



12th IAPR

**International Workshop
on Document Analysis Systems**

DAS 2016

Workshop Program

www.primaresearch.org/das2016

*April 11-14, 2016
Santorini, Greece*

DAS 2016

Program at a Glance

	Monday, April 11th	Tuesday, April 12th	Wednesday, April 13th	Thursday, April 14th
08:00-08:30		Registration		
08:30-09:00			Registration	Registration
09:00-09:30	Registration	Opening Ceremony	Oral Session 5 Document Image Analysis (DIA) Systems	IAPR Keynote Speech Jean-Marc Ogier
09:30-10:00		Opening Keynote Speech Ashok Popat		
10:00-10:30	Tutorial 1 - Scene-Text Localization, Recognition, and Understanding	Coffee break	Coffee break	Oral Session 7 Performance Evaluation and Ground Truthing
10:30-11:00				
11:00-11:30			Oral Session 1 Camera-Based Document Image Analysis	Coffee break
11:30-12:00	Coffee break	Oral Session 2 - Deep NN for Document Analysis	Discussion Groups	Oral Session 8 Handwriting Recognition and Word Spotting
12:00-12:30	Tutorial 1 (cont.)			
12:30-13:00				
13:00-13:30	Break	Lunch	Lunch	Lunch
13:30-14:00				
14:00-14:30				
14:30-15:00	Tutorial 2 - Tesseract Blends Old and New OCR Technology	Oral Session 3 Document Analysis for Digital Humanities	Oral Session 6 Graphics Recognition and Applications	Oral Session 9 OCR Systems
15:00-15:30				
15:30-16:00				
16:00-16:30	Coffee break	Poster Teasers	Social Event	Poster Teasers
16:30-17:00	Tutorial 2 (cont.)	Coffee break		Coffee break
17:00-17:30		Poster Session 1		Poster Session 2
17:30-18:00				
18:00-18:30		Oral Session 4 - Forensic Document Analysis		Reports of Discussion Groups
18:30-19:00	Welcome Reception			Concluding Remarks & Awards
19:00-20:00				
20:00-21:00				
21:00-23:00				

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Workshop Organization

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Basilis Gatos, NCSR Demokritos, Greece

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Michael Blumenstein, University of Technology Sydney, Australia
Josep Lladós, Universitat Autònoma de Barcelona, Spain
Dan Lopresti, Lehigh University, USA

Tutorial Chairs

Dimosthenis Karatzas, Universitat Autònoma de Barcelona, Spain
Cheng-Lin Liu, Chinese Academy of Sciences, China

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Chew Lim Tan, National University of Singapore
George Thoma, U.S. National Library of Medicine, NIH
Karl Tombre, LORIA - Université de Lorraine

Opening Keynote Talk

Developing Multilingual OCR at Google: Observations and Reflections



Ashok Popat
Google

Abstract

In this talk I will I reflect on our team's experiences in developing a multilingual OCR system at Google: enabling factors, effective practices, and challenges. I'll tell you what I think I've learned along the way, drawing on some experiences with other projects inside and outside Google.

Biography

Ashok C. Popat received the SB and SM degrees from the Massachusetts Institute of Technology in Electrical Engineering in 1986 and 1990, and the PhD from the MIT Media Lab in 1997. He is a Research Scientist at Google in Mountain View, CA. Prior to joining Google in 2005 he worked at Xerox PARC. His interests include signal processing, data compression, machine translation, and pattern recognition. He enjoys running, skiing, sailing, hiking, and spending time with his wife and two daughters.

IAPR Keynote Talk

How Companies and the Academic World Can Interact Together to Generate Innovations Related to Document Analysis



Jean-Marc Ogier
Université de La Rochelle

Abstract

Document analysis is the area of knowledge concerned with principles, tools and processes that improve our ability to create, manage, store, compact, access, protect and maintain documents. The fields of document recognition and retrieval have grown rapidly in recent years, crossing now different scientific communities. Such developments have been fueled by the emergence of new application areas such as the World Wide Web (WWW), digital libraries, video- and camera-based OCR, and more recently security management problems.

