WELCOME TO THE COMPUTER GRAPHICS NIGHT

THURSDAY, DECEMBER 02, 2021
| Page | Content                          |
|------|----------------------------------|
| 4    | GRADUATION                       |
| 22   | BEST THESIS AWARD                |
| 24   | BEST PAPER AWARD                 |
| 32   | BEST INDUSTRIAL PROJECT AWARD    |
THIS SECTION HIGHLIGHTS, IN ALPHABETICAL ORDER, ALL VISUAL COMPUTING DISSERTATIONS PUBLISHED BETWEEN DECEMBER 1, 2020 AND NOVEMBER 30, 2021.
Visual Data Analysis Supported by Eye-Tracking, Multi-Touch Displays, and Machine Learning

Mohammad Chegini, MSc

Doctoral Thesis

to achieve the university degree of

Doctor of Philosophy

PhD degree programme: Computer Science

submitted to

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Nanyang Technological University

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ABSTRACT

In recent years, data analysts have been confronted by increasing amounts of data, often in the form of multivariate datasets. Multivariate datasets can be thought of as a table, where dimensions are columns, and records are rows. Machine learning and data mining algorithms can help an analyst to build machine learning (ML) models to find structures in a dataset algorithmically. Alternatively, visualisation techniques such as scatterplot, scatterplot matrix, and parallel coordinates can help an analyst explore and find structures in a dataset visually. Although extensive research has been done around building and visualising an ML model, there is less research linking ML models and visualisations through human-centred interactions. Such a connection has the potential to help an analyst build better ML models by interactively steering the process. However, designing and evaluating such interaction techniques is challenging.

In this thesis, visual analytics techniques are proposed, which focus on building and modifying an ML model of a multivariate dataset, using machine learning, visualisation, and interactions. Moreover, the use of novel interaction modalities and devices such as large multi-touch displays, handheld devices, and eye-trackers is explored.

As a first step, a novel approach for selecting, searching for, and comparing local patterns within multivariate datasets using scatterplots is presented. An analyst can select a part of a scatterplot from a scatterplot matrix, and search for similar patterns using both model-based (ML regression) descriptors and shape-based descriptors. A relevance feedback module enables the analyst to improve the regression analysis and find relevant patterns more effectively.

The second part of the thesis goes beyond simple interaction and exploration using an ML model and focuses on ML model creation and modification. Specifically, an interactive visual labelling technique is presented, which allows an analyst to build and interactively improve an (ML classification) model for multivariate datasets. The technique combines linked visualisations, clustering, and active learning to help an analyst interactively label a multivariate dataset. In the third step, a user study was conducted which showed that such an interactive labelling technique could surpass common active learning algorithms for building an effective ML model.

Finally, the fourth part of the thesis explores several novel interaction modalities. It is shown how large multi-touch displays are effective for collaborative analysis of scatterplots. Extending these interactions, analysts can use a secondary handheld device to interact with linked-view information visualisation application to label multivariate datasets. In addition, user eye gaze interaction can be garnered by the system to help re-arrange the axes in a parallel coordinates visualisation.

In summary, this thesis uses human-centred interactions to bridge the gap between ML techniques and visualisation techniques. The thesis presents how to (1) interactively search and explore local regression models in a scatterplot space, (2) interactively build and improve an ML model of a multivariate dataset by linked visualisations, clustering, and active learning, and (3) use eye-tracking and multi-touch displays to investigate regression ML models collaboratively, and use eye gaze as an input for interaction with visualisations of a multivariate dataset.
Analysis of capacitive proximity sensing as basis for human vehicle interfaces

Vom Fachbereich Informatik der Technischen Universität Darmstadt genehmigte DISSERTATION zur Erlangung des akademischen Grades eines Doktor-Ingenieurs (Dr.-Ing.) von M.Eng. Sebastian Frank geboren in Landstuhl, Deutschland

Referenten der Arbeit: Prof. Dr.-habil. Ir. Arjan Kuijper Technische Universität Darmstadt Prof. Dr. techn. Dr.-Ing. eh. Dieter W. Fellner Technische Universität Darmstadt Prof. Dr. Kristof Van Laerhoven Universität Siegen

