

Nizhny Novgorod State University
Institute of Information Technologies, Mathematics and Mechanics
Department of Computer Software and Supercomputer Technologies

Educational course
«Modern methods and technologies
of deep learning in computer vision»

Lecture №5
Deep models for tracking objects in videos

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Vasiliev E.P.

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1 Abstract

The goal of this lecture is to study deep neural networks for solving the problem of *object tracking*.

At the beginning of the lecture, the object tracking problem is stated. An overview of the well-known datasets and benchmarks for object tracking (Multiple Object Tracking Challenge [1, 10], Long-Term Visual Object Tracking Benchmark [2, 11], TrackingNet [3, 12]) is given. Examples of images and groundtruth are represented, as well as the main features of these datasets (number of videos, frames and tracks). The most common quality metrics for object tracking are described. At first, quality metrics for single-object tracking are introduced: accuracy and robustness. Also, quality metrics for multiple-object tracking are defined: Multiple Object Tracking Accuracy (MOTA) and Multiple Object Tracking Precision (MOTP) [4]. Further, the classification of tracking methods by data access and classification of deep models by their role in tracking method are given. The well-known deep neural networks for object tracking are considered. First, the DeepSORT [5] model is described, it provides constructing a deep description of an object for the subsequent use in tracking algorithm. Further, the methods SINT [6], SiameseNET [7] and GOTURN [8] are considered, which replace some stages of tracking algorithms. In conclusion, the RNN-LSTM [9] model based on recurrent neural networks is represented, it implements object tracking using only deep neural networks.

Currently, new object tracking algorithms are being developed, new large datasets are being collected and deep models are being developed. The problem of object tracking cannot be considered completely solved. However, software that solves the problem of object tracking for the specific object classes (cars, pedestrians, etc.) with high accuracy already exists, and it is used in industry, manufacturing, and retail.

2 Literature

2.1 Books

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2.2 References

10. Multiple Object Tracking Benchmark [<https://motchallenge.net>].
11. Long-Term Visual Object Tracking Benchmark [<https://amoudgl.github.io/ltl>].
12. TrackingNet [<https://tracking-net.org>].