ChaLearn Looking at People: 
A Review of Events and Resources

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Abstract—This paper reviews the historic of ChaLearn Looking at People (LAP) events. We started in 2011 (with the release of the first Kinect device) to run challenges related to human action/activity and gesture recognition. Since then we have regularly organized events in a series of competitions covering all aspects of visual analysis of humans. So far we have organized more than 10 international challenges and events in this field. This paper reviews associated events, and introduces the ChaLearn LAP platform where public resources (including code, data and preprints of papers) related to the organized events are available. We also provide a discussion on our main findings and perspectives of ChaLearn LAP activities.

I. INTRODUCTION

Looking at People (LAP) is a challenging area of research that deals with the problem of automatically recognizing people in images, detecting and describing body parts, inferring their spatial configuration, performing action/gesture recognition from still images or image sequences, often including multi-modal data. Any scenario where the visual or multi-modal analysis of people takes a key role is of interest within the, so called, field of Looking at People [1].

Because of the huge configuration space of human bodily structure, posture, and movement, human analysis is a difficult problem for Computer Vision and Machine Learning, which involves dealing with numerous distortion factors, including: illumination changes, partial occlusions, changes in the point of view, rigid and elastic deformations, or high inter and intra-class variability. Despite the high difficulty of the problem, modern Computer Vision and Machine Learning techniques have advanced greatly the state-of-the-art and therefore deserve further attention.

Our selection of tasks when organizing new events is motivated both by academic interest and by potential applications, such as TV production, home entertainment (multimedia content analysis), education purposes, sociology research, surveillance and security, improved quality live by means of monitoring or automatic artificial assistance, etc. Academic interest in illustrated by new burgeoning subareas of LAP, such as Affective Computing, Social Signal Processing, Human Behavior Analysis, and Social Robotics, providing us with opportunities to make connections with other domains and expose the Computer Vision and Machine Learning community to new problems of high practical and societal interest.

These objectives were first illustrated in 2011 when ChaLearn LAP organized its first event on one-shot multimodal gesture recognition from RGB-Depth data sources. Since then, ChaLearn LAP has organized over 10 international challenges in the field of LAP, including face analysis, body posture, action/gesture analysis, including still images, image sequences, and multi-modal data sources, and focusing on cutting edge trends in computer vision and pattern recognition, like explainable computer vision, personality analysis, and collaborative competitions (a.k.a. coopetitions).

In this paper we briefly review the events organized so far, which are not limited to challenges, but also include, workshops, special issues, and book series. We also introduce the new ChaLearn LAP platform, which contains all information and resources from previous and current events, including programs, papers, codes, and data, among others. Finally, we discuss about near future plans within ChaLearn LAP series.

II. CHALEARN LAP EVENTS

ChaLearn [http://chalearn.org] is a non-profit organization with vast experience in the organization of academic challenges. ChaLearn is interested in all aspects of challenge organization, including data gathering procedures, evaluation protocols, novel challenge scenarios (e.g., coopetitions), training for challenge organizers, challenge analytics, results dissemination and, ultimately, advancing the state-of-the-art through challenges. Since 2003, ChaLearn has been organizing a number of challenges in several interrelated fields, including machine learning, computer vision, pattern recognition, causality and bioinformatics. The first challenge we organized was the NIPS 2003 Feature Selection challenge [http://clopinet.com/isabelle/Projects/NIPS2003/] and currently several challenges are running (please visit ChaLearn’s website for update information on ongoing and past challenges [http://chalearn.org]).

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ChaLearn LAP is a division of ChaLearn that focuses in challenges in the fields of computer vision and pattern recognition. This section reviews the historic of ChaLearn LAP events. We split them into challenges and their associated workshops, special issues, and Challenges in Machine Learning (CIML) Springer book series. Table I summarizes the list of challenges and their associated workshops and special issues. Next, we briefly review the organized competitions in the period 2011-2016.

Challenges and Workshops

Kinect revolutionized in 2010 the field of gesture recognition, and had a broad impact into other LAP areas. It is a valuable resource as it provides a variety of data modalities, including RGB image, depth image (using an infrared sensor), and audio. For this reason the first three challenges organized by ChaLearn LAP relied on the use and exploitation of such rich information.

