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GPUs in gravitational wave data analysis

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Gravitational wave physics is in the doorstep of a new, very exciting era. When the advanced Virgo and advanced LIGO detectors will start their operation, there will be considerable probability of performing the first direct detection of gravitational waves predicted almost 100 years ago by Einsten's theory of General Relativity.
However the extraction of the faint signal from the noisy measurement data is a challanging task - and due to the high arithmetic density of the algorithms - requires special methods and their efficient, sophisticated implementation on high-end many-core architectures such as GPUs, APUs, MIC and FPGAs.. The operation-level paralellizability of the algorithms executed so far on single CPU core results - has already resulted - in nearly 2 order of magnitude speedup of the analysis and can directly be trasnlated to detector sensitivity! As such, the developed and applied computational algorithms can be regarded as part of the instrument, thus giving thorough meaning to the notion of "e-detectors".
In this talk we will shortly present and discuss the many-core GPU algorithms used in gravitational wave data analysis for extracting the continous waves emitted by isolated, spinning neutron stars and the chirp-like signals of binary NS-NS or NS-BH systems with an outlook for future possibilities.

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