

1st Workshop on Reproducible Research in Pattern Recognition

Satellite workshop of ICPR 2016

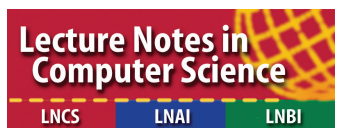
Dec 4, 2016 9:00 AM - 17h30
Cancún Mexico

Chairs

Miguel Colom (CMLA, ENS Cachan)
Bertrand Kerautret (LORIA, Université de Lorraine)
Pascal Monasse (LIGM, École des Ponts ParisTech)
Jean-Michel Morel (CMLA, ENS Cachan)

Co organizers:

Pablo Arias (CMLA ENS Cachan)
Nicolas Aubry (LORIA, Univ. Lorraine)
Adrien Krähenbühl (LaBRI Univ. Bordeaux)
Enric Meinhardt (CMLA ENS Cachan)
Nelson Monzón (Univ. de las Palmas de Gran Canaria)



Program: (room Cozumel 2)

8:40 - 9:00 Workshop Opening

9:00 - 10:00 **Keynote 1:** Image Processing On Line for Reproducible Research - Pascal Monasse

10:00 - 10:40 **Track2: Fast Track Poster Session (RR Results)**

10:00 - 10:05 Algorithms and Implementation for Segmenting Tree Log Surface Defects - Van-Tho Nguyen

10:05 - 10:10 The Multiscale Line Segment Detector - Pascal Monasse

10:10 - 10:15 An algorithm to decompose noisy digital contours - Bertrand Kerautret

10:40 - 10:55 Coffee break

11:00 - 12:15 **Track1: RR Framework**

11:00 - 11:25 A Novel Definition of Robustness for Image Processing Algorithms - Antoine Vacavant

11:25 - 11:50 Reproducible Pattern Recognition Research: The Case of Optimistic SSL - Jesse Krijthe

11:50 - 12:15 OpenMVG: Open Multiple View Geometry - Pierre Moulon

12:15 - 1:15 Lunch

1:15 - 2:15 **Keynote 2:** DAE platform in the context of Reproducible Research - Daniel Lopresti and Bart Lamiroy

2:15 - 2:50 Discussions/poster session 2

2:50 - 3:10 Coffee break

3:10 - 4:25 **Track2: RR Results**

15:10 - 15:35 Numerical implementation of the Ambrosio-Tortorelli functional using discrete calculus and application to image restoration and inpainting - Marion Foare

15:35 - 16:00 RSSL: Semi-supervised Learning in R - Jesse Krijthe

16:00 - 16:25 An Evaluation Framework and Database for MoCap-Based Gait Recognition Methods - Michal Balazia

4:25 - 5:35 **Tutorial:** Applying online demonstration of Image Processing algorithm - IPOL dev Team

5:35 - 5:45 Concluding exchange/discussions

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The DAE Platform: a Framework for Reproducible Research in Document Image Analysis

Daniel Lopresti ^{*† 1}, Bart Lamiroy ^{* ‡ 2}

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We present the DAE Platform in the specific context of reproducible research. DAE was developed at Lehigh University targeted at the Document Image Analysis research community for distributing document images, associated document analysis algorithms as well as an unlimited range of annotations and "ground truth" for benchmarking and evaluation of new contributions to the state-of-the-art.

DAE was conceived from the beginning with the idea of reproducibility and data provenance in mind. In this paper we more specifically analyze how this approach answers a number of challenges raised by the need of providing fully reproducible experimental research. Furthermore, since DAE has been up and running without interruption since 2010, we are in a position of providing a qualitative analysis of the technological choices made and open new development perspectives in the light of more recent technologies and practices.

*Speaker

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Image Processing On Line for Reproducible Research

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The Image Processing On Line (IPOL) journal was created in 2010 and it aims at publishing reproducible research in Signal Processing (mainly image and video processing, audio and 3D) and Computer Vision. The emphasis is put on the full explanation of the presented algorithm, including its pseudo-code. Moreover, an open-source implementation of the algorithm is always provided. Based on this code, an online demonstration system is presented to the visitor, which allows running the demonstration on proposed or user uploaded data and look at the results online without any software installation. An archive of the experiments performed by the visitors is freely available at each demo. The role of the reviewers is not only to assess the algorithm's reproducibility and if it matches what is described in the article, but also to check that the submitted implementation is a faithful, standard compliant implementation. Beyond its goal of being a reference repository of code and algorithms, the idea is to get eventually a fair evaluation and comparison of state-of-the-art algorithms in Signal Processing.

*Speaker

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A Novel Definition of Robustness for Image Processing Algorithms

Antoine Vacavant * ¹

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As image gains much wider importance in our society, image processing has found various applications since the 60’s: biomedical imagery, security and many more. A highly common issue in those processes is the presence of an uncontrolled and destructive perturbation generally designed as ”noise”. The ability of an algorithm to resist to this noise has been referred to as ”robustness”; but this notion has never been clearly defined for image processing techniques. A wide bibliographic study showed that this term ”robustness” is largely mixed up with others as efficiency, quality, etc., leading to a disturbing confusion. In this article, we propose a completely new framework to define the robustness of image processing algorithms, by considering multiple scales of additive noise. We show the relevance of our proposition by evaluating and by comparing the robustness of recent and more classic algorithms designed to two tasks: still image denoising and background subtraction in videos.

