Brace for supernova neutrino burst by waveform compression

The observation of neutrino burst from SN1987A provided invaluable insights on star evolution and essence of neutrinos. Because of the establishment of SuperNova Early Warning System(SNEWS), a global network of observatories has been formed for the next galactic supernova. Nevertheless, it remains a big challenge to transfer and store the complete data stream from PMT and FADC systems of neutrino and dark matter detectors.

We developed an effective algorithm that provides compression for PMT voltage readout waveforms by a library of orthogonal basis and information theoretic critera. In simulated dataset, our algorithm gives a 50 times reduction on the size of data while preserving full waveform features. We believe that efficient algorithms will largely empower those neutrino and dark matter detectors by improving their capability to gather supernova burst neutrino signals before falling back into degenerate emergency mode.

Primary author: XU, Benda

Co-authors: CHEN, Jiajie (Tsinghua University); WENG, Jun (Tsinghua University); TANG, Rulin (Tsinghua University); YUXIANG, Xing (Tsinghua University); ZHANG, Zhuojing (Tsinghua University)

Presenter: XU, Benda

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