Tag der Einreichung: 21/03/2021
Tag der mündlichen Prüfung: 02/06/2021

Darmstädter Dissertation 2021 D 17
ABSTRACT

People spend a lot of time in vehicles. Driving involves risks that are mitigated by passive and active safety systems. Active safety systems prevent accidents from happening in the first place. Human machine interfaces (HMI) are needed to monitor the driver’s behavior and capture driver’s input. This presents challenges based on environmental, vehicle interior, and user characteristics. Vehicles are directly exposed to the environment. Sensors have to cope with both rapid light changes and complete darkness. Vehicle interiors contain geometries that obscure parts of the human body. Sensors that require a line of sight may therefore be at a disadvantage. Sensor positioning is also limited by vehicle geometry. Sensors that require additional mounting impact the design and result in an obtrusive system. Systems that can be integrated invisibly into existing vehicle structures are less obtrusive and have less impact on the design. Parts of the user must also be monitored in free air, which makes contact-based scanning systems unsuitable. Some sensor systems are capable of monitoring the entire body, but still have to deal with the requirements of vehicle users. People will wear different clothing or glasses. User monitoring must be enabled regardless of this condition. People are also becoming sensitive to their personal data. This can be crucial for the acceptance of systems. Systems must also comply with regulations such as "Privacy by Design" which is required in the European Union. Privacy must therefore be preserved.

I argue that capacitive proximity sensors are capable of dealing with the above challenges. Due to the physical principle, illumination changes are not an issue, and they can sense through insulators. Capacitive proximity sensors (CAPS) can therefore be used in existing vehicle structures, both in close proximity and without contact with the object to be monitored. In addition, they are often said to maintain privacy. Based on the challenges and capabilities of CAPS, three research questions emerge:

• RQ1: How can we use existing vehicle structures to enhance or substitute vehicular HMI using CAPS?
• RQ2: How can we use existing vehicle structures to provide new ways of human computer interaction using CAPS?
• RQ3: Can CAPS contribute to the acceptance of vehicular HMI with regard to privacy concerns?

To find evidence to support these research questions, I focused on systems that help users drive safely. Cameras are commonly used in HMI. Because they require line of sight, affect interior design, and capture data that creates privacy concerns, they may not be the best choice. CAPS are therefore an opportunity to change the modality. Several applications are developed that provide evidence that the use of CAPS is beneficial for vehicle HMI. Each application is developed following a common process with the goal of meaningful uses. Each application is based on accident statistics and related research, so that real-world problems are addressed. This entails analysis of driving issues, prototype implementations of sensor topologies, and algorithms for attention monitoring, child monitoring, authentication, and gesture recognition in vehicles. One will additionally receive best practices for CAPS data labeling, which is crucial for supervised learning methods that are considered helpful. Privacy compliant behavior is analyzed in this thesis. Vehicle HMI are therefore analyzed with regard to privacy concerns and regulations. The user’s data protection perspective is also captured in a survey. This is necessary to find indications that CAPS is not only an alternative from a technical point of view. It is also an alternative that could be in the user’s favor.
Adaptive Filtering and Transformation of Cardiac Motion-Induced Signals during Low-Amplitude Activities

zur
Erlangung des akademischen Grades
Doktor-Ingenieur (Dr.-Ing)

vorgelegt von
Marian Haescher geboren am 03.09.1985 in Schwerin

Gutachter:
Reviewer 1
Reviewer 2
Reviewer 3

January 26, 2021 – version 6.1
The goal of the presented work was the development of a concept for the adaptive filtering and transformation of motion-induced cardiac signals during low-amplitude activities. In this process, analyses of the fundamentals and the current state-of-the-art were conducted in order to extract valid vital sign readings and allow for a transformation of the motion-induced cardiac signals (Seismocardiograms) into the golden standard of non-imaging cardiac diagnostics (Electrocardiograms). The transformation of Seismocardiograms into Electrocardiograms allows domain experts to perform diagnostics based on clinically relevant information. The extraction of valid vital sign readings also enables the reduction of false alerts and thus provides advantages for anomaly detection systems.

In eleven studies, confounding factors such as influences due to varying measuring positions or body postures, influences due to varying tissue structure (i.e., damping), advantages of multi-channel solutions or multi-sensory approaches, and advantages of different sensor types (i.e., accelerometer, gyroscope, Doppler-radar) and, finally, the transformation have been evaluated. The results were tested against competing approaches (e.g., Ballistocardiograms) and the golden standard (Electrocardiogram).

