



**Fakultät für Ingenieurwissenschaften,
Informatik und Psychologie**

Ingenieurwissenschaftliches Kolloquium

Gastvortrag / Invited Talk

Professor Gustavo Carneiro, School of
Computer Science, The University of Adelaide

19.06.2019, 16 Uhr, Hörsaal H 45.2

Title

O(N) Training of Triplet Nets for Distance Metric Learning

Abstract

In this talk, I will present a method that improves the efficiency of deep distance metric learning based on the optimization of the triplet loss function. One epoch of such training process based on a naive optimization of the triplet loss function has a run-time complexity $O(N^3)$, where N is the number of training samples. Such optimization scales poorly, and the most common approach proposed to address this high complexity issue is based on sub-sampling the set of triplets needed for the training process. Another approach explored in the field relies on an ad-hoc linearization (in terms of N) of the triplet loss that introduces class centroids, which must be optimized using the whole training set for each mini-batch – this means that a naive implementation of this approach has run-time complexity $O(N^2)$. This complexity issue is usually mitigated with poor, but computationally cheap, approximate centroid optimization methods. In this talk, I describe a solid theory on the linearization of the triplet loss with the use of class centroids, where the main conclusion is that our new linear loss represents a tight upper-bound to the triplet loss. Furthermore, based on the theory above, we propose a training algorithm that no longer requires the centroid optimization step, which means that our approach is the first in the field with a guaranteed linear run-time complexity. We show that the training of deep distance metric learning methods using the proposed upper-bound is substantially faster than triplet-based methods, while producing competitive retrieval accuracy results on benchmark datasets (CUB-200-2011 and CAR196).

Short Biography

Gustavo Carneiro is a professor of the School of Computer Science at the University of Adelaide and the Director of Medical Machine Learning at the Australian Institute of Machine Learning. He is the recipient of numerous research grants and fellowships from the Australian Research Council, Humboldt Foundation, Marie Curie Actions, Science and Technology Foundation

Organisation

Institut für Mess-,
Regel- und
Mikrotechnik

Jun.-Prof. Dr. Vasileios
Belagiannis

[vasileios.belagiannis@
uni-ulm.de](mailto:vasileios.belagiannis@uni-ulm.de)

13.06.19



(FCT - Portugal) and Natural Sciences and Engineering Research Council (NSERC - Canada). In the past, he worked at Siemens Corporate Research, University of British Columbia, and University of California San Diego. Prof. Carneiro received his Ph.D. in computer science from the University of Toronto in 2004 and his main research interests are in the fields of computer vision, medical image analysis and machine learning.