

3d Face Reconstruction University Of Nottingham

The promotion of CCTV surveillance and identity cards, along with ever heightened security at airports, immigration control and institutional access, has seen a dramatic increase in the use of automated and manual recognition. In addition, several recent disasters have highlighted the problems and challenges associated with current disaster victim identification. Discussing the latest advances and key research into identification from the face and skull, this book draws together a wide range of elements relating to craniofacial analysis and identification. It examines all aspects of facial identification, including the determination of facial appearance from the skull, comparison of the skull with the face and the verification of living facial images. With sections covering the identification of the dead and of the living, it provides a valuable review of the current state of play along with the latest research advances in this constantly evolving field.

3D face reconstruction and tracking has become an important research topic during the past few decades in both computer graphics and computer vision. Researchers are seeking for a method to model the human face using a low cost device with high quality. Currently, face models can be captured by expensive active sensor-like laser scanning; however, this sensor technology is not affordable for everyone and experiments must be conducted under certain conditions. In our thesis, we present an automatic 3D face reconstruction and pose estimation framework using a consumer depth camera. Our method does not require any prior face model database. We acquire location of human face part using regular face detector, and in order to generate a high quality face model, we integrate and register information from multiple frames together, which allows detection of noise. In addition, by detecting 2D landmark information provided by the RGB image, we are able to find correspondence in the 3D model. Results are demonstrated by visual inspection. Future application for our research may involve game design and face avatar generation.

3D image reconstruction is used in many fields, such as medicine, entertainment, and computer science. This highly demanded process comes with many challenges, such as images becoming blurry by atmospheric turbulence, getting snowed with noise, or becoming damaged within foreign regions. It is imperative to remain well-informed with the latest research in this field. Recent Advances in 3D Imaging, Modeling, and Reconstruction is a collection of innovative research on the methods and common techniques of image reconstruction as well as the accuracy of these methods. Featuring coverage on a wide range of topics such as ray casting, holographic techniques, and machine learning, this publication is ideally designed for graphic designers, computer engineers, medical professionals, robotics engineers, city planners, game developers, researchers, academicians, and students.

24th European Conference on Artificial Intelligence, 29 August-8 September 2020, Santiago de Compostela, Spain - Including 10th Conference on Prestigious Applications of Artificial Intelligence (PAIS 2020)

Fast Model-based 3D Human Face Reconstruction from Silhouettes of Multiple Views

Improved 3D Facial Reconstruction of Human Face Using Shape from Shading

7th Asian Conference on Computer Vision, Hyderabad, India, January 13-16, 2006, Proceedings

**Handbook of Pattern Recognition and Computer Vision
Computational Science - ICCS 2021**

This book presents the thoroughly revised versions of lectures given by leading researchers during the Workshop on Advanced 3D Imaging for Safety and Security in conjunction with the International Conference on Computer Vision and Pattern Recognition CVPR 2005, held in San Diego, CA, USA in June 2005. It covers the current state of the art in 3D imaging for safety and security.

The eight-volume set comprising LNCS volumes 9905-9912 constitutes the refereed proceedings of the 14th European Conference on Computer Vision, ECCV 2016, held in Amsterdam, The Netherlands, in October 2016. The 415 revised papers presented were carefully reviewed and selected from 1480 submissions. The papers cover all aspects of computer vision and pattern recognition such as 3D computer vision; computational photography, sensing and display; face and gesture; low-level vision and image processing; motion and tracking; optimization methods; physics-based vision, photometry and shape-from-X; recognition: detection, categorization, indexing, matching; segmentation, grouping and shape representation; statistical methods and learning; video: events, activities and surveillance; applications. They are organized in topical sections on detection, recognition and retrieval; scene understanding; optimization; image and video processing; learning; action, activity and tracking; 3D; and 9 poster sessions.

The two volume set LNCS 4841 and LNCS 4842 constitutes the refereed proceedings of the Third International Symposium on Visual Computing, ISVC 2007, held in Lake Tahoe, NV, USA, in November 2007. The 77 revised full papers and 42 poster papers presented together with 32 full and five poster papers of six special tracks were carefully reviewed and selected. The papers cover the four main areas of visual computing: vision, graphics, visualization, and virtual reality.

Computer Vision - ECCV 2016

21st International Conference, Krakow, Poland, June 16-18, 2021, Proceedings, Part V

Craniofacial Identification

Monocular Visual Scene Analysis

4th International Visual Informatics Conference, IVIC 2015, Bangi, Malaysia, November 17-19, 2015, Proceedings

16th European Conference, Glasgow, UK, August 23-28, 2020, Proceedings, Part VIII