In particular, Seismocardiograms, can be transformed into electrocardiograms by applying deep learning architectures. The transformed signals show a cross-correlation of 94% ($r=0.94$, $SD: 0.05$) with the golden standard, indicating a high congruence. An expert evaluation with 15 domain experts (cardiologists and rhythmologists) showed a mean evaluation of 4.87 out of 5 for the possibility of conducting rhythmological diagnostics and a 4.67 out of 5 for morphological diagnostics on a 5-point Likert scale. In addition to this, the evaluation of the adaptive filtering showed that vital sign readings (e.g., heart rate) could be extracted correctly from the motion-induced cardiac signals. In case of the Seismocardiograms, the comparison with the ground truth ECG (golden standard) showed only a small mean deviation of 0.31 beats per minute ($M: 0.31 \text{ bpm}, SD: 1.65 \text{ bpm}$).

Thereby, the concept developed and evaluated in this work combines the reliability and validity of the golden standard with an improved and simpler data acquisition and eliminates the risk for infections and erroneous measurements by presenting an electrodeless solution.
Automation for camera-only 6D object detection

Pavel Rojtberg
Fachbereich Informatik
Technische Universität Darmstadt

Dissertation zur Erlangung des Grades
Doktor-Ingenieur
2021

Referenten:
Prof. Dr. Arjan Kuijper
Prof. Dr. techn. Dieter W. Fellner
Prof. Dr. Didier Stricker

Darmstädter Dissertation
D 17
Today a widespread deployment of Augmented Reality (AR) systems is only possible by means of computer vision frameworks like ARKit and ARCore, which abstract from specific devices, yet restrict the set of devices to the respective vendor. This thesis therefore investigates how to allow deploying AR systems to any device with an attached camera. One crucial part of an AR system is the detection of arbitrary objects in the camera frame and naturally accompanying the estimation of their 6D-pose. This increases the degree of scene understanding that AR applications require for placing augmentations in the real world. Currently, this is limited by a coarse segmentation of the scene into planes as provided by the aforementioned frameworks. Being able to reliably detect individual objects, allows attaching specific augmentations as required by e.g. AR maintenance applications. For this, we employ convolutional neural networks (CNNs) to estimate the 6D-pose of all visible objects from a single RGB image. Here, the addressed challenge is the automated training of the respective CNN models, given only the CAD geometry of the target object. First, we look at reconstructing the missing surface data in real-time before we turn to the more general problem of bridging the domain gap between the non-photorealistic representation and the real world appearance. To this end, we build upon generative adversarial network (GAN) models to formulate the domain gap as an unsupervised learning problem. Our evaluation shows an improvement in model performance, while providing a simplified handling compared to alternative solutions. Furthermore, the calibration data of the used camera must be known for precise pose estimation. This data, again, is only available for the restricted set of devices, that the proprietary frameworks support. To lift this restriction, we propose a web-based camera calibration service that not only aggregates calibration data, but also guides users in the calibration of new cameras. Here, we first present a novel calibration-pose selection framework that reduces the number of required calibration images by 30% compared to existing solutions, while ensuring a repeatable and reliable calibration outcome. Then, we present an evaluation of different user guidance strategies, which allows choosing a setting suitable for most users. This enables even novice users to perform a precise camera calibration in about 2 minutes. Finally, we propose an efficient client-server architecture to deploy the aforementioned guidance on the web, making it available to the widest possible range of devices. This service is not restricted to AR systems, but allows the general deployment of computer vision algorithms on the web that rely on camera calibration data, which was previously not possible. These elements combined, allow a semi-automatic deployment of AR systems with any camera to detect any object.
Extending the design space of e-textile assistive Smart Environment applications

Vom Fachbereich Informatik
der Technischen Universität Darmstadt
genehmigte

DISSERTATION

zur Erlangung des akademischen Grades eines
Doktor-Ingenieurs (Dr.-Ing.)

von

M.Sc. Silvia Dorotheea Rus
geboren in Târgu Secuiesc, Rumänien

Referenten der Arbeit:
- Prof. Dr. techn. Dr.-Ing. eh. Dieter W. Fellner
  Technische Universität Darmstadt
- Prof. Dr. Juan Carlos Augusto
  Middlesex University London
- Prof. Dr. Arjan Kuijper
  Technische Universität Darmstadt

Tag der Einreichung: 10/05/2021
Tag der mündlichen Prüfung: 30/06/2021

Darmstadt 2021
ABSTRACT

The thriving field of Smart Environments has allowed computing devices to gain new capabilities and develop new interfaces, thus becoming more and more part of our lives. In many of these areas it is unthinkable to renounce to the assisting functionality such as e.g. comfort and safety functions during driving, safety functionality while working in an industrial plant, or self-optimization of daily activities with a Smartwatch.