Industrial market and companies impose to take a fresh look on « document analysis problems », and highlight the necessity to enlarge the way to consider document, through the crossing of different disciplines. This talk will try to show what kind of conditions are required for developing interactions between industry and academic worlds in an efficient manner.

Two main applications contexts with industrial partners will illustrate how the notion of «document» have been re-considered for solving societal challenges. Some perspectives will try to draw potential perspectives concerning document analysis field.

Biography

Jean-Marc Ogier received his PhD degree in computer science from the University of Rouen, France, in 1994. During this period (1991-1994), he worked on graphic recognition for Matra Ms&I Company. From 1994 to 2000, he was an associate professor at the University of Rennes 1 during a first period (1994-1998) and at the University of Rouen from 1998 to 2001. Now full professor at the university of la Rochelle, Pr Ogier is the head of URL laboratory which gathers more than 120 members and works mainly of Document Analysis and Content Management. Author of more than 230 publications / communications, he managed several French and European projects dealing with historical document analysis, either with public institutions, or with private companies. Pr Ogier was Deputy Director of the GDR I3 of the French National Research Centre (CNRS) between 2005 and 2013. He was also Chair of the Technical Committee 10 (Graphic Recognition) of the International Association for Pattern Recognition (IAPR) from 2010 to 2015, and is the representative member of France at the governing board of the IAPR. Jean-Marc Ogier has been the general chair of the program chair of several international scientific events dealing with document analysis (DAS, ICDAR, GREC, ...) At last he is also Vice rector of the university of La Rochelle and president of VALCONUM association, which is an association aiming at fostering relations between industries and research organizations.

DAS 2016 Detailed Program

Nomikos Conference Centre, Fira, Santorini, Greece

Monday, 11 April 2016

- | | |
|----------------------|--|
| 09:00 – 10:00 | Registration |
| 10:00 – 11:30 | Tutorial 1
Scene-Text Localization, Recognition, and Understanding
Albert Gordo (Xerox Research Center Europe) and Lluís Gómez i Bigordà (Computer Vision Center, Universitat Autònoma de Barcelona) |
| 11:30 – 12:00 | Coffee break |
| 12:00 – 13:00 | Tutorial 1 (cont.) |
| 13:00 – 14:30 | Break |
| 14:30 – 16:00 | Tutorial 2
Tesseract Blends Old and New OCR Technology
Ray Smith (Google Inc) |
| 16:00 – 16:30 | Coffee break |
| 16:30 – 17:30 | Tutorial 2 (cont.) |
| 18:30 – 21:00 | Welcome Reception - Nomikos Conference Centre |

Tuesday, 12 April 2016

- 08:00 – 09:00** **Registration**
- 09:00 – 09:30** **Opening Ceremony**
- 09:30 – 10:30** **Opening Keynote Talk**
Developing Multilingual OCR at Google: Observations and Reflections
Ashok Popat
- 10:30 – 11:00** **Coffee break**
- 11:00 – 12:00** **Oral Session 1: Camera-Based Document Image Analysis**
Chair: Koichi Kise
- Delaunay Triangulation-Based Features for Camera-Based Document Image Retrieval System**
Q. B. Dang, M. Rusiñoly, M. Coustaty, M. M. Luqman, C. D. Tranz, and J.-M. Ogier
- High Performance OCR for Camera-Captured Blurred Documents with LSTM Networks**
Fallak Asad, Adnan Ul-Hasan, Faisal Shafait, and Andreas Dengel
- Text Detection in Arabic News Video Based on SWT Operator and Convolutional Auto-Encoders**
Oussama Zayene, Mathias Seuret, Sameh M. Touj, Jean Hennebert, Rolf Ingold, and Najoua E. Ben Amara
- 12:00 – 13:00** **Oral Session 2: Deep NN for Document Analysis**
Chair: Cheng-Lin Liu
- RNN Based Uyghur Text Line Recognition and Its Training Strategy**
Pengchao Li, Jiadong Zhu, Liangrui Peng, and Yunbiao Guo
- CNN Based Transfer Learning for Historical Chinese Character Recognition**
Yejun Tang, Liangrui Peng, Qian Xu, Yanwei Wang, and Akio Furuhashi
- Complete System for Text Line Extraction Using Convolutional Neural Networks and Watershed Transform**
Joan Pastor-Pellicer, Muhammad Zeshan Afzal, Marcus Liwicki, and María José Castro-Bleda
- 13:00 – 14:30** **Lunch**

