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Learning features of multidimensional data using latent space representation

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With the increasing complexity and growing volume of data taken by the current experiments, the enormous challenge of isolating potential BSM signatures from the known Standard Model(SM) footprints is an active area of research in HEP. Machine learning (ML) algorithms are appropriate for analyzing large amounts of data and can find more intrinsic patterns in multidimensional data. We explored different data dimension reduction algorithms such as Principal Component Analysis(PCA) or Uniform Manifold Approximation and Projection(UMAP) to better understand the multidimensional data in lower dimensional latent space. We have also shown that preserved data structure in the latent space can be used as a potential classifier in an object or event-level classification task. We benchmark their performance against the popular Deep Neural Network based classifier in the context of classifying prompt leptons from fake leptons in various class imbalance and training statistics scenarios.

Session

Future Experiments and Detector Development

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