Adults spend a lot of time on flexible surfaces such as in the office chair, in bed or in the car seat. These are crucial parts of our environments. Even though environments have become smarter with integrated computing gaining new capabilities and new interfaces, mostly rigid surfaces and objects have become smarter. In this thesis, I build on the advantages flexible and bendable surfaces have to offer and look into the creation process of assistive Smart Environment applications leveraging these surfaces. I have done this with three main contributions.

First, since most Smart Environment applications are built-in into rigid surfaces, I extend the body of knowledge by designing new assistive applications integrated in flexible surfaces such as comfortable chairs, beds, or any type of soft, flexible objects. These developed applications offer assistance e.g. through preventive functionality such as decubitus ulcer prevention while lying in bed, back pain prevention while sitting on a chair or emotion detection while detecting movements on a couch.

Second, I propose a new framework for the design process of flexible surface prototypes and its challenges of creating hardware prototypes in multiple iterations, using resources such as work time and material costs. I address this research challenge by creating a simulation framework which can be used to design applications with changing surface shape. In a first step I validate the simulation framework by building a real prototype and a simulated prototype and compare the results in terms of sensor amount and sensor placement. Furthermore, I use this developed simulation framework to analyse the influence it has on an application design if the developer is experienced or not.

Finally, since sensor capabilities play a major role during the design process, and humans come often in contact with surfaces made of fabric, I combine the integration advantages of fabric and those of capacitive proximity sensing electrodes. By conducting a multitude of capacitive proximity sensing measurements, I determine the performance of electrodes made by varying properties such as material, shape, size, pattern density, stitching type, or supporting fabric. I discuss the results from this performance evaluation and condense them into e-textile capacitive sensing electrode guidelines, applied exemplary on the use case of creating a bedsheet for breathing rate detection.
ULRICH JOHANNES SCHERHAG

FACE MORPHING AND MORPHING ATTACK DETECTION
zur Erlangung des akademischen Grades Doktor-Ingenieur (Dr.-Ing.)
vorgelegte Dissertation von

ULRICH JOHANNES SCHERHAG
geboren in Mainz

1. Gutachten: Prof. Dr. Dr. eh. Dieter Fellner
2. Gutachten: Prof. Dr. Christoph Busch
3. Gutachten: Prof. Dr. Raymond N. J. Veldhuis

Tag der Einreichung: 01.10.2020
Tag der Prüfung: 16.11.2020

Fachgebiet Graphisch-Interaktive Systeme
Fachbereich Informatik
Technische Universität Darmstadt
Hochschulkennziffer D-17
November 2020
ABSTRACT

In modern society, biometrics is gaining more and more importance, driven by the increase in recognition performance of the systems. In some areas, such as automatic border controls, there is no alternative to the application of biometric systems.

Despite all the advantages of biometric systems, the vulnerability of these still poses a problem. Facial recognition systems for example offer various attack points, like faces printed on paper or silicone masks. Besides the long known and well researched presentation attacks there is also the danger of the so-called morphing attack.

The research field of morphing attacks is quite young, which is why it has only been investigated to a limited extent so far. Publications proposing algorithms for the detection of morphing attacks often lack uniform databases and evaluation methods, which leads to a restricted comparability of the previously published work. Thus, the focus of this thesis is the comprehensive analysis of different features and classifiers in their suitability as algorithms for the detection of morphing attacks. In this context, evaluations are performed with uniform metrics on a realistic morphing database, allowing the simulation of various realistic scenarios.

If only the suspected morph is available, a HOG feature extraction in combination with an SVM is able to detect morphs with a D-EER ranging from 13.25% to 24.05%. If a trusted live capture image is available in addition, for example from a border gate, the deep ArcFace features in combination with an SVM can detect morphs with a D-EER ranging from 2.71% to 7.17%.
Interactive Visual Analysis and Guidance Methods for Discovering Patterns in High-Dimensional Data

Doctoral Thesis
to achieve the university degree of
Doctor of Technical Sciences

submitted to

Graz University of Technology

Supervisor
Univ.-Prof. Dr. Tobias Schreck
Institute of Computer Graphics and Knowledge Visualisation

Prof. Dr. Daniel A. Keim
University of Konstanz

Graz, December 2020
ABSTRACT

In this day and age, data is increasingly important and fast-growing. It will be collected in all different areas, whether in research, industry or social life with the intent to gain knowledge and insights from it. To explore these large collections of data, information visualization techniques are often used, which map the data into a visual representation for an easier detection of patterns and hidden insights. However, there still exist well-known problems, like the curse of dimensionality for high-dimensional data, where merely visualizing the data is not sufficient enough. Another challenge is to find the right means, i.e., visualization type, parameter settings, exploration tools, to find the valuable information in the data. To this end, the integration of visual analytics approaches can be used to support the user in finding interesting patterns or to guide them through the analytical process.