14:30 – 16:00 **Oral Session 3: Document Analysis for Digital Humanities**
Chair: Marcus Liwicki

Historical Document Dating Using Unsupervised Attribute Learning
Sheng He, Petros Samara, Jan Burgers, and Lambert Schomaker

Automatic Handwritten Character Segmentation for Paleographical Character Shape Analysis

Théodore Bluche, Dominique Stutzmann, and Christopher Kermorvant

Large Scale Continuous Dating of Medieval Scribes Using a Combined Image and Language Model

Fredrik Wahlberg, Lasse Mårtensson, and Anders Brun

An Interactive Transcription System of Census Records Using Word-Spotting Based Information Transfer

Joan Mas, Alicia Fornés, and Josep Lladós

16:00 – 16:30 **Poster Teasers, Chair: Alicia Fornes**

16:30 – 17:00 **Coffee break**

17:00 – 18:00 **Poster Session 1, Chair: Alicia Fornes**

A Fine-Grained Approach to Scene Text Script Identification

Lluís Gómez and Dimosthenis Karatzas

OCR Error Correction Using Character Correction and Feature-Based Word Classification

Ido Kissos and Nachum Dershowitz

New Sharpness Features for Image Type Classification Based on Textual Information

K. S. Raghunandan, Palaiahnakote Shivakumara, G. Hemantha Kumar, Umapada Pal, and Tong Lu

Removal of Gray Rubber Stamps

Soumyadeep Dey, Jayanta Mukhopadhyay, and Shamik Sural

Evaluation of the Stability of Four Document Segmentation Algorithms

Sébastien Eskenazi, Petra Gomez-Krämer, and Jean-Marc Ogier

Combination of Structural and Factual Descriptors for Document Stream Segmentation

Romain Karpinski and Abdel Belaïd

Document Image Quality Assessment Using Discriminative Sparse Representation

Xujun Peng, Huaigu Cao, and Prem Natarajan

Modified X-Y Cut for Re-Ordering Strokes of Online Handwritten Mathematical Expressions

Anh Duc Le, Hai Dai Nguyen, and Masaki Nakagawa

Automatic Synthesis of Historical Arabic Text for Word-Spotting

Majeed Kassis and Jihad El-Sana

Analysis of Stroke Intersection for Overlapping PGF Elements

Yan Chen, Xiaoqing Lu, Jingwei Qu, and Zhi Tang

Recognition-Based Approach of Numeral Extraction in Handwritten Chemistry Documents Using Contextual Knowledge

Nabil Ghanmi and Abdel Belaïd

Unsupervised Word Clustering Using Deep Features

Mandar Kulkarni, Shirish Subhash Karande, and Sachin Lodha

An Interactive Approach with Off-Line and On-Line Handwritten Text Recognition Combination for Transcribing Historical Documents

Emilio Granell, Verónica Romero, and Carlos D. Martínez-Hinarejos

Handwriting Transcription and Keyword Spotting in Historical Daily Records Documents

Verónica Romero, Alejandro H. Toselli, Joan Andreu Sánchez, and Enrique Vidal

Text Extraction in Document Images: Highlight on Using Corner Points

Vikas Yadav and Nicolas Ragot

A Table Detection Method for PDF Documents Based on Convolutional Neural Networks

Leipeng Hao, Liangcai Gao, Xiaohan Yi, and Zhi Tang

Efficient Document Image Segmentation Representation by Approximating Minimum-Link Polygons

George Retsinas, Georgios Louloudis, Nikolaos Stamatopoulos, and Basilis Gatos

Page Segmentation for Historical Document Images Based on Superpixel Classification with Unsupervised Feature Learning

Kai Chen, Cheng-Lin Liu, Mathias Seuret, Marcus Liwicki, Jean Hennebert, and Rolf Ingold