2011/12 Gesture Challenge: First, we organized a challenge on gesture and sign language recognition from video, mostly focusing on hand and arm gestures, although facial expressions and whole body motion may enter into account [2], with funding from DARPA, NSF, and the Pascal2 EU network of excellence, and prizes donated by Microsoft Xbox and Texas Instrument. We used the Kaggle platform. Applications include recognizing signals for man-machine communication, translating sign languages for the deaf to hearing people, and computer gaming. The challenge focused in one-shot gesture recognition (i.e., learning models from a single example), and included qualitative and quantitative tracks. A large “user-independent” dataset (of over 60’000 gestures) covering a high number of domains and gesture categories was released [3], and the Levenstein metric was used as a quantitative measure for ranking participants. Dozens of participants joined the competition that lasted more than one year. Although the impulse for the design of this challenge and part of the funding was given by the DARPA Deep Learning program, no deep learning method was applied! Rather, more conventional combinations of ad hoc feature extraction methods and hidden Markov models dominated the methodology of top ranking participants. The no deep learning revolution caught up right after this first challenge!

2013 Looking at People ICMI Challenge: ChaLearn LAP organized in 2013 a challenge and workshop on multimodal gesture recognition from 2D and 3D video data using Kinect [4]. In this challenge and all following ones, we used the Codalab platform running on Microsoft Azure, with the support of Microsoft Research. New in this competition was the user independent aspect capturing applications of gesture recognition genuinely important in many multi-modal interaction and computer vision applications, including image/video indexing, video surveillance, computer interfaces, and gaming. User-independent recognition of continuous, natural signing is very challenging due to the multimodal nature of the visual cues (e.g., movements of fingers and lips, facial expressions, body pose), as well as technical limitations such as spatial and temporal resolution and unreliable depth cues. We ran a competition containing a dataset with more than 13’000 gesture samples from a dictionary of 20 Italian sign gesture categories. For the first time in video LAP challenges deep learning methods won! An interesting finding from this challenge was that the audio modality was very helpful for recognizing gestures.

2014 Looking at People ECCV Challenge: ChaLearn organized in 2014 three parallel challenge tracks on Human Pose Recovery on RGB data, action/interaction spotting on RGB data, and gesture spotting on RGB-Depth data [5]. The challenge featured three quantitative tracks:

- Track 1: Human Pose Recovery. More than 8,000 frames of continuous RGB sequences are recorded and labeled with the objective of performing human pose recovery by means of recognizing more than 120’000 human limbs of different people.
- Track 2: Action/Interaction Recognition. 235 performances of 11 action/interaction categories are recorded and manually labeled in continuous RGB sequences of different people performing natural isolated and collaborative actions randomly.
- Track 3: Gesture Recognition. More than 14’000 gestures are drawn from a vocabulary of 20 Italian sign gesture categories. The emphasis of this third track is on multi-modal automatic learning of a set of 20 gestures performed by several different users, with the aim of performing user independent continuous gesture spotting.

During this challenge, the state of the art was significantly advanced in the three tracks, where solutions based in deep learning obtained the best results.

2015 Looking at People CVPR Challenge: After the boom of Kinect and the fact that human-level performance was reached in several tasks/challenges involving Kinect-recorded data, ChaLearn LAP started to look at open challenges in relevant fields that have to do with still and sequences of RGB images.

ChaLearn organized in 2015 parallel challenge tracks on RGB data for Human Pose Recovery, action/interaction spotting, and cultural event recognition [6]. The challenge featured three quantitative tracks:

- Track 1: Human Pose Recovery. More than 8,000 frames of continuous RGB sequences are recorded and labeled with the objective of performing human pose recovery by means of recognizing more than 120,000 human limbs of different people.
- Track 2: Action/Interaction Recognition. 235 performances of 11 action/interaction categories are recorded and manually labeled in continuous RGB sequences of different people performing natural isolated and collaborative actions randomly.
- Track 3: Cultural Event Recognition. More than 10’000 images corresponding to 50 different cultural event categories will be considered. In all the categories, garments,
human poses, objects and context will be possible cues to be exploited for recognizing the events, while preserving the inherent inter- and intra-class variability of this type of images. Examples of cultural events will be Carnival, Oktoberfest, San Fermin, Maha-Kumbh-Mela and Aoi-Matsuri, among others.

**2015 Looking at People ICCV Challenge:** ChaLearn organized for ICCV2015 two parallel quantitative challenge tracks on RGB data [7].

- **Track 1: Apparent Age Estimation.** 5’000 images each displaying a single individual, labeled with the apparent age. Each image has been labeled by multiple individuals using a collaborative Facebook implementation. The votes variance is used as a measure of the error for the predictions. This is the first state of the art dataset for Apparent Age Recognition rather than Real Age recognition.

- **Track 2: Cultural Event Recognition.** Near 30’000 images corresponding to 100 different cultural event categories will be considered. In all the categories, garments, human poses, objects and context will be possible cues to be exploited for recognizing the events, while preserving the inherent inter- and intra-class variability of this type of images.