In this doctoral thesis, I will discuss important aspects for searching and analyzing patterns in high-dimensional data, and present novel approaches that focus on current limitations. This especially includes the development, implementation and use of visual search techniques, which help the user to discover interesting patterns in complex data. For example, I will investigate sketch-based search methods to find patterns in several data types, e.g., bivariate data and trajectory data, and that allow a more intuitive way to express complex search queries. One central research objective, amongst others, is to investigate approaches for analyzing local patterns and create interactive exploration tools to make comparisons of local patterns more efficient. Interactive lens techniques are efficient exploration tools for analyzing local areas of interest, which can be used to interactively select a portion of data on which the analysis is performed. I will discuss the use of interactive lens techniques for local patterns in various data structures and show how they open up new opportunities for local pattern analysis. Moreover, I present visual guidance concepts that support the user in various analytical tasks, such as query formulation, data selection and pattern exploration. I will consider novel sensor technologies like eye tracking for the guidance process and utilize gaze information for pattern recommendation in large data sets. Finally, this thesis discusses the benefits and challenges of the proposed methods and outlines future directions.
Mitigating Soft-Biometric Driven Bias and Privacy Concerns in Face Recognition Systems

Entschärfung soft-biometrischer Bedenken hinsichtlich der Privatsphäre und Voreingenommenheit von Gesichtserkennungssystemen
Zur Erlangung des akademischen Grades Doktor-Ingenieur (Dr.-Ing.) genehmigte Dissertation von Philipp Terhörst aus Bocholt, Germany
Tag der Einreichung: 24.02.2021, Tag der Prüfung: 20.04.2021

1. Gutachten: Prof. Dr. Arjan Kuijper
2. Gutachten: Prof. Dr. Dieter W. Fellner
3. Gutachten: Prof. Vitomir Štruc
Darmstadt
ABSTRACT

Biometric verification refers to the automatic verification of a person's identity based on their behavioural and biological characteristics. Among various biometric modalities, the face is one of the most widely used since it is easily acquirable in unconstrained environments and provides a strong uniqueness. In recent years, face recognition systems spread world-wide and are increasingly involved in critical decision-making processes such as finance, public security, and forensics. The growing effect of these systems on everybody's daily life is driven by the strong enhancements in their recognition performance.

The advances in extracting deeply-learned feature representations from face images enabled the high-performance of current face recognition systems. However, the success of these representations came at the cost of two major discriminatory concerns. These concerns are driven by soft-biometric attributes such as demographics, accessories, health conditions, or hairstyles.

The first concern is about bias in face recognition. Current face recognition solutions are built on representation-learning strategies that optimize total recognition performance. These learning strategies often depend on the underlying distribution of soft-biometric attributes in the training data. Consequently, the behaviour of the learned face recognition solutions strongly varies depending on the individual's soft-biometrics (e.g. based on the individual's ethnicity).

The second concern tackles the user's privacy in such systems. Although face recognition systems are trained to recognize individuals based on face images, the deeply-learned representation of an individual contains more information than just the person's identity. Privacy-sensitive information such as demographics, sexual orientation, or health status, is encoded in such representations. However, for many applications, the biometric data is expected to be used for recognition only and thus, raises major privacy issues. The unauthorized access of such individual's privacy-sensitive information can lead to unfair or unequal treatment of this individual.

Both issues are caused by the presence of soft-biometric attribute information in the face images. Previous research focused on investigating the influence of demographic attributes on both concerns. Consequently, the solutions from previous works focused on the mitigation of demographic-concerns only as well. Moreover, these approaches require
ABSTRACT

computationally-heavy retraining of the deployed face recognition model and thus, are hardly-integrable into existing systems.

Unlike previous works, this thesis proposes solutions to mitigating soft-biometric driven bias and privacy concerns in face recognition systems that are easily-integrable in existing systems and aim for more comprehensive mitigation, not limited to pre-defined demographic attributes. This aims at enhancing the reliability, trust, and dissemination of these systems.

The first part of this work provides in-depth investigations on soft-biometric driven bias and privacy concerns in face recognition over a wide range of soft-biometric attributes. The findings of these investigations guided the development of the proposed solutions. The investigations showed that a high number of soft-biometric and privacy-sensitive attributes are encoded in face representations. Moreover, the presence of these soft-biometric attributes strongly influences the behaviour of face recognition systems. This demonstrates the strong need for more comprehensive privacy-enhancing and bias-mitigating technologies that are not limited to pre-defined (demographic) attributes.