Isolated Handwritten Digit Recognition Using oBIFs and Background Features

Abdeljalil Gattal, Chawki Djeddi, Youcef Chibani, and Imran Siddiqi

Fuzzy Integral for Combining SVM-Based Handwritten Soft-Biometrics Prediction

Nesrine Bouadjenek, Hassiba Nemmour, and Youcef Chibani

Preserving Text Content from Historical Handwritten Documents

Arpita Chakraborty and Michael Blumenstein

Handwritten and Machine-Printed Text Discrimination Using a Template Matching Approach

Mehryar Emambakhsh, Yulan He, and Ian Nabney

Discovery and Verification of Computed Data Values in Heterogeneous Web Tables

George Nagy, David Embley, Mukkai Krishnamoorthy and Sharad Seth

Deep Convolutional Neural Networks for Word Spotting in Historical Documents

Sebastian Sudholt and Gernot Fink

A CNN Based Scene Chinese Text Recognition Algorithm With Synthetic Data Engine

Xiaohang Ren, Kai Chen and Jun Sun

Object Proposals for Text Extraction in Natural Scenes using Ensemble RankSVM

Rong Li, Mengyi En, Jianqiang Li and Haibin Zhang

Data Mining Historical Newspaper Metadata

Jean-Philippe Moreux

Clustering Fundamental Spatial n-Grams for Large Scale Cuneiform Search

Bartosz Bogacz and Hubert Mara

Improving Online Arabic Handwritten Recognition by using Deep Architecture for Feature Extraction

Mohamed Elleuch, Rania Maalej, Najiba Tagougui and Monji Kherallah

Subword Spotting for Use in a Computer Assisted Transcription System

Brian Davis, Robert Clawson and William Barrett

Accuracy of Gradient based Skew Estimation

Florian Kleber, Markus Diem and Robert Sablatnig

18:00 – 19:00

Oral Session 4: Forensic Document Analysis

Chair: Dimosthenis Karatzas

General Pattern Run-Length Transform for Writer Identification

Sheng He and Lambert Schomaker

Banknote Counterfeit Detection through Background Texture Printing Analysis

Albert Berenguel, Oriol Ramos Terrades, Josep Lladós, and Cristina Cañero

Performance of an Off-Line Signature Verification Method Based on Texture Features on a Large Indic-Script Signature Dataset

Srikanta Pal, Alireza Alaei, Umamada Pal, and Michael Blumenstein

Wednesday, 13 April 2016

- 08:30 – 09:00** **Registration**
- 09:00 – 10:00** **Oral Session 5: Document Image Analysis (DIA) Systems**
Chair: Andreas Dengel
- Word Segmentation Using the Student's-t Distribution**
Georgios Louloudis, Giorgos Sfikas, Nikolaos Stamatopoulos, and Basilis Gatos
- MSIO: MultiSpectral Document Image BinarizatIOn**
Markus Diem, Fabian Hollaus, and Robert Sablatnig
- SDK Reinvented: Document Image Analysis Methods as RESTful Web Services**
Marcel Würsch, Rolf Ingold, and Marcus Liwicki
- A Compliant Document Image Classification System Based on One-Class Classifier**
Nicolas Sidère, Jean-Yves Ramel, Sabine Barrat, Vincent Poulain D'Andecy, and Saddok Kebairi
- 10:30 – 11:00** **Coffee break**
- 11:00 – 13:00** **Discussion Groups**
Chair: Marcus Liwicki
- 13:00 – 14:30** **Lunch**
- 14:30 – 16:00** **Oral Session 6: Graphics Recognition and Applications**
Chair: Jean-Yves Ramel
- Automatic Hyperlinking of Engineering Drawing Documents**
Purnendu Banerjee, Sumit Choudhary, Supriya Das, Himadri Majumdar, Rahul Roy, and B. B. Chaudhari
- Understanding Line Plots Using Bayesian Network**
Rathin Radhakrishnan Nair, Nishant Sankaran, Ifeoma Nwogu, and Venu Govindaraju
- What You See is What You Get? Automatic Image Verification for Online News Content**
Sarah Elkasrawi, Andreas Dengel, Ahmed Abdelsamad, and Syed Saqib Bukhari
- Semi-Automatic Text and Graphics Extraction of Manga Using Eye Tracking Information**
Christophe Rigaud, Thanh-Nam Le, J.-C. Burie, J.-M. Ogier, Shoya Ishimaru, Motoi Iwata, and Koichi Kise
- 16:00 – 23:00** **Social Event – Gala dinner at Mario Restaurant**