**2016 Looking at People CVPR Challenge:** ChaLearn organized for CVPR2016 three parallel quantitative challenge tracks on RGB face analysis [8].

- **Track 1: Apparent Age Estimation.** An extended version of the previous ICCV2015 challenge dataset. It contains 8,000 images each displaying a single individual, labeled with the apparent age. Each image has been labeled by multiple individuals, using a collaborative Facebook implementation and Amazon Mechanical Turk. The votes variance is used as a measure of the error for the predictions. This is the first state of the art dataset for Apparent Age Recognition rather than Real Age recognition.

- **Track 2: Accessories Classification.** The aim of this track is to detect and classify complements and accessories worn by the subjects. It uses a fraction of the Faces of the World dataset, a challenging dataset consisting of 8’000 images, each displaying a single individual, labelled with the accessories they are wearing.

- **Track 3: Smile and Gender Classification.** In this track, participants will have to classify images of the FotW dataset according to gender (male, female or other) and basic expression (smiling, neutral or other expression). Along with accurate face detection and alignment, this track will require robust feature selection and extraction in order to identify the subject’s gender and expression, which can be difficult to classify even to the human eye in uncontrolled environments such as those present in the FotW dataset.

**2016 Looking at People ECCV Challenge:** Research advances in computer vision and pattern recognition have resulted in tremendous advances in different problems and applications. As a result, several problems on visual analysis can be considered as solved (e.g., face recognition), at least in certain scenarios and under specific circumstances. Despite these important advances, there are still many open problems that are receiving much attention from the community because of the potential applications. For that reason, ChaLearn LAP has started to focus on problems going beyond the information visually depicted in videos.

First, co-located with the workshop we organized a challenge on “first impressions”, in which participants developed solutions for recognizing personality traits of users in short video sequences [9]. We made available a large newly collected dataset sponsored by Microsoft of at least 10’000 15-second videos collected from YouTube, annotated with personality traits by AMT workers. The traits correspond to the “big five” personality traits used in psychology and well known of hiring managers using standardized personality profiling: Extroversion, agreeableness, conscientiousness, neuroticism, and openness to experience. As is known, the first impression made is highly important in many contexts, such as human resourcing or job interviews. This work could become very relevant to training young people to present themselves better by changing their behavior in simple ways.

**2016 Looking at People ICPR Challenge:** In the same line, we organized a contest around four LAP problems that require, in addition to performing an effective visual analysis, to deal with multimodal information (e.g., audio, RGB-D video, etc.) in order to be solved [10]. These four tracks included a second round on the first impressions challenge. The contest was supported by three organizations with vast experience and prestige in the organization of academic contests, namely: ChaLearn, MediaEval and ImageCLEF. The contest was also supported by the IAPR TC 12 on visual and multimedia information systems.

The tracks of the contest were as follows:

- **Track 1: First impressions challenge.** Participants developed solutions for recognizing personality traits in short video sequences. This corresponds to the second round of the first impressions challenge organized at ECCV 2016 [9].

- **Track 2: Isolated gesture recognition track.** We organized a track on isolated gesture recognition from RGB-D data, where the goal was to develop methods for recognizing the category of human gestures from segmented RGB-D video. A new dataset called ChaLearn LAP RGB-D Isolated Gesture Dataset (IsoGD) was considered for this track [11]. This dataset includes 47’933 RGB-D gesture videos (about 9G). Each RGB-D video depicts a single gesture and there are 249 gesture categories performed by 21 different individuals.

- **Track 3: Continuous gesture recognition track.** We also organized a track complimentary to track 2 on continuous gesture recognition from RGB-D data. The goal in this track was to develop methods that can perform simultaneous segmentation and recognition of gesture categories from continuous RGB-D video. The newly cre-
we provide a summary of each of them. Topics related to LAP in prestigious journals. In the following, we organized a series of Special Issues and Special issues 

\[26\], \[27\], \[28\], \[29\], \[30\], \[15\], \[16\], \[17\], \[18\], \[19\], \[20\], \[21\], \[22\], \[23\], \[24\], \[25\], \[31\], \[32\], \[33\], \[34\], \[35\], \[36\], \[37\], \[38\], \[39\], \[40\], \[41\], \[42\], \[43\], \[44\], \[45\], \[46\], \[47\], \[33\], \[34\], \[35\], \[36\], \[37\], \[38\], \[39\], \[40\], \[41\], \[42\], \[43\], \[44\], \[45\], \[46\], \[47\].

