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Boosting the LHC resonance search program with Sophon

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We introduce a novel experimental methodology, Signature-Oriented Pre-training for Heavy-resonance ObservatioN (Sophon), designed to enhance the LHC resonance search program in the Lorentz-boosted regime. Sophon leverages the principles of "large models for large-scale classification", employing the advanced deep learning algorithm to train a classifier across an extensive (o(100)) set of boosted final states provided by the newly developed JetClass-II dataset. We show that the resulting model (the Sophon model) is capable of learning intricate jet signatures, achieving two key objectives: (1) optimal constructions of various jet tagging discriminates and (2) high-performance transfer learning capabilities across new tasks. These capabilities ensure Sophon pushes widespread model-specific searches to their sensitivity frontier and also significantly improves model-agnostic approaches, thereby accelerating LHC resonance searches in a broad sense.

Theme of discussion

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