



**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS**

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Bio-inspired Learning Strategies for Resource-Constrained Cyber-Physical Systems
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SHORT ABSTRACT

This thesis explores Artificial Intelligence (AI) methods that cater to resource-constrained Cyber-Physical Systems (CPS). The work highlights the importance of enabling onboard training and adaptation to overcome issues like domain shift and concept drift, which are common when using pre-trained models. It introduces innovative methods such as ChaoticImmuneNet and GADANN, that leverage concepts and advanced techniques like Chaos Theory, Evolutionary Algorithms, Deep Neural Networks, etc. to facilitate efficient and adaptive AI operations on edge devices. Using real-world applications such as an Internet-of-Things based setup for automated surveillance and response, enabling recognition tasks for mobile robots and gesture recognition, in real-time; this thesis brings out the practical viability of these AI methods. Additionally, it presents RoboDA, a multi-domain dataset designed to facilitate the evaluation of Domain Adaptation methods for robot vision. Overall, the thesis contributes to the advancement of AI by making it more accessible and effective in low-resource environments, paving the way for smarter and more autonomous CPSs.