



Final Report on IAPR TC10
(September 2018 - December 2020)



December 24, 2020

1. TC Background Information

1.1. TC Aim and Scope

The IAPR's Technical Committee 10 on Graphics Recognition promotes interaction among researchers working in document image analysis in general, and graphics recognition in particular. Graphics Recognition is an exciting field of pattern recognition, whose main relevant topics of interest include:

- Analysis and interpretation of graphical documents, such as: engineering drawings, floorplans, mathematical expressions, comics, maps, music scores, patents, diagrams, charts, tables, etc.
- Recognition of graphic elements in heterogeneous documents, such as symbols, logos, stamps, dropcaps, drawings, etc.
- Identification/ localization of graphical mark-ups and annotations in written documents.
- Raster-to-vector techniques.
- Graphics-based information retrieval.
- Historical graphics recognition and indexing.
- Forensics (Writer identification/verification) in graphic documents.
- Description of complete systems for interpretation of graphic documents.
- Datasets and performance evaluation in graphics recognition.
- Authoring, editing, storing and presentation systems for graphics multimedia documents.
- 3-D models from multiple 2-D views (line drawings).
- Digital ink processing.
- Sketch recognition and understanding.
- Camera-based graphics recognition.
- Graphics recognition in born digital documents.
- Analysis of graphics on new digital interfaces.
- Graphics detection and recognition in real scenes.

1.2 TC Structure and Organization

Leadership Team

- Chair: Dr. Alicia Fornés (Computer Vision Center, Universitat Autònoma de Barcelona, Spain)
<http://www.cvc.uab.es/people/afornes/>
- Vice-chair: Prof. Jean-Christophe Burie (University of La Rochelle, France)
<https://l3i.univ-larochelle.fr/Burie-Jean-Christophe-MCF-HDR>
- Webmaster: Dr. Muhammad Muzzamil Luqman (University of La Rochelle, France)
http://pageperso.univ-lr.fr/muhammad_muzzamil.luqman
- Communications officer: Dr. Christophe Rigaud (University of La Rochelle, France)
<http://www.christophe-rigaud.com/>
- Educational officer: Dr. KC Santosh (University of South Dakota, USA)
<http://kc-santosh.org/>
- Dataset curator: Dr. Partha Pratim Roy (Indian Institute of Technology, India)
<https://sites.google.com/site/2partharoy/>

1.3 TC website URL

- Website (new website and logo): <https://iapr-tc10.univ-lr.fr/>
- Twitter: https://twitter.com/IAPR_TC10

1.4 Number of members (people on mailing list)

- TC10 mailing list: 83 subscribers to the newsletter. Due to the GDPR, we had a membership update. The newsletters are accessible at the TC10 website.
- TC10 Twitter: 199 followers.

1.5. Communication means (e.g. newsletters, social media) and frequency

- Newsletters: Sent every month/bi-month with news of interest for the research community.
- Website: updates with news of interest
- Twitter

1.6. Listing of key event(s) typically organized by the TC

TC10 organizes and co-sponsors several international workshops and conferences in this field. The two main events are the ICDAR conference and the GREC workshop.

TC10 also organizes several educational activities: the summer school and the doctoral consortium.

2. Activities in the last two years (since ICPR 2018)

2.1. Conferences/Workshops organized

The main events are described next.

International Conference on Document Analysis and Recognition (ICDAR)



<http://icdar2019.org/>

ICDAR is the main (biennial) conference for researchers in Document Image Analysis. ICDAR 2019 was held in Sydney on September 20-25. ICDAR is a very successful and flagship conference series, which is the biggest and premier international gathering for researchers, scientist and practitioners in the document analysis community. The conference is endorsed by IAPR-TC 10/11 and it was established nearly three decades ago.

In this edition, there were:

- 403 submitted papers: 403
- 228 accepted papers (52 oral, 176 poster)
- 433 participants

International Workshop on Graphics Recognition (GREC)



<https://grec2019.univ-lr.fr/>

The 13th IAPR International Workshop on Graphics Recognition (GREC 2019), is a biennial event, organized by the TC-10, and held in conjunction with ICDAR on September 20-21. The GREC workshop is the main event exclusively devoted to graphics recognition and provides an excellent opportunity for researchers and practitioners at all levels of experience to meet colleagues and to share new ideas and knowledge about graphics recognition methods. GREC is very interactive, and focuses on discussions, exchanges and interactions among researchers. Also, GREC enjoys strong participation from industry and academia.

