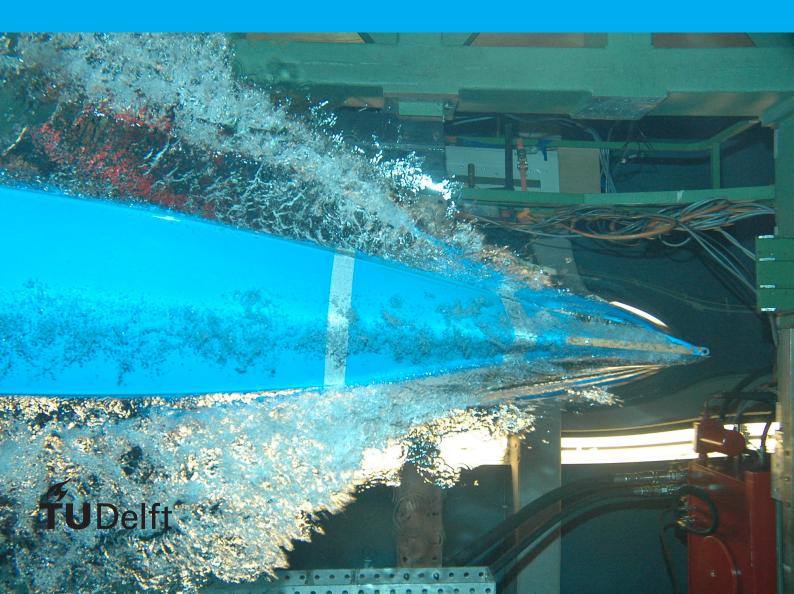
Learn representations in the presence of segmentation label noises

J. Ju



Learn representations in the presence of segmentation label noises

by

J. Ju

to obtain the degree of Master of Science at the Delft University of Technology, to be defended publicly on Thursday August 31, 2017 at 13:00 PM.

Student number: 4518454

Project duration: September 1, 2016 – August 31, 2017 Thesis committee: Prof. dr. A. Hanjalic, TU Delft, chair

> dr. J. C. van Gemert, TU Delft, daily supervisor Prof. dr. M. Loog, TU Delft, supervior

dr. Z. Szlávik, IBM

This thesis is confidential and cannot be made public until August 31, 2017.

An electronic version of this thesis is available at http://repository.tudelft.nl/.



Preface

Transferring pre-trained representations is widely adopted by convolutional neural networks for semantic segmentation because the training data is often available only on a small scale. In domains where directly adapting classification networks is challenging, we propose to train representations with segmentation datasets containing mislabeled objects and unsegmented objects. Our experiments demonstrate that both mislabeled segments and incomplete segmentation lower the fine-tuning performance of the learned representations. To get rid of the negative effect of objects label noises, we propose to assign objects of any categories a foreground label instead of the exact object categories. Learning representations by segmenting foreground and background turns out to improve the fine-tuning performance significantly when label noises are dominant in the pre-training data. In the existence of unsegmented objects, a sigmoid loss for the background class is proposed to achieve high recall while keeping the precision better than simply weighting the classes. The proposed class dependent, sigmoid (or softmax) loss achieves both better pre-training performance and better fine-tuning performance than the class-weighted loss in the presence of incomplete segmentation.

Members of the thesis committee include Prof. dr. A.Hanjalic (Multimedia Computing Group, TU Delft) as the chair, dr. J.C. van Gemert (Vision Lab, TU Delft) who was the daily supervisor of the student, and Prof.dr. M. Loog (Pattern Recognition Laboratory, TU Delft) and dr. Z. Szlávik (CAS Benelux, IBM).

I sincerely appreciate the magnificent supports provided by dr. J.C. van Gemert, Prof.dr. M. Loog and dr. Z. Szlávik as co-supervisors day to day. I would also like to thank dr. D.M.J. Tax for his expert knowledge in the domain.

J. Ju Delft, August, 2017