- Track 4: Context of experience track. The aim was to explore the suitability of video content for watching in certain situations. Specifically, we look at the situation of watching movies on an airplane. As a viewing context, airplanes are characterized by small screens and distracting viewing conditions. We assume that movies have properties that make them more or less suitable to this context. We were interested in developing systems that are able to reproduce a general judgment of viewers about whether a given movie is a good movie to watch during a flight. We provided a dataset including a list of movies and human judgments concerning their suitability for airplanes \[12\]. The goal of the task was to use movie metadata and audio-visual features extracted from movie trailers in order to automatically reproduce these judgments. The provided dataset comprised: a total of 318 movies + metadata + audio (MFCC), textual (td-idf) and visual (HOG, CM, LBP, GLRLM) features + movie. Video resolution: full HD 1080p, with length of around 2-5 minutes, the considered categories are: latest, recent, the collection, family, world, dutch and European.

**Special issues**

Together with the challenges and their associated workshops, we organized a series of Special Issues and Special Topics related to LAP in prestigious journals. In the following, we provide a summary of each of them.

**2014 JMLR Gesture:** We organized a Special Topic on Gesture Recognition at Journal of Machine Learning Research. The scope of this special issue included: Algorithms for gesture and activity recognition, in particular addressing: Learning from unlabeled or partially labeled data; Learning from few examples per class, and transfer learning; Continuous gesture recognition and segmentation Deep learning architectures, including convolutional neural networks; Gesture recognition in challenging scenes, including cluttered/moving backgrounds or cameras; Large scale gesture recognition o Multi-modal features for gesture recognition, including non-conventional input sources, such as inertial, depth or thermal data; Integrating information from multiple channels (e.g., position/motion of multiple body parts, hand shape, facial expressions); Applications in video surveillance, image or video indexing and retrieval, recognition of sign languages for the deaf, emotion recognition and affective computing, computer interfaces, virtual reality, robotics, ambient intelligence, and games. A total of 18 papers were published within this Special Topic at Journal of Machine Learning Research \[13\], \[14\], \[15\], \[16\], \[17\], \[18\], \[19\], \[20\], \[21\], \[22\], \[23\], \[24\], \[25\], \[26\], \[27\], \[28\], \[29\], \[30\].

**2016 TPAMI HuPBa:** We organized a Special Issue on Multi-modal Human Pose Recovery and Behavior Analysis (HuPBa) at IEEE Transactions on Pattern Analysis and Machine Intelligence Journal. The scope of this special issue included: Multi-modal data fusion and learning strategies; Combination techniques of visual and non-visual descriptors (RGB-D, multispectral, thermal, IR, audio, IMU, EDA, EEG, etc.); Calibration and synchronization of multi-modal data; Multi-modal datasets and evaluation metrics; Leisure, security, health and energy applications based on multi-modal data; Multi-modal Affective Computing and Social Signal processing systems; Multi-modal algorithms designed for GPUs, smart phones and game consoles. A total of 17 papers were published within this Special Issue at IEEE TPAMI \[31\], \[32\], \[33\], \[34\], \[35\], \[36\], \[37\], \[38\], \[39\], \[40\], \[41\], \[42\], \[43\], \[44\], \[45\], \[46\], \[47\].

**2016 IJCV LAP:** We organized a Special Issue on LAP at International Journal of Computer Vision. The scope of this special issue included: Gesture (hands and body), posture and sign recognition, analysis and synthesis; Face recognition, analysis and synthesis; Body motion analysis and synthesis, action/interaction recognition and spotting; Context analysis for human behavior recognition in still images and image sequences; Psychological, affective, and behavioral analysis; Tracking systems on Looking at People; 3D human analysis and multi-modal Looking at People; Biometry analysis, identification and verification; Looking at People for Virtual and Augmented Reality; Datasets and evaluation protocols on Looking at People; Computer Vision applications of LAP.

**2017 TPAMI Faces:** Currently we are organizing a Special Issue at IEEE Transactions on Pattern Analysis and Machine Intelligence journal in the topic of face analysis. Automated face analysis is a research topic that has received so much attention from the Computer Vision and Pattern Recognition communities in the past, that research progress has made some think that problems such as face recognition or face detection are solved. However, many aspects of face analysis remain open problems, including the implementation of large-scale face detection and recognition methods for images captured in real-life applications. These include 3D face analysis and face pose estimation from 2D; face analysis under extreme pose variation and occlusion, identity recognition, emotion and micro-expression recognition, and analysis of dynamics of facial expression. Luckily, these are also areas in which the community is making rapid progress enabled by more powerful methods (e.g. Deep Learning) that push the state-of-the-art. Among real-world applications are security and video surveillance, human computer/robot interaction, interpersonal communication, entertainment, commerce, and assistive technologies for education and physical and mental health.

