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EDITORIAL

Computer Vision and Pattern Recognition 2020

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This special issue covers a wide range of topics from the area of Computer Vision, Pattern Recognition, and Machine Learning. This breadth of scope is reflected by the papers included in this special issue, which touch topics including geometric Computer Vision, medical image processing, physical scene understanding, and interpretability of deep neural networks. This special issue consists of extended versions of the best papers originally presented at the 42nd German Conference on Pattern Recognition (DAGM GCPR 2020), held virtually between September 28th and October 1st, 2020.

This special issue consists of 4 papers that are briefly discussed as follows:

The first article, by Annika Hagemann, Moritz Knorr, Holger Janssen, and Christoph Stiller on "Inferring bias and uncertainty in camera calibration" introduces an evaluation scheme to capture the fundamental error sources in camera calibration: systematic errors (biases) and uncertainty (variance). The proposed bias detection method is able to detect systematic errors and can thus be used to reveal inaccuracies in the calibration setup. It can thus be used for camera model selection. A novel resampling-based uncertainty estimator enables uncertainty estimation under non-ideal conditions and thereby extends the classical covariance estimator.

In "Assignment Flow For Order-Constrained OCT Segmentation", Dmitrij Sitenko, Bastian Boll, and Christoph Schnörr propose a novel, purely data driven geometric approach to order-constrained 3D Optical Coherence Tomography retinal cell layer segmentation which takes as input data in any metric space and provides basic operations that can be effectively computed in parallel. Compared to established retinal layer segmentation methods, the proposed formulation does not require a shape prior and accomplishes the natural order of the retina in a purely geometric way, while maintaining a high level of accuracy.

The third article, by Rama Krishna Kandukuri, Jan Achterhold, Michael Moeller, and Joerg Stueckler on "Physical Representation Learning and Parameter Identification from Video Using Differentiable Physics" investigates the combination of differentiable physics and spatial transformers in a deep action conditional video representation network. The proposed model learns a physically interpretable latent representation and can identify physical parameters. It can be trained both in a supervised and a self-supervised fashion.

In "Semantic Bottlenecks: Quantifying & Improving Inspectability of Deep Representations", the authors Max Losch, Mario Fritz, and Bernt Schiele introduce the concept of Semantic Bottlenecks (SB). In order to increase inspectability of neural networks, SBs can be integrated into pretrained networks. SBs help to align channel outputs with individual visual concepts. The article further introduces a new metric for measuring this type of alignment.

This special issue was preceded by an international conference, the 42nd German Conference on Pattern Recognition (DAGM GCPR 2020) held virtually between September 28th and October 1st, 2020. DAGM GCPR 2020 received 89 submissions from 22 countries. Each paper was subject to a double-blind review process and was reviewed by three reviewers. One of the reviewers acted as a meta-reviewer for the paper, led the discussion of the paper once all reviews were available, and made a publish / reject recommendation to the Program Chairs. For the special track papers, the track chairs acted as meta reviewers. The Program Chairs decided to reject 5 submissions before review due to violation of the double blind review process, missing files, etc. From the remaining submissions, 35 high-quality papers were selected for publication (39% acceptance rate), with one paper being withdrawn later by the authors.

Among the accepted papers, 5 papers were nominated for the DAGM GCPR 2020 best paper award based on the scores provided by the reviewers and meta-reviewers. This special

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issue presents extended versions of 4 of these 5 best papers. These extended versions were again peer-reviewed according to the journal's high standards by at least two expert reviewers in the field. For each paper, we contacted the original reviewers from the DAGM GCPR 2020 conference to ensure reviewer continuity. Two of the papers have received major revisions and the revised papers received two additional reviews. Two of the papers received minor revisions and the revised papers were reviewed by the guest lead editor.

The 4 contributions to this special issue encompass a wide range of research in various topics such as camera calibration, optical coherence tomography (OCT) segmentation, video-based representation learning and parameter identification as well as interpretability of deep neural networks, thereby appealing to both the experts in the field and those who want a snapshot of the current breadth of computer vision and machine learning research.

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