STAVROS TSOGKAS

92295 Grande Voie des Vignes, Châtenay-Malabry, France
http://cvn.ecp.fr/personnel/tsogkas/
email: stavros.tsogkas@centralesupelec.fr

RESEARCH INTERESTS Computer vision (shape analysis, semantic segmentation, fine-grained recognition, object detection), deep learning.

EMPLOYMENT

CentraleSupélec Jan. 2016 - Aug. 2016
Research engineer (CVN lab)

EDUCATION

CentraleSupélec Jan. 2016
PhD on Computer Vision
Thesis: Mid-level Representations for Modeling Objects
Advisor: Iasonas Kokkinos

National Technical University of Athens Sep. 2011
Diploma in Electrical and Computing Engineering
Thesis: Learning-Based Symmetry Detection in Natural Images
Advisors: Petros Maragos, Iasonas Kokkinos

INTERNSHIPS

Research intern at Oxford University (Visual Geometry Group) Aug.-Nov. 2014
Project: Semantic segmentation of object parts.
Supervisor: Andrea Vedaldi.

PUBLICATIONS

- Sub-cortical Brain Structure Segmentation Using F-CNNs, *ISBI 2016* **(oral)**
  M. Shakeri*, **S. Tsogkas***, E. Ferrante, S. Lippe, S. Kadoury, N. Paragios, I. Kokkinos (* denotes equal contribution)
- Accurate Human-Limb Segmentation in RGB-D images for Intelligent Mobility Assistance Robots
  ICCV 2015 3^{rd} Workshop on Assistive Computer Vision and Robotics
  S. Chandra, **S. Tsogkas**, I. Kokkinos
- Semantic Part Segmentation with Deep Learning, *arXiv report*
  S. Tsogkas, I. Kokkinos, G. Papandreou, A. Vedaldi
- Deformable Part Models with CNN Features,
  ECCV 2014 Parts and Attributes workshop
  P.-A. Savalle, **S. Tsogkas**, G. Papandreou and I. Kokkinos
- Superpixel-grounded Deformable Part Models, *CVPR 2014*
  E. Trulls, **S. Tsogkas**, I. Kokkinos, A. Sanfeliu, F.Moreno
- Understanding Objects in Detail with Fine-grained Attributes, *CVPR 2014*
  A. Vedaldi, S. Mahendran, **S. Tsogkas**, S. Maji, B. Girshick, J. Kannala, E. Rahtu, I. Kokkinos, M. B. Blaschko, D. Weiss, B. Taskar, K. Simonyan, N. Saphra, S. Mohamed
- Learning-Based Symmetry Detection in Natural Images, *ECCV 2012*
  S. Tsogkas, I. Kokkinos

SKILLS MATLAB, C/C++, Latex, Caffe, MatConvNet.

TEACHING Teaching assistant in "Computer Vision" and "Signal Processing" (taught by Iasonas Kokkinos) ECP, 2011-2012

PROFESSIONAL SERVICE Reviewer for: TPAMI, CVIU, IMAVIS, ICCV, CVPR, ICVGIP.

IEEE

Treasurer, IEEE NTUA Student Branch	2010-2011
Chairman, IEEE NTUA Student Branch	2011-2012
IEEE Student member	2012-2015

LANGUAGES English (fluent), French (proficient), Greek (native).

INTERESTS Piano, bass guitar, poker, board games, travelling.

RESEARCH STATEMENT

My PhD focuses on exploiting mid-level representations for object recognition. These representations provide a middle ground between bottom-up and top-down processing, are more robust than pixel-level features and can be shared among different object classes. The mid-level constructs we consider in the works described below are medial axes, object parts, and convolutional features.

In [1] we successfully transferred ideas from learning-based boundary detection to the detection of medial axes in RGB images. Our method is still the state-of-the-art for this task, and we have been examining a variation based on random forests, that cuts down the computation cost dramatically. We have also improved deformable part models (DPMs) using bottom-up segmentation information. In [2] we employed soft segmentation masks to "clean up" HOG features, separating them into foreground and background components; training DPMs with these enhanced features leads to better detection performance. In [3] we showed that the prediction of certain attributes can benefit substantially from accurate part detection. In that work I proposed and implemented a coarse-to-fine approach using DPMs, that speeds up part detection 4-7 times, with negligible performance loss.

During the last year I have been focusing on deep learning for object detection and fine-grained semantic segmentation. In [4], we integrated CNN features in the DPM pipeline obtaining a 14.5% absolute gain in mean average precision (mAP) on the PASCAL VOC 2007 dataset, while keeping computation time low, despite the increased feature dimensionality. In my latest project I investigate the use of CNNs for semantic segmentation of object parts [5]. Specifically, we use a combination of fully convolutional CNNs and fully-connected CRFs to achieve state-of-the-art performance for part segmentation of faces and pedestrians. On top of this combination we train a Restricted Boltzmann Machine and use it as a shape prior, to guarantee plausible part segmentations.

We have also used CNN features to successfully tackle semantic part segmentation using diverse type of input data and architectures. In [6] we perform human limb segmentation exploiting both RGB and depth maps (captured from a Kinect sensor) in a single training and testing framework; the long-term goal is to use this framework as part of a complete robotic platform for mobility assistance of elderly people. Finally, in [7] we design a new architecture for the segmentation of sub-cortical structures in

3D brain MRI volumes, and combine it with a MRF to enforce volumetric homogeneity, achieving state-of-the-art performance in two brain segmentation datasets.

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References

[1] S. Tsogkas and I. Kokkinos. Learning-based symmetry detection in natural images, *ECCV 2012*.

[2] E. Trulls, S. Tsogkas, I. Kokkinos, A. Sanfeliu, and F. Moreno-Noguer. Segmentation-aware deformable part models, *CVPR 2014*.

[3] A. Vedaldi, S. Mahendran, S. Tsogkas, S. Maji, B. Girshick, J. Kannala, E. Rahtu, I. Kokkinos, M. B. Blaschko, D. Weiss, B. Taskar, K. Simonyan, N. Saphra, and S. Mohamed. Understanding objects in detail with fine- grained attributes, *CVPR 2014*.

[4] P.-A. Savalle, S. Tsogkas, G. Papandreou, and I. Kokkinos. Deformable part models with cnn features, *ECCV, Parts and Attributes Workshop (ECCVW 2014)*.

[5] S. Tsogkas, I. Kokkinos, G. Papandreou, and A. Vedaldi. Semantic part segmentation with deep learning, *arXiv preprint arXiv:1505.02438, 2015*.

[6] S. Chandra, S. Tsogkas, I. Kokkinos. Accurate Human-Limb Segmentation in RGB-D images for Intelligent Mobility Assistance Robots, *ICCV 2015* 3^{rd} *Workshop on Assistive Computer Vision and Robotics*.

[7] M. Shakeri*, S. Tsogkas*, E. Ferrante, S. Lippe, S. Kadoury, N. Paragios, I. Kokkinos, Sub-cortical Brain Structure Segmentation Using F-CNNs, *ISBI 2016*.