**2017 TAC Personality:** Currently we are organizing a Special Issue at IEEE Transactions on Affective Computing in the topic of personality analysis. The automatic analysis of videos and any other kind of input data to characterize human behavior has become an area of active research with applications in affective computing, human-machine interfaces, gaming, secu-
rity, marketing, health, and other domains. Research advances in multimedia information processing, computer vision and pattern recognition have lead to established methodologies that are able to successfully recognize consciously executed actions, or intended movements (e.g., gestures, actions, interactions with objects and other people). However, recently there has been much progress in terms of computational approaches to characterize sub-conscious behaviors, which may be revealing aptitudes or competence, hidden intentions, and personality traits. This special issue will compile progress on apparent personality analysis from a computational perspective.

CIML Series

Starting in 2017, we are running the Springer Series on Challenges in Machine Learning [http://www.springer.com/series/15602], the first series of books entirely dedicated to collect papers associated to successful competitions in machine learning and related fields. The scope of the series also includes analyses of the challenges, tutorial material, dataset descriptions, and pointers to data and software. Together with the websites of the challenge competitions, they offer a complete teaching toolkit and a valuable resource for engineers and scientists. This new series will be one of our main forums for disseminating results of competitions in ChaLearn LAP.

Discussion

We just described the challenges organized by ChaLearn LAP in the last 6 years. The areas covered by the different challenges, included the analysis of human faces, body movements, actions, pose estimation and even analysis of cultural images. Clearly, the organization of these events helped considerably to advance the state of the art in different subfields of computer vision and pattern recognition. Multiple information sources were considered through the organized competitions, including RGB images and video, depth video and audio. Approaches taking advantage of multimodal information were the most successful in most of the cases. Interestingly, with the organization of the different challenges we witnessed the empowerment and the establishment of deep learning as the methodology ruling computer vision competitions. We foresee upcoming challenges will be dominated by deep learning as well, however, a major drawback of this sort of methods is that they are limited in terms of their explicability and interpretability features. Because of that, we are currently organizing a challenge in that direction [48]. We foresee that challenges in similar topics (i.e., extending the capabilities of deep learning techniques) will prevail the arenas of computer vision and pattern recognition.

We also reviewed and presented an overview of the forums and publications at which challenge results have been presented, including workshops, special issues and the brand new CIML Series. This is an aspect as important as the challenges themselves, advancing the state of the art through competitions require of effective dissemination means. In the near future we will focus on novel ways of challenge dissemination.

III. ChaLearn LAP webpage

ChaLearn LAP official webpage can be found at [http://chalearnlap.cvc.uab.es/]. It contains all material associated to the organized events, including challenges, competitions, data, codes, special issues, books, and associated publications. In the Challenges menu all organized and in progress competitions are listed. Subpages from competitions include:

- Description: Full explanation of the competition.
- Schedule: Important dates of the competition.
- Associated events: Links to related events.
- Tracks: The set of tracks within the same competition. Each one includes the results of the participants.
- People: It shows the list of co-organizers.
- Sponsors: The set of sponsors of the competition.

Datasets menu lists all available datasets. Subpages from datasets include:

- Description: Full explanation of the dataset.
- Associated events: Links to related events.
- Data: Training, Validation and Test data.
- Results: The results of track participants. Users can also upload their results post competition. It also contains the summary of methods and open source code.

Workshop menu lists all organized workshops.

Subpages of workshop page include:

- Description: Full explanation of the workshop.
- Schedule: Important dates of the workshop.
- Associated events: Links to related events.
- People: List of co-organizers.
- Program: Calendar of the workshop day.
- Gallery: Set of images of the workshop day.

The special issues menu list all organizers special issues. Subpages from special issues include:

- Description: Full explanation of the special issue.
- Schedule: Important dates of the special issue.
- Associated events: Links to related events.
- People: List of guest editors.
- Papers published: Set of papers published within the special issue.

Last web pages contain the main ChaLearn LAP organizers, general sponsors and set publications related to ChaLearn LAP events.
We reviewed the historic of events organized within the ChaLearn LAP series, including the competitions, workshops, special issues and books in the period 2011-2017. We also presented the new ChaLearn LAP webpage, which includes all the information associated to the organizing events, also including data, code, and the results of the competitions and the state of the art results on the provided datasets. Users of the webpage can also submit predictions to any data used within ChaLearn LAP competitions. Currently, we are organizing a new series of competitions within the field of LAP, including face and body analysis. In particular, 2017 events will focus on explainable computer vision and machine learning models within the field of personality analysis.

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