Thursday, 14 April 2016

- 08:30 – 09:00** **Registration**
- 09:00 – 10:00** **IAPR Keynote Speech**
How Companies and the Academic World Can Interact Together to Generate Innovations Related to Document Analysis
Jean-Marc Ogier
- 10:00 – 11:00** **Oral Session 7: Performance Evaluation and Ground Truthing**
Chair: Jean-Marc Ogier
- Creating Ground Truth for Historical Manuscripts with Document Graphs and Scribbling Interaction**
Angelika Garz, Mathias Seuret, Fotini Simistira, Andreas Fischer, and Rolf Ingold
- Document Image Quality Assessment Based on Texture Similarity Index**
Alireza Alaei, Donatello Conte, Michael Blumenstein, and Romain Raveaux
- Quality Prediction System for Large-Scale Digitisation Workflows**
Christian Clausner, Stefan Pletschacher, and Apostolos Antonacopoulos
- 11:00 – 11:30** **Coffee break**
- 11:30 – 13:00** **Oral Session 8: Handwriting Recognition and Word Spotting**
Chair: Enrique Vidal
- Keyword Retrieval Using Scale-Space Pyramid**
Irina Rabaev, Klara Kedem, and Jihad El-Sana
- A Segmentation-Free Handwritten Word Spotting Approach by Relaxed Feature Matching**
Anders Hast and Alicia Fornés
- Increasing Robustness of Handwriting Recognition Using Character N-Gram Decoding on Large Lexica**
Martin Schall, Marc-Peter Schambach, and Matthias O. Franz
- Word Spotting in Historical Document Collections with Online-Handwritten Queries**
Christian Wieprecht, Leonard Rothacker, and Gernot A. Fink
- 13:00 – 14:30** **Lunch**

14:30 – 16:00 **Oral Session 9: OCR Systems**

Chair: Abdel Belaid

QATIP — An Optical Character Recognition System for Arabic Heritage Collections in Libraries

Felix Stahlberg and Stephan Vogel

OCRoRACT: A Sequence Learning OCR System Trained on Isolated Characters

Adnan Ul-Hasan, Syed Saqib Bukhari, and Andreas Dengel

Error Detection in Indic OCRs

V. S. Vinitha and C. V. Jawahar

Multilingual OCR for Indic Scripts

Minesh Mathew, Ajeet Kumar Singh, and C. V. Jawahar

16:00 – 16:30 **Poster Teasers, Chair: Masaki Nakagawa**

16:30 – 17:00 **Coffee break**

17:00 – 18:00 **Poster Session 2, Chair: Masaki Nakagawa**

Entity Local Structure Graph Matching for Mislabeling Correction

Nihel Kooli, Abdel Belaïd, Aurélie Joseph, and Vincent Poulain D'Andecy

OCR Accuracy Prediction Method Based on Blur Estimation

Van-Cuong Kieu, Florence Cloppet, and Nicole Vincent

Marginal Noise Reduction in Historical Handwritten Documents — A Survey

Arpita Chakraborty and Michael Blumenstein

Globally Optimal Text Line Extraction Based on K-Shortest Paths Algorithm

Liuan Wang, Seiichi Uchida, Wei Fan, and Jun Sun

Natural Scene Character Recognition Using Robust PCA and Sparse Representation

Zheng Zhang, Yong Xu, and Cheng-Lin Liu

Recognition of Greek Polytonic on Historical Degraded Texts Using HMMs

Vassilis Katsouros, Vassilis Papavassiliou, Fotini Simistira, and Basilis Gatos

Effective Candidate Component Extraction for Text Localization in Born-Digital Images by Combining Text Contours and Stroke Interior Regions