This edition was organized by Jean-Christophe Burie (La Rochelle Université, France), Gunther Drevin (North-West University, South-Africa), Partha Pratim Roy (Indian Institute of Technology, India) and K.C. Santosh (University of South Dakota, USA). For this edition of GREC, authors could submit short or long papers depending of the maturity of their research. Each submission was reviewed by two expert reviewers.

In this edition, there were:

- 23 accepted papers (17 long papers and 6 short papers)
- 100 participants (first time with so many attendees)
- 30-35% participants from industry (more than ever)

The workshop had over 100 highly interactive participants on the first day. The second day, due to the start of other ICDAR workshops, attendance was around 50 participants. Full access to the program and list of presented papers is available at the GREC 2019 website.

Long papers were published in the ICDAR proceedings. Short papers were available at the GREC 2019 website. The accepted 23 papers were from 8 different countries. The nationalities of the papers (by first authors) were the following:



The workshop comprised several sessions dedicated to specific topics related to graphics in document analysis and graphic recognition. Each session began with an introductory talk by the session chairs, describing the state-of-the-art, putting the presented talks in a more global perspective, and stating the current open challenges of session topics. Then this was followed by several short talks that contribute by proposing solutions to some of the questions or presenting author's results. Each session was concluded by a panel discussion.

For this edition, we aimed to highlight three topics related to graphic recognition in order to organize special sessions on: Music Scores analysis and recognition, Comics Analysis and Understanding, Sketch Recognition and Understanding. However, only one paper on sketch analysis and one paper on music scores were submitted. So, only a special session dedicated to Comics was proposed. The sessions were the following:

1. Graphic element extraction and recognition: Floorplan, etc.
2. Comics Analysis and Understanding
3. Mathematical expressions and Music Scores
4. Detection and Classification: symbols, sketches, etc.
5. Other graphic recognition approaches

In this GREC edition we included a round-table discussion with 2 industrial and 2 academic participants to discuss abouts the future of Graphics Recognition and the impacts of Artificial Intelligence.

2.2. Educational activities (Schools, Tutorials, Short courses, Webinars, Doctoral consortia)

The educational activities of the period are described next.

2nd IAPR TC10 / TC11 Summer School on Document Analysis: Document Informatics



2nd IAPR TC10/TC11 Summer School on Document Analysis and Recognition

<http://portail-video.univ-lr.fr/2nd-IAPR-TC10-TC11-Summer-School>

The aim of the Schools is to provide both an objective and clear overview and an in-depth analysis of the state-of-the-art research in selected topics of Reading Systems and Graphics Recognition. The School aims to provide a stimulating opportunity for young researchers and Ph.D. students in the field.

The second edition of the IAPR TC10/TC11 Summer School took place between July 2-6, 2018, in La Rochelle, France. The school was planned as a 5-day, full-time event, focused on PhD students and post-doc level participants. In response to an open call for participation, 25 PhD students registered to attend to the summer school, from France, Austria, Tunisia, Indonesia, Vietnam, Pakistan, Finland, Sweden, Germany, and Italy. Among the registered participants, 4 benefited from a fee waiver, while 2 more received travel. The lectures were recorded and made available at the website of the summer school.

3rd IAPR TC10 / TC11 Summer School on Document Analysis: Deep Learning Applications for Document Analysis



<http://www.pprs.org.pk/events/ssda2019.html>

The third edition of the IAPR TC10/TC11 Summer School on Document Analysis was held on August 19-23, 2019 in Islamabad (Pakistan), by the Pakistan Pattern Recognition Society, and led by Prof. Faisal Shafait. The School aimed to provide the participants with different aspects and in-depth analysis of the latest research in the field of document understanding.

The school was planned as a 5-day, full-time event, focused on PhD students and post-doc level participants. The school had a record participation of 129 participants, out of which 93 were local students, 6 were international participants, and 30 were industry participants.

13 scholarships, worth 3,900 USD, were conferred to different students to facilitate participation due to disadvantaged backgrounds (4 scholarships), remote areas (2 scholarships), academic excellence (4 scholarships) and international participants (3 scholarships). The funds were covered partly by IAPR (2,500 USD) and partly by the host organization, NUST (1,400 USD).

