gradient and its heat content. By leveraging TC characteristics and higher pre-storm ocean parameters as input features, the RF model predicts TC-induced SSHAs up to 30 days after TC passage. The method includes data collection from observational datasets and reanalysis, preprocessing, meta-analysis, and RF modeling with grid search and cross-validation techniques. The results demonstrate the effectiveness of the method in inferring both the amplitude and temporal evolution of SSHA produced by TCs of different intensity groups, thus outperforming machine learning methods and alternative numerical modeling. However, limitations include reduced prediction accuracy with longer lead times and difficulty in handling extremely high TC intensities. The study highlights the promise of machine learning in improving severe weather forecasting, while also emphasizing the need for further research to address existing limitations.

**Wang, E. K., Wang, F., Kumari, S., Yeh, J. H., & Chen, C. M. (2021). Intelligent monitor for typhoon in IoT system of smart city. *The Journal of Supercomputing*, *77*, 3024-3043.**

**<https://link.springer.com/article/10.1007/s11227-020-03381-0>**

In areas where natural disasters such as storms frequently occur, quick and accurate response is essential to minimize material and human damage. This study examines the potential to leverage Internet of Things (IoT) technology for smart monitoring, diagnostics, and repair in smart cities to address emerging problems. Focusing on improving the storm early warning system, a deep learning method to recognize storm clouds and central locations is proposed. This approach integrates Fast R-CNN with a bottom-up attention mechanism for object detection, uses ResNet-101 for feature extraction, and transfer learning to fine-tune the model. Experiments with both eye and eyeless storms showed higher identification accuracy than traditional methods. The results show that this framework holds promise for strengthening storm early warning systems and improving disaster response capabilities in smart cities. The object detection framework is designed based on attention mechanism and Fast R-CNN, with ResNet-101 used for feature extraction. Fast R-CNN is deployed to detect objects and locate the storm center, with transfer learning facilitating model fine-tuning. Experiments performed on labeled eye and non-eye storm datasets evaluate the recognition accuracy, IOU, and positioning error, thereby confirming the effectiveness and superiority of this method.