Title
Perceptual losses in precipitation nowcasting: Exploring limits and potential

Author
Dekker, Diewertje

Date
2022-07-19

Abstract
Accurate short term rain predictions are important for flood early warning systems, emergency services, energy management and other services that that make weather dependent decisions. Recently introduced machine learning models suffer from blurry and unrealistic predictions at longer lead times, causing poor performance on the rarer heavy rainfall events. The objective of this research was to explore how the loss function in a recurrent, convolutional neural network (TrajGRU, X. Shi et al. (2017)) can be modified, to get sharper and more realistic predictions, without worsening its performance. Six perceptive loss functions, which should better represent how an image is perceived, are thoroughly analysed to understand the reasons behind their functioning in the context of precipitation nowcasting. It was shown that these perceptive losses can lead to an improvement in sharpness for the first lead time, but that the blurriness for longer lead times arises due to the imbalance in the dataset and the uncertainty of the model with respect to the location of the rain. This thesis gets concluded with recommendations on how to deal with these two problems.