# Adaptive NN Control of Classes of Nonlinear Systems

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**Abstract:** Next-generation artificial intelligence methods is oriented to interpretable and generalizable. In spite of these remarkable advances in artificial intelligent field, due to the complexity of nonlinear systems, the present research on AI methods still presents poor robustness and interpretability. From a theoretical viewpoint, there is, in general, lack of a firmly mathematical basis in stability, robustness, and performance analysis of physically informed neural networks control and AI system. Stability and performance are two important issues for control system design and practical applications. In this report, adaptive control for single-input single-output (SISO) nonlinear systems is first introduced by exploiting the physical property of the systems. Then, adaptive control for nonlinear systems are introduced in strict-feedback form using integral Lyapunov, barrier Lyapunov, and integral Barrier Lyapunov functions. Finally, time-synchronized performance control guarantees all the system state elements converge to the origin at the same time through direction ratio persistence. Under different operating conditions and a priori knowledge, adaptive NN controls have gone through the pioneering works, as a powerful tool in modelling and control of nonlinear systems.

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