Neuralese: A Visual-Interactive Platform for Neural Network Development With Topology-Aware Optimization

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Artificial intelligence education faces a dual challenge: tools that provide accessibility limit control over neural network design, while flexible frameworks impose significant programming and computational demands. This tradeoff prevents students from gaining practical experience in building and training models. This project develops Neuralese, a platform enabling students to construct, train, and deploy neural networks through a visual-interactive environment without programming. The system supports the full AI development workflow, including model construction, dataset handling, interactive training, and deployment. The platform uses a client-server architecture with GPU-accelerated training. Two optimizations support concurrent training workloads: Section Reuse, which exploits architectural similarity between models, and Topology Fusion, which consolidates operations across training sessions. Evaluation with 83 students showed higher learning gains than traditional instruction. Grade 7 and Grade 5 experimental groups improved by 18% and 10% respectively compared to controls (Cliff's d ˜ 0.56 and 0.42). System optimizations reduced training time for 16 users by up to 3.4× and kernel launches by approximately 5×. These results indicate that visual-interactive neural network development can improve accessibility while supporting scalable AI education.

Awards Won:
Association for the Advancement of Artificial Intelligence: Honorable Mention (do not read aloud). Winners receive a student level membership. Information is included separately in the SAO Portal.