ICDAR 2019 Doctoral Consortium



<http://icdar2019.org/doctoral-consortium-2/>

The Doctoral Consortium (held in conjunction with ICDAR) was an excellent opportunity for PhD students to test their research ideas, present their current progress and future plans, and receive constructive criticism and insights related to their future work and career perspectives. For that, a mentor (a senior researcher who is active in the field) was assigned to each participant to provide individual feedback on the student's Ph.D. project. In addition, students also had the opportunity to present an overview of their research plan during a special poster session. During that poster session, students and their mentors could discuss the project details. The prize for the best poster was delivered at the conference gala dinner.

This edition was organized by Prof. Véronique Eglin and Prof. Jean-Christophe Burie. The ICDAR 2019 Doctoral Consortium accepted 19 students, which were mentored by 19 senior active researchers of all nationalities working in the field of Document Image Analysis and Recognition. The covered topics were the following:

- Multilingual OCR (1)
- Handwriting recognition (1)
- Scene text or symbol recognition (5)
- Analysis of document structure (4)
- Large scale document, time optimization (2)
- Deep learning techniques for document analysis/recognition (6)

ICDAR 2019 Tutorial

Graph-based Methods in Pattern Recognition and Document Image Analysis and Recognition

ICDAR2019-GMPRDIA

Graph-based Methods in Pattern Recognition & Document Image Analysis

Home Objectives & Motivation Program Material/Ressources



<http://gmprdia.univ-lr.fr/>

At ICDAR 2019, the GMPRDIA tutorial was related to the TC10 activities. It consisted in a Half-day tutorial in the context of ICDAR (September 21, 2019). The tutorial was presented by Muzzamil Luqman (Université de la Rochelle, France), Anjan Dutta and Pau Riba (Computer Vision Center, Universitat Autònoma de Barcelona, Spain).

The first main objective of this second edition of GMPRDIA tutorial was to introduce the graph-based structural pattern recognition to the students, postdocs, experienced researchers and practitioners. The second main objective was to present a survey of the related works in order to motivate/facilitate them to benefit from the graph-based structural pattern recognition approaches.

In the tutorial, the organizers presented different graph representation paradigms suitable for Computer Vision, Pattern Recognition, and Image analysis research. Apart from that, different state-of-the-art techniques including graph matching, graph embedding/kernel, graph neural network for graph-based recognition, detection and indexing were discussed and their application to the related fields were described.

The material and resources of GMPRDIA 2019 are available at the website of the tutorial.

2.3. Promotion of research, publicity and dissemination activities

We have approached and established links to research communities on music, sketch and comics recognition and understanding. Works on these topics have been presented in the GREC workshop and in the ICDAR conference. In addition, we have proposed a special issue in an international journal.

Special Issue on graphics recognition at IJDAR:

Deep learning for graphics recognition: document understanding and beyond



https://iapr-tc10.univ-lr.fr/?page_id=645

We have proposed the edition of a special issue on graphics recognition in IJDAR (International Journal on Document Analysis and Recognition), covering the state of the art and the relevant advances in the field.

Unlike the conventional pattern recognition and machine-learning works, in this special issue, we focus on high-level deep learning architectures and/or models for graphics recognition problems. In pattern recognition issues, the convolutional neural network (CNN) and the recurrent neural network with long short-term memory (LSTM) have been applied successfully. The improvement of performance is effective with deep learning, when large sets of labeled data are available for supervised learning. How Graphic Recognition can benefit from Deep Learning? Can common deep learning models be used to tackle Graphic Recognition problems and improve document understanding?

This special issue is aimed to report the original and innovative advances in Graphics Recognition using deep learning methods. Thus, articles presenting reviews, perspectives, new methods and applications using deep learning for graphics recognition are invited. The special issue received 8 submissions, which are currently under review.

Guest editors:

- K.C. Santosh (University of South Dakota, USA)
- Jean-Christophe Burie (La Rochelle Université, France)
- Alicia Fornés (Computer Vision Center, Universitat Autònoma de Barcelona, Spain)
- Muhammad Muzzamil Luqman (La Rochelle Université, France)

2.4. Collaborations with other organizations and TCs

TC10 has a very strong collaboration with TC-11 (Reading Systems), organizing joint events.

2.4. Dataset Curation

Different scientific datasets have been created, promoted, and contributed by TC10 members. They include datasets on engineering drawings, comics, music scores, etc.