3D face reconstruction and facial expression analytics using 3D facial data are new and hot research topics in computer graphics and computer vision. In this

proposal, we first review the background knowledge for emotion analytics using 3D morphable face model, including geometry feature-based methods, statistic model-based methods and more advanced deep learning-based methods. Then, we introduce a novel 3D face modeling and reconstruction solution that robustly and accurately acquires 3D face models from a couple of images captured by a single smartphone camera. Two selfie photos of a subject taken from the front and side are used to guide our Non-Negative Matrix Factorization (NMF) induced part-based face model to iteratively reconstruct an initial 3D face of the subject. Then, an iterative detail updating method is applied to the initial generated 3D face to reconstruct facial details through optimizing lighting parameters and local depths. Our iterative 3D face reconstruction method permits fully automatic registration of a part-based face representation to the acquired face data and the detailed 2D/3D features to build a high-quality 3D face model. The NMF part-based face representation learned from a 3D face database facilitates effective global and adaptive local detail data fitting alternatively. Our system is flexible and it allows users to conduct the capture in any uncontrolled environment. We demonstrate the capability of our method by allowing users to capture and reconstruct their 3D faces by themselves. Based on the 3D face model reconstruction, we can analyze the facial expression and the related emotion in 3D space. We present a novel approach to analyze the facial expressions from images and a quantitative information visualization scheme for exploring this type of visual data.

The two-volume set LNCS 13141 and LNCS 13142 constitutes the proceedings of the 28th International Conference on MultiMedia Modeling, MMM 2022, which took place in Phu Quoc, Vietnam, during June 6–10, 2022. The 107 papers presented in these proceedings were carefully reviewed and selected from a total of 212 submissions. They focus on topics related to multimedia content analysis; multimedia signal processing and communications; and multimedia applications and services.

This book constitutes the refereed proceedings of the 38th Computer Graphics International Conference, CGI 2021, held virtually in September 2021. The 44 full papers presented together with 9 short papers were carefully reviewed and selected from 131 submissions. The papers are organized in the following topics: computer animation; computer vision; geometric computing; human poses and gestures; image processing; medical imaging; physics-based simulation; rendering and textures; robotics and vision; visual analytics; VR/AR; and engage.

Computer Vision – ACCV 2020

ECAI 2020

3D Human Face Reconstruction and 2D Appearance Synthesis

3d Facial Reconstruction of a 5,500 Year Old Skull from Ballynahatty

15th Asian Conference on Computer Vision, Kyoto, Japan, November 30 – December 4, 2020, Revised Selected Papers, Part V

Recent Advances in 3D Imaging, Modeling, and Reconstruction

This book constitutes the refereed proceedings of the Fourth International Conference on Advances in Visual Informatics, IVIC 2015, held in Bangi, Malaysia, in November 2015. The

five keynotes and 45 papers presented were carefully reviewed and selected from 82 initial submissions. The papers are organized in four tracks on visualization and big data; machine learning and computer vision; computer graphics; as well as virtual reality.

This book presents the proceedings of the Joint Conference of the Asian Council on Ergonomics and Design and Southeast Asian Network of Ergonomics Societies (ACED SEANES), held on December 2-4, 2020. By highlighting the latest theories and models, as well as cutting-edge technologies and applications, and by combining findings from a range of disciplines including engineering, design, robotics, healthcare, management, computer science, human biology and behavioral science, it provides researchers and practitioners alike with a comprehensive, timely guide on human factors and ergonomics. It also offers an excellent source of innovative ideas to stimulate future discussions and developments aimed at applying knowledge and techniques to optimize system performance, while at the same time promoting the health, safety and wellbeing of individuals. The proceedings include papers from researchers and practitioners, scientists and physicians, institutional leaders, managers and policy makers that contribute to constructing the Human Factors and Ergonomics approach across a variety of methodologies, domains and productive sectors.

The six volume set of LNCS 12622-12627 constitutes the proceedings of the 15th Asian Conference on Computer Vision, ACCV 2020, held in Kyoto, Japan, in November/ December 2020.* The total of 254 contributions was carefully reviewed and selected from 768 submissions during two rounds of reviewing and improvement. The papers focus on the following topics: Part I: 3D computer vision; segmentation and grouping Part II: low-level vision, image processing; motion and tracking Part III: recognition and detection; optimization, statistical methods, and learning; robot vision Part IV: deep learning for computer vision, generative models for computer vision Part V: face, pose, action, and gesture; video analysis and event recognition; biomedical image analysis Part VI: applications of computer vision; vision for X; datasets and performance analysis *The conference was held virtually.

4th Chinese Conference, PRCV 2021, Beijing, China, October

29 – November 1, 2021, Proceedings, Part II

Advances in Visual Computing

Reconstruction of the Unknown Face : a Forensic Case

14th European Conference, Amsterdam, The Netherlands,

October 11–14, 2016, Proceedings, Part V

**An Accurate and Efficient Method for Reconstruction of 3D
Faces from Stereo Images**

From Image Sequence to Frontal Image

This book constitutes the refereed post-conference proceedings of the 15th EAI International Conference on Quality, Reliability, Security and Robustness in Heterogeneous Networks, QShine 2020, held in November 2020. Due to COVID-19 pandemic the conference was held virtually. The 19 revised full papers were carefully reviewed and selected from 49 submissions. The papers are organized thematically in tracks on Network Reliability and Security an Emerging Applications.

