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Line gain for long term environmental survey

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The complexity of artificial intelligence (AI) raises significant challenges in developing embedded detection systems [1,2], particularly in terms of power consumption [3]. In contrast, biological auditory perception addresses these issues efficiently [4]. Drawing inspiration from biological primitive extraction in the auditory system [5], we present a new method for drastically reducing energy required for acoustic signal processing and classification. This method could also be applied to more general problems. To assess the efficiency of the proposed algorithm, experiments were conducted using the Google Speech Command Dataset [6], focusing on 4 and 8 classes with added noise. Mimicking the structure of the cochlea, system training starts with 64 analog primitives, which are pruned sequentially, retaining only the most relevant ones for classification. This pruning relies on a novel neural network layer called "Line Gain." Results demonstrate that the proposed algorithm significantly reduces total energy consumption by 82%, while maintaining comparable accuracy levels (greater than 90%). Applications are then conducted on whale voicings. Perspectives are given in the context of low power budget detectors as subsea monitoring to assess long term anthropophony and biophony.

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