

Application of machine learning techniques at BESIII experiment

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The BESIII detector is a general purpose spectrometer located at BEPCII. BEPCII is a double ring e^+e^- collider running at center of mass energies between 2.0 and 4.6 GeV and reached a peak luminosity of $1 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ at $\sqrt{s} = 3770 \text{ MeV}$.

As an experiment in the high precision frontier of hadron physics, since 2009, BESIII has collected the world's largest data samples of J/ψ , $\psi(3686)$, $\psi(3770)$, $\psi(4040)$ and $\psi(4260)$ decays. These data are being used to make a variety of interesting and unique studies of light hadron spectroscopy, charmonium spectroscopy and high-precision measurements of charmed hadron decays.

The application of machine learning techniques at BESIII is discussed.

By investigating the typical use cases as “event selection for rare signal”, “particle identification of lepton” and “track segment building for CGEM (Cylindrical Gas Electron Multiplier Inner Tracker)”, we map those tasks of data processing to classification problems in the machine learning field. The comparison of performance with traditional approaches will be given.

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