Dear Editorial Board for Solar Energy,

We wish to submit an original research article entitled “Real-time spectral radiance estimation of hemispherical clear skies with machine learned regression models” for consideration by Solar Energy. The authors (Joseph Del Rocco, Dr. Paul D. Bourke, and Charles B. Patterson, Dr. Joseph T. Kider Jr.) confirm that this work is original and has not been published elsewhere, nor is the article currently under consideration for publication elsewhere.

This work presents a computationally efficient approach for reconstruction of high-dimensional atmospheric spectral radiance for clear skies, including non-visible spectra, UV and near IR, given only a low-dimensional RGB photograph of the sky and its capture time. We estimate spectral sky radiance distributions as directional quantities for the entire sky, as opposed to a single downwelling or irradiance measurement. This reconstruction of spectral radiance for the entire sky is still difficult and expensive to measure, and complicated to model in real-time, alternative solutions are still needed to predict within acceptable tolerances for use in various industries today.

Solar Energy is the leading journal for the science and application of solar radiation research, and other renewable energy technologies. Solar Energy has published research on spectral sky radiance and irradiance measurements and models for predictions of such measurements. Our work includes original research, measurements, modern machine learning methods, and suggestions for application. Our work is not only relevant to Solar Energy in terms of content, but many of our citations come from authors of Solar Energy published articles.

Spectral radiance reconstruction from photographs is directly relevant to PV alignment, environmental and atmospheric science, remote sensing, the built environment (building science), and rendering (computer graphics). Atmospheric energy is directional and many algorithms either already need this information for accurate calculations, or should be taking it into account. Affordable, real-time constrained methods are desired in building performance, as buildings are already expensive to build, maintain and repair, and typically not equipped with or have access to modern atmospheric monitoring. This method will provide readers with a new technique for deploying systems that account for spectral radiance in real-time applications.

Thank you for your consideration of this manuscript.

Sincerely,

Joseph Del Rocco

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University of Central Florida