Guided by these findings, this work proposes solutions for mitigating bias in face recognition systems and solutions for the enhancement of soft-biometric privacy in these systems. The proposed bias-mitigating solutions operate on the comparison- and score-level of recognition system and thus, can be easily integrated. Incorporating the notation of individual fairness, that aims at treating similar individuals similarly, strongly mitigates bias of unknown origins and further improves the overall-recognition performance of the system.

The proposed solutions for enhancing the soft-biometric privacy in face recognition systems either manipulate existing face representations directly or changes the representation type including the inference process for verification. The manipulation of existing face representations aims at directly suppressing the encoded privacy-risk information in an easily-integrable manner. Contrarily, the inference-level solutions indirectly suppress this privacy-risk information by changing the way of how this information is encoded.

To summarise, this work investigates soft-biometric driven bias and privacy concerns in face recognition systems and proposed solutions to mitigate these. Unlike previous works, the proposed approaches are (a) highly effective in mitigating these concerns, (b) not limited to the mitigation of concerns origin from specific attributes, and (c) easily-integrable into existing systems. Moreover, the presented solutions are not limited to face biometrics and thus, aim at enhancing the reliability, trust, and dissemination of biometric systems in general.
THE WINNERS OF THE BEST THESIS AWARD WILL BE ANNOUNCED AT THE COMPUTER GRAPHICS NIGHT EVENT.
THE JUDGING PROCESS

The judges select the bachelor’s and master’s theses they consider the best of those submitted for the Visual Computing Cluster between November 2020 and October 2021. These winning theses demonstrate high quality both with respect to scientific achievement and presentation.

The theses are chosen by the judges in collaboration with the theses supervisors. As the scope of visual computing is very broad, the winning theses are not ranked.

THE PRIZE

The winners receive a certificate, a book, and a trip to a Eurographics or equivalent leading visual computing conference, agreed by the winners with the judges.
BEST PAPER AWARD

Graduation  Best Thesis Award  Best Paper Award  Best Industrial Project Award

THE FOLLOWING SECTION HIGHLIGHTS ALL NOMINATED PUBLICATIONS AND WORKS WORTHY OF DISTINCTION. THE WINNERS OF THE BEST PAPER AWARD WILL BE ANNOUNCED AT THE COMPUTER GRAPHICS NIGHT EVENT.
PANEL OF JUDGES
BEST PAPER AWARD

THE JUDGING PROCESS

The chair of the independent panel of judges receives forty selected papers for the Visual Computing Cluster in 2021 considered to be the best by the Fraunhofer IGD competence center heads and the professors of affiliated university groups. These papers span a wide range of research fields, including human-computer interaction, computer graphics, computer vision, modeling, visual search and analysis, and visual inference, medical computing, and simulation.

The first task is to classify the papers into categories according to their impact on business, science, or society. Each paper is initially ranked by each judge based on three scores: 1) how relevant the paper is to the corresponding category, 2) the quality of the paper, and 3) how familiar the judge is with the topic (confidence value).

In the second step, scores for all papers are collected from all the judges, and the papers are each assigned to at least one category. Then the three best-ranked papers within an individual category are nominated. In addition, any papers that score at least one ‘outstanding’ grading by one of the judges are nominated.

Finally, the judges meet to discuss all nominated papers. Two papers are selected as ‘honorable mention’ papers and one paper is selected as the ‘best paper’ for each of the categories.

THE JUDGES

Prof. R. Klein
Univ. Bonn (chair)

Prof. J. Gall
Univ. Bonn

Prof. G. Zachmann
Univ. Bremen

Prof. H. Müller
TU Dortmund

Prof. H. Lentsch
Univ. Tübingen

THE PRIZE

The honorable mentions and the best paper authors receive a certificate. The authors of the best paper in the categories “Impact on business,” “Impact on science,” “Impact on society” also receive a book and a monetary prize.
IMPACT ON BUSINESS

Terhörst, Philipp (Fraunhofer IGD / TU Darmstadt GRIS); Kolf, Jan Niklas (TU Darmstadt GRIS); Damer, Naser (Fraunhofer IGD / TU Darmstadt GRIS); Kirchbuchner, Florian (Fraunhofer IGD / TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC): SER-FIQ: Unsupervised Estimation of Face Image Quality Based on Stochastic Embedding Robustness. In: 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition

