

Koopman Analysis of Gradient Descent Optimization

Tom Berkov Ido Cohen Guy Gilboa

October 10, 2021

Abstract

Recently applications of tools from dynamical systems, such as Dynamic Mode Decomposition (DMD) and Koopman analysis, to Neural Networks (NNs) are becoming increasingly popular. Such works attempt to accelerate the training, while avoiding the black-box nature of NNs by employing well understood mathematical tools. This paper presents a bottom-up theoretical analysis of the training of NNs via the application of Koopman Theory, and its reconstruction by DMD. We then use this reconstruction to extrapolate the trajectory of the weights during training, to achieve acceleration, save computation power and reach better stability.