across different frameworks including TensorFlow, PyTorch, and JAX. Performance benchmarks indicate significant improvements when regularization techniques like dropout and weight decay prevent overfitting. Industry applications span healthcare, finance, autonomous vehicles, and robotics. Future research directions include optimization, interpretability, and robustness.

Metric	Baseline	Improved	Enhancement
Accuracy	87.2%	94.7%	+7.5%
F1-Score	0.832	0.923	+0.091
Precision	0.845	0.935	+0.090
Recall	0.819	0.912	+0.093
Training Time	24.3h	18.7h	-23.0%
Memory Usage	8.2GB	6.8GB	-17.1%