Kai Chen, Fei Yin, and Cheng-Lin Liu

Interactive Definition and Tuning of One-Class Classifiers for Document Image Classification

Nathalie Girard, Roger Trullo, Sabine Barrat, Nicolas Ragot, and Jean-Yves Ramel

Election Tally Sheets Processing System

Juan Ignacio Toledo, Alicia Fornés, Jordi Cucurull, and Josep Lladós

Human-Document Interaction Systems — A New Frontier for Document Image Analysis

Dimosthenis Karatzas, Vincent Poulain D'Andecy, Marçal Rusiñol, Antonio Chica, and Pere-Pau Vazquez

Named Entity Recognition from Unstructured Handwritten Document Images

Chandranath Adak, Bidyut B. Chaudhuri, and Michael Blumenstein

Visual Analysis System for Features and Distances Qualitative Assessment: Application to Word Image Matching

Frédéric Rayar, Tanmoy Mondal, Sabine Barrat, Fatma Bouali, and Gilles Venturini

An Adaptive Zoning Technique for Word Spotting Using Dynamic Time Warping

A. Papandreou, B. Gatos, and K. Zagoris

Visual Script and Language Identification

Anguelos Nicolaou, Andrew D. Bagdanov, Lluís Gomez-Bigorda, and Dimosthenis Karatzas

Making Europe's Historical Newspapers Searchable

Clemens Neudecker and Apostolos Antonacopoulos

Keyword Spotting in Handwritten Documents Using Projections of Oriented Gradients

George Retsinas, Georgios Louloudis, Nikolaos Stamatopoulos, and Basilis Gatos

Online Arabic Handwriting Recognition with Dropout Applied in Deep Recurrent Neural Networks

Rania Maalej, Najiba Tagougui, and Monji Kherallah

Automatic Selection of Parameters for Document Image Enhancement Using Image Quality Assessment

Ritu Garg and Santanu Chaudhury

A Simple and Effective Solution for Script Identification in the Wild

Ajeet Kumar Singh, Anand Mishra, Pranav Dabral, and C. V. Jawahar

Camera-Based System for User Friendly Annotation of Documents

Yusuke Oguma and Koichi Kise

Searching Corrupted Document Collections

Jason Soo and Ophir Frieder

Stamp processing with exemplar features

Yash Bhalgat, Mandar Kulkarni, Shirish Karande and Sachin Lodha

Computer Assisted Transcription and Indexing of Handwritten Historical Documents Demonstration

Verónica Romero, Enrique Vidal, Alejandro Toselli, Joan Puigcerver and Luis A. Leiva

Character Recognition using SVM-HMM in a Multi-hypotheses architecture

Anupama Ray and Santanu Chaudhury

Handwriting Drawing and Learning through Generation

Rabiaa Zitouni, Hala Bezine, Najet Arous and Adel M. Alimi

A Novel Skew Detection and Correction Approach for Scanned Documents

Riaz Ahmad, Sheikh Faisal Rashid, Muhammad Zeshan Afzal, Andreas Dengel, Thomas Breuel and Marcus Liwicki

A Novel Model For Arbitrarily-Oriented Characters Recognition in Natural Scene Images

Yangbo Dong, Anna Zhu and Guoyou Wang

Multi One-Class Incremental SVM for Document Stream Digitization

Anh Khoi Ngo Ho, Véronique Eglin, Nicolas Ragot and Jean-Yves Ramel

Clustering Benchmark for Characters in Historical Documents

Martin Jenckel, Syed Saqib Bukhari and Andreas Dengel

Online Arabic Handwriting Recognition System based on BLSTM for Features Extraction

Rania Maalej, Najiba Tagougui and Monji Kherallah

Semi Automatic Color Segmentation of Document Pages

Stéphane Bres and Véronique Eglin

Redefining Binarization and the Visual Archetype

Anguelos Nicolaou and Marcus Liwicki

18:00 – 18:30 **Reports of Discussion Groups**

18:30 – 19:00 **Concluding Remarks & Awards**

The Organizing Committee of the **12th IAPR International Workshop on Document Analysis Systems** acknowledges the following sponsors for their generous contribution to the Workshop's success

