



VISCERAL@ISBI 2014

**VISCERAL Organ Segmentation and
Landmark Detection Challenge**

at IEEE International Symposium on Biomedical Imaging 2014
Beijing, China, May 1, 2014

Proceedings



Orcun Goksel (Ed.)

© 2014 for the individual papers by the papers' authors.
Copying permitted only for private and academic purposes.
Re-publication of material from this volume requires permission by the copyright owners.

Editor's address:

Prof. Dr. Orcun Goksel
Swiss Federal Institute of Technology (ETH) Zürich
Computer Vision Laboratory
Sternwartstrasse 7
8092 Zürich, Switzerland
ogoksel@ethz.ch

Preface

VISCERAL (Visual Concept Extraction Challenge in Radiology) aims to organize series of benchmarks on the processing of large-scale 3D radiology images, by using an innovative cloud-based evaluation approach.

While a growing number of benchmark studies compare the performance of algorithms for automated organ segmentation in images with restricted field of views, emphasis on anatomical segmentation and landmark localization in images with wide field-of-view (e.g. showing entire abdomen, trunk, or the whole body) has been limited. **VISCERAL Anatomy²** benchmark series, namely *Organ Segmentation and Landmark Detection Benchmarks*, aim to address this need. This ISBI **VISCERAL Challenge**, a part of **Anatomy²** series, has been organized on May 1st 2014, within the IEEE International Symposium on Biomedical Imaging (ISBI) in Beijing, China.

The challenge participants have submitted segmentation and localization results two weeks before the challenge session, that were evaluated against test data by the organizers with results presented during the challenge session. Each participant presented his method in a 15 minute oral session during the challenge session. Participants also submitted short papers summarizing their specific methodologies that were used to generate their results.

This volume contains two parts. The first part consist of one paper authored by the organizers of the challenge, and the second part presents a compilation of the submissions by the challenge participants. We thank the authors for their submissions and the program committee for their hard work.

Orcun Goksel
On behalf of *VISCERAL Consortium*

Session Chairs

Orçun Göksel, Swiss Federal Institute of Technology (ETH) Zürich, Switzerland
Bjoern Menze, Munich University of Technology (TUM), Germany

VISCERAL Consortium

Allan Hanbury, Vienna University of Technology, Austria (coordinator)
Henning Müller, University of Applied Sciences Western Switzerland, Switzerland
Georg Langs, Medical University of Vienna, Austria
Orçun Göksel, ETH Zürich, Switzerland
Marc-André Weber, University of Heidelberg, Germany
Tomàs Salas Fernandez, Catalan Agency for Health Information, Assessment and Quality, Spain

Contributing VISCERAL Team Members

Ivan Eggel, University of Applied Sciences Western Switzerland, Switzerland
Katharina Grünberg, University of Heidelberg, Germany
Markus Holzer, Medical University of Vienna, Austria
András Jakab, Medical University of Vienna, Austria
Oscar Jiménez, University of Applied Sciences Western Switzerland, Switzerland
Georgios Kontokotsios, Vienna University of Technology, Austria
Markus Krenn, Medical University of Vienna, Austria
Roger Schaer, University of Applied Sciences Western Switzerland, Switzerland
Abdel Aziz Taha, Vienna University of Technology, Austria
Marianne Winterstein, University of Heidelberg, Germany

Contents

PART I: ORGANIZATION AND EVALUATION

VISCERAL – VISual Concept Extraction challenge in RAdioLogY: ISBI 2014 Challenge Organization

Oscar Alfonso Jiménez del Toro, Orcun Goksel, Bjoern Menze, Henning Müller, Georg Langs, Marc-André Weber, Ivan Eggel, Katharina Gruenberg, Markus Holzer, András Jakab, Georgios Kontokotsios, Markus Krenn, Tomàs Salas Fernandez, Roger Schaer, Abdel Aziz Taha, Marianne Winterstein, Allan Hanbury

6

PART II: PARTICIPANT SUBMISSIONS

Rule-Based Ventral Cavity Multi-Organ Automatic Segmentation in CT Scans

Assaf B. Spanier, Leo Joskowicz

16

Automatic Liver Segmentation Using Multiple Prior Knowledge Models and Free-Form Deformation

Cheng Huang, Xuhui Li, Fucang Jia

22

Automatic Multi-Organ Segmentation Using Fast Model Based Level Set Method and Hierarchical Shape Priors

Chunliang Wang, Örjan Smedby

25

Hierarchical Multi-structure Segmentation Guided by Anatomical Correlations

Oscar Alfonso Jiménez del Toro, Henning Müller

32

Segmentation and Landmark Localization Based on Multiple Atlases

Orcun Goksel, Tobias Gass, Gabor Szekely

37