Hura V.T., postgraduate

Ivan Franko Lviv National University, Faculty of Electronics

and Computer Technologies, St. Drahomanova 50, Lviv

Department of radioelectronic and computer systems

**MACHINE LEARNING APPROACH FOR AIR QUALITY PREDICTION**

Air pollution is a major concern in many parts of the world, as it can have negative effects on human health and the environment. As a result, there has been a growing interest in developing machine learning-based models that can predict air quality in different regions. In this article, we will explore how machine learning is being used to predict air quality and the benefits it can provide.

Machine learning is a subset of artificial intelligence that involves the development of algorithms that can learn from data and make predictions or decisions based on that data. In the context of air quality prediction, machine learning algorithms can be trained on historical data to identify patterns and make predictions about future air quality.

One of the most important factors in air quality is the presence of particulate matter (PM), which includes tiny particles that can be harmful to human health. Machine learning algorithms can be trained to predict PM levels based on a variety of factors, including weather conditions, traffic patterns, and emissions from nearby sources.

For example, a study published in the journal Atmospheric Environment in 2018 used machine learning to predict PM levels in Beijing, China. The researchers used data from air quality monitoring stations and meteorological sensors to train a neural network, a type of machine learning algorithm, to predict PM levels. They found that their model was able to accurately predict PM levels up to 48 hours in advance, which could be used to inform public health warnings and guide policy decisions.

Another study published in the Journal of Environmental Management in 2019 used machine learning to predict air quality in the city of Ahmedabad, India. The researchers used data from air quality monitoring stations and satellite imagery to train a machine learning algorithm to predict air quality. They found that their model was able to accurately predict air quality levels up to two days in advance, which could be used to help city officials make decisions about traffic management and other measures to improve air quality.

There are several benefits to using machine learning for air quality prediction. One of the main advantages is that it can provide more accurate and timely predictions than traditional methods. This can be particularly important in areas where air pollution is a major concern, as it can help people take steps to protect their health and reduce exposure to harmful pollutants.

In addition, machine learning can help identify the factors that contribute to poor air quality, which can inform policy decisions and guide efforts to reduce pollution. For example, if a machine learning model identifies that traffic congestion is a major contributor to air pollution in a particular area, policymakers could consider measures such as implementing congestion charges or promoting public transportation to reduce emissions from cars.

Despite the benefits of using machine learning for air quality prediction, there are also some challenges that need to be addressed. One of the main challenges is data availability, as machine learning algorithms require large amounts of high-quality data to train effectively. In many parts of the world, air quality monitoring data may not be widely available, which can limit the accuracy of machine learning models.

Another challenge is the complexity of the models themselves, as machine learning algorithms can be difficult to interpret and explain. This can make it challenging for policymakers and members of the public to understand how the models work and how the predictions are generated.

In conclusion, machine learning has the potential to revolutionize the way we predict air quality and address the problem of air pollution. While there are still some challenges that need to be overcome, the benefits of using machine learning for air quality prediction are clear. By providing more accurate and timely predictions and identifying the factors that contribute to poor air quality, machine learning can help protect human health and the environment.

List of references

1. Wang, S., Ma, Y., Wang, Z., Wang, L., Chi, X., Ding, A., Yao, M., Li, Y., Li, Q., Wu, M., Zhang, L., Xiao, Y., and Zhang, Y.: Mobile monitoring of urban air quality at high spatial resolution by low-cost sensors: impacts of COVID-19 pandemic lockdown, Atmos. Chem. Phys., 21, 7199–7215, https://doi.org/10.5194/acp-21-7199-2021, 2021

2. Roscher, R., Bohn, B., Duarte, M. F., and Garcke, J.: Explainable machine learning for scientific insights and discoveries, IEEE Access, 8, 42200–42216, https://doi.org/10.1109/ACCESS.2020.2976199, 2020