Boutros, Fadi (Fraunhofer IGD / TU Darmstadt GRIS); Damer, Naser (Fraunhofer IGD / TU Darmstadt GRIS); Raja, Kiran (NTNU, Gjovik, Norway); Ramachandra, Raghavendra (NTNU, Gjovik, Norway); Kirchbuchner, Florian (TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC): Iris and Periocular Biometrics for Head Mounted Displays: Segmentation, Recognition, and Synthetic Data Generation. In: Image and Vision Computing

Kunkel, Julian M. (Univ. of Reading, England); Jumah, Nabeeh (Univ. Hamburg); Novikova, Anastasia (Fraunhofer IGD); Ludwigs, Thomas (DKRZ, Hamburg); Yashiro, Hisashi (RIKEN, Tokyo); Maruyama, Naoya (RIKEN, Tokyo); Wahib, Mohamed (AIST Tokyo); Thuburn, John (Univ. of Exeter): AIMES: Advanced Computation and I/O Methods for Earth-System Simulations. In: Software for Exascale Computing – SPPEXA 2016-2019

Kügler, David (TU Darmstadt GRIS / DZNE, Bonn); Uecker, Marc (TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC); Mukhopadhyay, Anirban (TU Darmstadt GRIS): AutoSNAP: Automatically Learning Neural Architectures for Instrument Pose Estimation. In: Medical Image Computing and Computer Assisted Intervention – MICCAI 2020

Frank, Sebastian (Fraunhofer IGD / TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC): Privacy by Design: Analysis of Capacitive Proximity Sensing as System of Choice for Driver Vehicle Interfaces. In: HCI International 2020 – Late Breaking Papers

Baumgartl, Tom (TU Darmstadt GRIS); Petzold, Markus (Univ. Hospital Heidelberg); Wunderlich, Marcel (TU Darmstadt GRIS); Höhn, Markus (TU Darmstadt GRIS); Archambault, Daniel (Swansea Univ.); Lieser, M. (Univ. Hospital Heidelberg); Dalpke, Alexander (TU Dresden); Scheithauer, Simone (Univ. Göttingen); Marschollek, Michael (Peter L. Reichertz Institute for Medical Informatics); Eichel, Vanessa M. (Univ. Hospital Heidelberg); Mutters, Nico T. (Univ. Hospital Heidelberg); Landesberger, Tatiana von (TU Darmstadt GRIS / Univ. of Rostock): In Search of Patient Zero: Visual Analytics of Pathogen Transmission Pathways in Hospitals. In: IEEE Transactions on Visualization and Computer Graphics
FINAL NOMINATIONS
BEST PAPER AWARD
Ströter, Daniel (TU Darmstadt GRIS); Mueller-Roemer, Johannes (Fraunhofer IGD / TU Darmstadt GRIS); Stork, André (Fraunhofer IGD / TU Darmstadt GRIS); Fellner, Dieter W. (Fraunhofer IGD / TU Darmstadt GRIS / TU Graz CGV): **OLBVH: Octree Linear Bounding Volume Hierarchy for Volumetric Meshes.** In: The Visual Computer

Terhörst, Philipp (Fraunhofer IGD / TU Darmstadt GRIS); Kolf, Jan Niklas (TU Darmstadt GRIS); Damer, Naser (Fraunhofer IGD / TU Darmstadt GRIS); Kirchbuchner, Florian (Fraunhofer IGD / TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC): **SER-FIQ: Unsupervised Estimation of Face Image Quality Based on Stochastic Embedding Robustness.** In: 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition

Kloiber, Simon (TU Graz CGV); Settgast, Volker (Fraunhofer Austria); Schinko, Christoph (Fraunhofer Austria); Weinzerl, Martin (AVL List GmbH, Graz); Fritz, Johannes (AVL List GmbH, Graz); Schreck, Tobias (TU Graz CGV); Preiner, Reinhold (TU Graz CGV): **Immersive Analysis of User Motion in VR Applications.** In: The Visual Computer

Kügler, David (TU Darmstadt GRIS / DZNE, Bonn); Uecker, Marc (TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC); Mukhopadhyay, Anirban (TU Darmstadt GRIS): **AutoSNAP: Automatically Learning Neural Architectures for Instrument Pose Estimation.** In: Medical Image Computing and Computer Assisted Intervention – MICCAI 2020

Mahajan, Shweta (TU Darmstadt Visual Inference); Gurevych, Iryna (TU Darmstadt); Roth, Stefan (TU Darmstadt Visual Inference): **Latent Normalizing Flows for Many-to-Many Cross-Domain Mappings.** In: Eighth International Conference on Learning Representations

