From the Impact of Radon to Forecasting: the Different Shades of Environmental Radioactivity

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Every day, without realizing it, we live immersed in environmental radioactivity, a natural and generally harmless phenomenon. In the past, its strong correlation with meteorological variables has been verified, and the possibility of estimating its value using these variables has been demonstrated. In this project, this physical phenomenon is investigated in greater depth by measuring different combinations of alpha, beta, and gamma radiation, as well as radon gas concentration. Thanks to these measurements, performed mainly with instruments designed and built by the finalist, it was possible to verify phenomena already known in the literature and, above all, to achieve some original observations. The weak correlation between the different types of radiation and radon concentration showed that, on the balcony where the instruments were installed, several different phenomena contribute to environmental radioactivity. In fact, it was demonstrated that, contrary to what is often reported, the presence of radon - favored by winds coming from the Apennines behind Genoa - is not the dominant cause of radioactivity. It was also shown that, by adding information on wind and rain, meteorological variables allow for an accurate estimation of both different types of radiation and radon concentration. Above all, a method for forecasting future radioactivity has been introduced for the first time in the scientific literature. An LSTM neural network, receiving input values for radioactivity over the last six days, together with meteorological variables (which are essential for achieving good accuracy), can forecast the average radioactivity over the next two days.

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