

# Efficient approximation of the explicit model predictive controller using deep learning

Qiao Luo

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## Abstract

Model predictive control (MPC) is a widely used control strategy that predicts optimal control inputs of a model system. However, a major challenge in this field is the online-solving of an optimization problem at each sampling time. The explicit MPC law, a piecewise affine (PWA) function, bypasses this hurdle enabling the offline computation of MPC problems. Nonetheless, one main drawback of the explicit MPC law is the exponential growth of the number of affine regions of the PWA function with increasing prediction horizon which poses a storage problem for real word applications. Additionally, for a given state of the model system one needs to firstly determine the corresponding affine region. One approach to counteract these issues is the approximation of explicit MPC laws using neural networks. In this case, computing the optimal control to a given state corresponds to a simple evaluation of the network. In this talk, we will discuss existing approximation results and ideas to improve those statements motivated by numerical experiments.