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Bayesian Model Comparison: The Battle Royale of New Physics Models

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Finding high-likelihood regions in BSM scenarios, particularly in high-dimensional models is a computationally expensive task and inefficient task using conventional statistical methods, due to the curse of dimensionality. In this work, we implement a generative framework, Real-valued Non-Volume Preserving(RealNVP) Normalizing Flows as our Machine Learning(ML) framework to assist Nested Sampling in likelihood calculation. This approach reaches convergence to a tolerance of approximately 0.001 within a few days. NS also computes Bayesian evidence. For similar Beyond the Standard Model (BSM) scenarios tested on the same dataset, comparing their evidences allows us to objectively assess which model is more strongly supported by the data. This method can be leveraged to calculate the evidence for different New Physics (NP) models, thereby facilitating model comparison.

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