Abstract

With heightened concerns over the environmental impacts of internal combustion engines (ICEs), many automobile manufacturers have curtailed development of internal combustion engines in favor of alternative fuel vehicles. Alternatively, manufacturers have devoted large amounts of resources to redesign existing ICEs for improved efficiency. Both of these solutions are costly and time-consuming. Meanwhile, the advancement of deep learning algorithms provides the opportunity for a new avenue of automotive optimization. The focus of this study is on the application of deep learning algorithms specifically in engine control units (ECUs), which can significantly improve performance, efficiency, and reliability alike.

The objective of this study is to demonstrate the potential for a machine learning model to optimize internal combustion engines. A Python script was written to simulate the essential qualities of a commercial engine; a PyTorch neural network was trained to operate its inputs to optimize efficiency. After several hundred training cycles, the model attempted to optimize engine performance given fictitious environment data. Engine performance was recorded in various formats, notably fuel consumption. These results were holistically evaluated against simulated data of human inputs. The results show promise for AI controlled ECU systems to improve fuel efficiency of ICEs, without the steep development costs of full engine redesign.