Dong, Jianxu (Max Planck Institute for Informatics); Roth, Stefan (TU Darmstadt Visual Inference); Schiele, Bernt (Max Planck Institute for Informatics): **Deep Wiener Deconvolution: Wiener Meets Deep Learning for Image Deblurring.** In: Advances in Neural Information Processing Systems
FINAL NOMINATIONS
BEST PAPER AWARD
Kügler, David (TU Darmstadt GRIS / DZNE, Bonn); Uecker, Marc (TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC); Mukhopadhyay, Anirban (TU Darmstadt GRIS): **AutoSNAP: Automatically Learning Neural Architectures for Instrument Pose Estimation.** In: Medical Image Computing and Computer Assisted Intervention – MICCAI 2020

Haescher, Marian (Fraunhofer IGD / Univ. of Rostock); Chodan, Wencke (Fraunhofer IGD); Höpfner, Florian (Fraunhofer IGD); Bieber, Gerald (Fraunhofer IGD); Aehnelt, Mario (Fraunhofer IGD); Srinivasan, Karthik (Next Step Dynamics AB, SE, Germany); Alt Murphy, Margit (Univ. of Gothenburg): **Automated Fall Risk Assessment of Elderly Using Wearable Devices.** In: Journal of Rehabilitation and Assistive Technologies Engineering (RATE)

Baumgartl, Tom (TU Darmstadt GRIS); Petzold, Markus (Univ. Hospital Heidelberg); Wunderlich, Marcel (TU Darmstadt GRIS); Höhn, Markus (TU Darmstadt GRIS); Archambault, Daniel (Swansea Univ.); Lieser, M. (Univ. Hospital Heidelberg); Dalpke, Alexander (TU Dresden); Scheithauer, Simone (Univ. Göttingen); Marschollek, Michael (Peter L. Reichertz Institute for Medical Informatics); Eichel, V. M. (Univ. Hospital Heidelberg); Mutters, Nico T. (Univ. Hospital Heidelberg); Landesberger, Tatiana von (TU Darmstadt GRIS / Univ. of Rostock): **In Search of Patient Zero: Visual Analytics of Pathogen Transmission Pathways in Hospitals.** In: IEEE Transactions on Visualization and Computer Graphics

Terhörst, Philipp (Fraunhofer IGD / TU Darmstadt GRIS); Kolf, Jan Niklas (TU Darmstadt GRIS); Damer, Naser (Fraunhofer IGD / TU Darmstadt GRIS); Kirchbuchner, Florian (Fraunhofer IGD / TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC): **Face Quality Estimation and Its Correlation to Demographic and Non-Demographic Bias in Face Recognition.** In: IJCB 2020. IEEE / IARP International Joint Conference on Biometrics

Terhörst, Philipp (Fraunhofer IGD / TU Darmstadt GRIS); Kolf, Jan Niklas (TU Darmstadt GRIS); Damer, Naser (Fraunhofer IGD / TU Darmstadt GRIS); Kirchbuchner, Florian (Fraunhofer IGD / TU Darmstadt GRIS); Kuijper, Arjan (Fraunhofer IGD / TU Darmstadt MAVC): **Post-comparison Mitigation of Demographic Bias in Face Recognition Using Fair Score Normalization.** In: Pattern Recognition Letters

Schufrin, Marija (Fraunhofer IGD); Reynolds, Steven Lamarr (Fraunhofer IGD); Kuijper, Arjan (Fraunhofer IGD); Kohlhammer, Jörn (Fraunhofer IGD): **A Visualization Interface to Improve the Transparency of Collected Personal Data on the Internet.** In: IEEE Transactions on Visualization and Computer Graphics
THE WINNERS OF THE BEST INDUSTRIAL PROJECT AWARD WILL BE ANNOUNCED AT THE COMPUTER GRAPHICS NIGHT EVENT.
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THE JUDGING PROCESS

The judges call for nominations for the Best Industrial Project Award. The submitted entries are evaluated in terms of economic criteria, such as project value/scope, the potential for follow-up projects, and technologies developed for other departments. Other aspects, including customer satisfaction, innovation, and utilization of publicly funded projects, are also taken into account.

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Up to three winning projects receive a certificate and monetary prizes for their competence center.

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OUR THANKS
TO OUR COLLEAGUES
FOR THEIR
EXCELLENT WORK AND
OUTSTANDING ACHIEVEMENTS
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