

# A Statistical Formulation for Reduced Order Modeling in Radiation Transport

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## Abstract

Monte Carlo simulations are the most common approach to simulating radiation transport, and there are well-vetted codes that ensure accurate modeling. The problem, as with many applications of Monte Carlo modeling, is that the simulations are often prohibitively computationally expensive. In order to increase efficiency, it is possible in some applications to develop reduced order models (ROM) that significantly accelerate the Monte Carlo simulations, but projection onto the ROM often loses the advantages of the statistical nature of the Monte Carlo model. In this work we demonstrate a fully statistical approach to generating a ROM from Monte Carlo training simulations of radiation transport phenomena and using the ROM to accelerate future simulations. This approach allows us to accelerate MC calculations using the ROM, up to 4 orders of magnitude in some cases, while providing an estimate of the uncertainty in the projection, due to the statistical formulation of the projection.

## References

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