The datasets are listed at the TC10 website:

https://iapr-tc10.univ-lr.fr/?page_id=71

3. Future plans (timeline until ICPR 2022 and beyond):

Task-force: definition of the Document Analysis and Recognition Strategy

Over the past year, the IAPR TC10 and TC11 have been working on a mid/long-term strategic plan for the document analysis and recognition (DAR) community. This has been the culmination of numerous discussions since 2017, facilitated also by regular meetings like the “Future of Document Analysis and Recognition” workshops organized during ICDAR 2017 and ICDAR 2019, as well as numerous online debates organized via the *Kialo* platform.

A timeline of key events in this process is summarized below:



In December 2019 we constituted a task force to work on the definition of the DAR strategy. The task force met in Barcelona in January 2020, reviewed data collected by TC10 and TC11, and worked on a first version of a SWOT analysis, objectives and list of potential actions.



The data we reviewed, and prepared on Q4 2019, is available here:

http://www.cvc.uab.es/~dimos/downloads/DataAnalysis_v03.pdf

An overview of the process that was followed was presented at DAS 2020, available here:

<https://www.youtube.com/watch?v=46pgNwj0IQ>

Over 2020, the TC10 and TC11 chairs we have been jointly working into structuring the results of these discussions into a final list of actions. The first draft of the strategic plan is ready and will be circulated with the community over the next couple of weeks.

3.1. Planned activities

The main objectives for the next year consist of the organization of the main events: ICDAR conference and workshops, as well as the doctoral consortium.

- ICDAR 2021: The ICDAR 2021 conference will be held in Lausanne (Switzerland) in September 2021. It is our main flagship conference, jointly organized by TC10 and TC11 <https://icdar2021.org/>
- GREC 2021: The 14th IAPR International Workshop on Graphics Recognition will be held in September 2021. This edition will be organized by Dr. Jean-Christophe Burie, together with some younger members of the TC10 community. The workshop is the main event exclusively focused on graphics recognition topics, which puts a special emphasis on the interaction and discussion among researchers on these topics.
- FDAR 2021: The ICDAR Workshop on Future of Document Analysis and Recognition 2021 (3rd edition) will be held in September. It is a joint initiative of the current TC10 and TC11 leaderships to continue the debate about the future of the document image analysis and recognition community.
- Doctoral consortium 2021: As usual, the day before the ICDAR conference starts, the TC10/11 Doctoral consortium will be held.

3.2. Recommendation to ExCo for TC leadership team for 2021-2022 term

For the next term, we would like to recommend Dr. Jean-Christophe Burie (current vice-chair) for taking the lead of TC10.

4. Other Comments

New TC10 website and logo

We have made a considerable effort to renew the website and incorporate new and updated contents. Thus, the new TC10 website aims to be the platform to find updated information about conferences, the GREC workshop, summer schools, recent papers, competitions, databases, educational resources, etc.

The screenshot shows the TC10 website interface. At the top, there is a browser address bar with the URL iapr-tc10.univ-lr.fr. Below the address bar is the TC10 logo, which consists of the letters 'TC' in blue and '10' in a stylized font, with 'GRAPHICS RECOGNITION' and the IAPR logo underneath. A search icon is located in the top right corner. A navigation menu is positioned below the logo, containing links for Home, TC10, GREC workshop, TC10 / TC11 Summer School, Newsletters, Resources, and Contact us. A breadcrumb trail below the menu reads 'Home > TC10 > Chair's message'. The main content area is titled 'Chair's message' and begins with a 'Welcome.' section. It then states that IAPR's Technical Committee 10 on Graphics Recognition promotes interaction among researchers working in document image analysis in general, and graphics recognition in particular. A list of relevant topics in graphics recognition is provided, including analysis of graphical documents, recognition of graphic elements, identification and localization of graphical mark-ups, raster-to-vector techniques, graphics-based information retrieval, historical graphics recognition and indexing, forensics, description of complete systems, datasets and performance evaluation, authoring and editing systems, 3-D models, and digital ink processing. On the right side of the page, there is a 'Subscribe To Mailing List' section with a 'Join us!' button. Below that is a section for 'IJ DAR Special Issue 2019-2020', which includes the title 'Deep Learning for Graphics Recognition: Document Understanding and Beyond', a link for more information, and a list of important dates: paper submission deadline (Feb 16, 2020), first review notification (May 10, 2020), decision (final notification) (July 10, 2020), and production (Springer, IJ DAR) (Sept, 2020). At the bottom right, there is a 'News & Announcements' section and a small circular logo with a blue arrow.