*Speaker

Reproducible Pattern Recognition Research: The Case of Optimistic SSL

Jesse Krijthe * ^{1,2}, Marco Loog ^{1,3}

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² Department of Molecular Epidemiology, Leiden University Medical Center – Netherlands

³ The Image Section, University of Copenhagen – Denmark

In this paper, we discuss the approaches we took and trade-offs involved in making a paper on a conceptual topic in pattern recognition research fully reproducible. We discuss our definition of reproducibility, the tools used, how the analysis was set up, show some examples of alternative analyses the code enables and discuss our views on reproducibility.

*Speaker

OpenMVG: Open Multiple View Geometry

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The OpenMVG C++ library provides a vast collection of multiple-view geometry tools and algorithms to spread the usage of computer vision and structure-from-motion techniques. Close to the state-of-the-art in its domain, it provides an easy access to common tools used in 3D reconstruction from images. Following the credo "Keep it simple, keep it maintainable" the library is designed as a modular collection of algorithms, libraries and binaries that can be used independently or as bricks to build larger systems. Thanks to its strict test driven development, the library is packaged with unit-test code samples that make the library easy to learn, modify and use. Since its first release in 2013 under the MPL2 license, OpenMVG has gathered an active community of users and contributors from many fields, spanning hobbyists, students, computer vision experts, and industry members.

*Speaker

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RSSL: Semi-supervised Learning in R

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² Department of Molecular Epidemiology, Leiden University Medical Center – Netherlands

In this paper, we introduce a package for semi-supervised learning research in the R programming language called RSSL. We cover the purpose of the package, the methods it includes and comment on their use and implementation. We then show, using several code examples, how the package can be used to replicate well-known results from the semi-supervised learning literature.

*Speaker

Numerical implementation of the Ambrosio-Tortorelli functional using discrete calculus and application to image restoration and inpainting

Marion Foare * ¹, Jacques-Olivier Lachaud[†] ¹, Hugues Talbot

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The Mumford-Shah (MS) functional is one of the most influential variational model in image segmentation, restoration, and cartooning. Difficult to solve, the Ambrosio-Tortorelli (AT) functional is of particular interest, because minimizers of AT can be shown to converge to a minimizer of MS. This paper takes an interest in a new method for numerically solving the AT model (Foare et al. 2016). This method formulates the AT functional in a discrete calculus setting, and by this way is able to capture the set of discontinuities as a one-dimensional set. It is also shown that this model is competitive with total variation restoration methods. We present here the discrete AT models in details, and compare its merit with recent convex relaxations of AT and MS functionals. We also examine the potential of this model for inpainting, and describe its implementation in the DGtal library, an open-source project.

*Speaker

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An Evaluation Framework and Database for MoCap-Based Gait Recognition Methods

Michal Balazia * ¹

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As a contribution to reproducible research, this paper presents a framework and a database to improve the development, evaluation and comparison of methods for gait recognition from Motion Capture (MoCap) data. The evaluation framework provides implementation details and source codes of state-of-the-art human-interpretable geometric features as well as our own approaches where gait features are learned by a modification of Fisher’s Linear Discriminant Analysis with the Maximum Margin Criterion, and by a combination of Principal Component Analysis and Linear Discriminant Analysis. It includes a description and source codes of a mechanism for evaluating four class separability coefficients of feature space and four rank-based classifier performance metrics. This framework also contains a tool for learning a custom classifier and for classifying a custom query on a custom gallery. We provide an experimental database along with source codes for its extraction from the general CMU MoCap database.

*Speaker

An algorithm to decompose noisy digital contours

Phuc Ngo*¹, Hayat Nasser¹, Isabelle Debled-Rennesson¹, Bertrand Kerautret^{† 1}

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From the previous digital contour decomposition algorithm, this paper focuses on the implementation and on the reproduction of the method linking to an online demonstration. This paper also gives improvement of the previous method with details on the intern parameter choice and shows how to use the C++ source code in other context.

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†Speaker

The multiscale line segment detector

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We propose a multiscale extension of a well-known line segment detector, LSD. We show that its multiscale nature makes it much less susceptible to over-segmentation and more robust to low contrast and less sensitive to noise, while keeping the parameter-less advantage of LSD and still being fast. We also present here a dense gradient filter that disregards regions in which lines are likely to be irrelevant. As it reduces line mismatches, this filter improves the robustness of the application to structure-from-motion. It also yields a faster detection.

*Speaker

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Algorithms and Implementation for Segmenting Tree Log Surface Defects

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This paper focuses on the algorithms and implementation details of a published segmentation method defined to identify the defects of tree log surface. Such a method overcomes the difficulty of the high variability of the tree log surface and allows to segment the defects from the tree bark. All the algorithms used in this method are described in link to their source code which guarantees a full reproducible method associated to an online demonstration.

*Speaker

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On the Implementation of Centerline Extraction based on Confidence Vote in Accumulation Map

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This paper focuses on the implementation details of a recent method which extracts the centerline of 3D shapes using solely partial mesh scans of these shapes. This method extracts the shape centerline by constructing an accumulation map from input points and normal vectors and by filtering it with a confidence vote. This paper presents in details all the algorithms of the method and describes the implementation and development choices. Some experiments test the robustness to the parameter variability and show the current limitations allowing to consider further improvements.

*Speaker

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