Colour and Visual Computing Symposium 2022 (CVCS 2022)

The Norwegian Colour and Visual Computing Laboratory at the Norwegian University of Science and Technology (NTNU) in Gjøvik, Norway has organised the Colour and Visual Computing Symposium 2022 (CVCS 2022), which this year has taken place on September 8-9, 2022. The event took place in NTNU in Gjøvik. This edition of the symposium follows the success achieved by the previous events of the biannual Gjøvik Colour Imaging Symposium (GCIS), from 2003 to 2011, and Colour and Visual Computing Symposium (CVCS) 2013, CVCS 2015 ,CVCS 2018 and CVCS 2020. The symposium has attracted a growing number of participants and provided a platform for fruitful discussion and exploration of recent theoretical advances and emerging practical applications in the field of colour and visual information processing. During the past CVCS events, the accepted papers were published as an IEEE proceeding. However, the papers accepted at CVCS 2020 and CVCS 2022 are submitted for publishing as a CEUR Workshop Proceedings volume. This proceeding volume is published electronically with a gold open access, and is currently indexed by Google Scholar, DBLP, and Scopus. The CVCS 2020 symposium contains a rich program of invited keynotes, together with regular talks contributed by young researchers and well-known international experts in the field. The papers contained in this Proceedings cover a wide range of topics including color imaging, appearance, vision, spectral imaging, visual computing, and medical imaging. The CVCS 2022 Program Committee received 35 submissions. All papers went through a blind review process and each paper has been reviewed by three reviewers. The paper selection criteria were methodology used and scientific quality in terms of novelty and originality. Finally, 20 high-quality papers of high-quality scientific content were selected and presented at the symposium. Four keynote speakers contributed to the success of the event: Professor Karl R Gegenfurtner, Head of the DFG Collaborative Research Center (Faculty of Psychology at Giessen University). Professor Robert Jenssen Director of SFI Visual Intelligence (UiT The Arctic University of Norway). Dr. Sebastian Bosse Head of Interactive & Cognitive Systems Group (Fraunhofer HHI – Heinrich Hertz Institute). Reader William Smith, Computer Vision (Department of Computer Science University of York, United Kingdom).

Keynote: Professor Karl R. Gegenfurtner

Title: Color vision for objects

The study of color vision in humans has been a successful enterprise for more than 100 years. In particular, the establishment of colorimetry by the CIE in 1931 has brought forward tremendous advances in the study of color in business, science, and industry (Judd 1952). During the past 50 years, the processing of color information at the first stages of the visual system—in the cone photoreceptors and retinal ganglion cells—has been detailed at unprecedented levels of accuracy. Has color vision been solved? I will argue that a transition from flat, matte surfaces to the color distributions that characterize real-world, 3D objects in natural environments is necessary to fully understand human color vision. I will present results from Virtual Reality psychophysics and from Deep Neural Network modeling that show the importance of objects for color discrimination, color constancy and the emergence of color categories.

Keynote: Professor Robert Jenssen

Title: Visual Intelligence for medical image analysis

In deep learning for medical image analysis, exploitation of limited data, in the sense of having few annotations, is a key challenge. Transparency is also a challenge, in the sense of revealing biases, artefacts, or confounding factors, on the path toward more trustworthy analysis systems. This talk outlines some lines of research in Visual Intelligence to tackle these challenges. The first part of the talk focuses on medical image segmentation when little labelled data is available by developing an anomaly detection-inspired approach to few-shot learning. The second part focuses on XAI (explainable AI) by developing a self-explainable model to highlight potential challenges obtained when leveraging several different image data sources for diagnostics as well as to reveal causes in the form of image artefacts.

Keynote: Dr Sebastian Bosse

Title: Neural approaches to visual quality estimation

Accurate computational estimation of visual quality as it is perceived by humans is crucial for any visual communication or computing system that has humans as the ultimate receivers. But most importantly besides the practical importance, there is a certain fascination to it: While it is so easy, almost effortless, to assess the visual quality of an image or a video, it is astonishingly difficult to predict it computationally. Consequently, the problem of quality estimation touches on a wide range of disciplines like engineering, psychology, neuroscience, statistics, computer vision, and, since a couple of years now, on machine learning. In this talk, Bosse gives an overview of recent advances in neural network-based-approaches to perceptual quality prediction. He examines and compares different concepts of quality prediction with a special focus on the feature extraction and representation. Through this, Bosse revises the underlying principles and assumptions, the algorithmic details and some quantitative results. Based on a survey of the limitations of the state of the art, Bosse discusses challenges, novel approaches and promising future research directions that might pave the way towards a general representation of visual quality.

Keynote: Reader William Smith

Title: Self-supervised Inversed Rendering

Inverse rendering is the task of decomposing one or more images into geometry, illumination and reflectance such that these quantities would recreate the original image when rendered. Deep learning has shown great promise for solving components of this task in unconstrained situations. However, the challenge is a lack of ground truth labels to use for supervision. Will Smith will describe a line of work that learns to solve this problem for outdoor scenes with no ground truth. They are based on extracting a self-supervision signal from unstructured image collections alone while introducing model-based constraints to resolve ambiguities. He will describe both single image methods, that learn general principles of inverse rendering, and multi-image methods that fit to a single scene by extending Neural Radiance Fields to relightable outdoor scenes. Smith will describe priors that we enforce on natural illumination and results on the application of photorealistic scene relighting.

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Seyed Ali Amirshahi - General chair

Jean-Baptiste Thomas - Program chair

Kiran Raja Program – Program chair

Aditya Suneel Sole - Publication chair

Dar'ya Guarnera - Publication chair

Jon Yngve Hardeberg - Publicity and sponsorship chair

Faouzi Alaya Cheikh – Special session and event Chair

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