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The search space for optimal parameters in a typical complex deep learning (DL) system is vast even by today's computing standards. Conventional DL algorithms are complex, are extremely computationally expensive, and often result in suboptimal solutions, negatively impacting performance and generalization. Quantum computing (QC) offers the potential for rapid training of such models and the ability to find better solutions quickly in these large search spaces. We plan to demonstrate that our QC-based training can find better parameters than conventional parameter optimization approaches and overcome the deficiencies of current DL technology on state-of-the-art challenges such as automatic interpretation of electroencephalography (EEG) signals.