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Statistical methods for cosmic ray composition analysis at the Telescope Array Observatory

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The Telescope Array (TA) surface detector (SD) stations record the temporal development of the signal from the extensive air shower front which carries information about the type of the primary particle. We develop methods for studies of the primary mass composition of ultra-high-energy cosmic rays based on multivariate analysis (MVA). We propose to convert each observable into percentile rank with respect to Monte-Carlo. These ranks demonstrate stronger composition sensitivity than raw data values. We report the results of the technique on TA primary mass composition and primary mass and neutrino search.

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