This book emphasizes recent advances in the creation of biometric identification systems for various applications in the field of human activity. The book displays the problems that arise in modern systems of biometric identification, as well as the level of development and prospects for the introduction of biometric technologies. The authors classify biometric technologies into two groups, distinguished according to the type of biometric characteristics used. The first group uses static biometric parameters: fingerprints, hand geometry, retina pattern, vein pattern on the finger, etc. The second group uses dynamic parameters for identification: the dynamics of the reproduction of a signature or a handwritten keyword, voice, gait, dynamics of work on the keyboard, etc. The directions of building information systems that use automatic personality identification based on the analysis of unique biometric characteristics of a person are discussed. The book is intended for professionals working and conducting research in the field of intelligent information processing, information security, and robotics and in the field of real-time identification systems. The book contains examples and problems/solutions throughout.

This book presents the proceedings of the 24th European Conference on Artificial Intelligence (ECAI 2020), held in Santiago de Compostela, Spain, from 29 August to 8 September 2020. The conference was postponed from June, and much of it conducted online due to the COVID-19 restrictions. The conference is one of the principal occasions for researchers and practitioners of AI to meet and discuss the latest trends and challenges in all fields of AI and to demonstrate innovative applications and uses of advanced AI technology. The book also includes the proceedings of the 10th Conference on Prestigious Applications of Artificial Intelligence (PAIS 2020) held at the same time. A record number of more than 1,700 submissions was received for ECAI 2020, of which 1,443 were reviewed. Of these, 361 full-papers and 36 highlight papers were accepted (an acceptance rate of 25% for full-papers and 45% for highlight papers). The book is divided into three sections: ECAI full papers; ECAI highlight papers; and PAIS papers. The topics of these papers cover all aspects of AI, including Agent-based and Multi-agent Systems; Computational Intelligence; Constraints and Satisfiability; Games and Virtual Environments; Heuristic Search; Human Aspects in AI; Information Retrieval and Filtering; Knowledge Representation and Reasoning; Machine Learning; Multidisciplinary Topics and Applications; Natural Language Processing; Planning

and Scheduling; Robotics; Safe, Explainable, and Trustworthy AI; Semantic Technologies; Uncertainty in AI; and Vision. The book will be of interest to all those whose work involves the use of AI technology.

16th EAI International Conference, QShine 2020, Virtual Event, November 29-30, 2020, Proceedings

Innovations and Advances in Computer Sciences and Engineering

Third International Symposium, ISVC 2007, Lake Tahoe, NV, USA, November 26-28, 2007, Proceedings, Part I

Interactivity and the Future of the Human-Computer Interface

Automatic 3D Face Reconstruction and Tracking Using Consumer RGB-D Camera

28th International Conference, MMM 2022, Phu Quoc, Vietnam, June 6-10, 2022, Proceedings, Part II

Innovations and Advances in Computer Sciences and Engineering includes a set of rigorously reviewed world-class manuscripts addressing and detailing state-of-the-art research projects in the areas of Computer Science, Software Engineering, Computer Engineering, and Systems Engineering and Sciences. **Innovations and Advances in Computer Sciences and Engineering** includes selected papers from the conference proceedings of the International Conference on Systems, Computing Sciences and Software Engineering (SCSS 2008) which was part of the International Joint Conferences on Computer, Information and Systems Sciences and Engineering (CISSE 2008).

This book constitutes the refereed proceedings of the Third International Workshop on Analysis and Modelling of Faces and Gestures, AMFG 2007, held within the scope of ICCV 2007, the International Conference on Computer Vision. The papers review the status of recognition, analysis and modeling of face, gesture, activity, and behavior. Topics addressed include feature representation, 3D face, video-based face recognition, facial motion analysis, and sign recognition.

This book constitutes the thoroughly refereed conference proceedings of the International Workshop on Face and Facial Expression Recognition from Real World Videos in conjunction with the 22nd International Conference on Pattern Recognition held in Stockholm, Sweden, in August 2014. The 11 revised full papers were carefully reviewed and selected from numerous submissions and cover topics such as Face Recognition, Face Alignment, Facial Expression Recognition and Facial Images.

Computer Vision – ECCV 2020

Biometric Identification Technologies Based on Modern Data Mining Methods

Analysis and Modeling of Faces and Gestures

Third International Workshop, AMFG 2007 Rio de Janeiro, Brazil, October 20, 2007 Proceedings

3D Face Reconstruction and Emotion Analytics with Part-based Morphable Models

38th Computer Graphics International Conference, CGI 2021, Virtual Event, September 6-10, 2021, Proceedings

In this thesis we explore how multiple images from a sequence which individually are considered not usable for a forensic procedure, can be combined to reconstruct a face model that is usable in a forensic face comparison procedure. The best way to improve the current forensic face comparison procedure is to incorporate multiple images in the reconstruction process to reconstruct a high quality frontal view of the face. Based on the available literature and the forensic setting, we chose a structure from motion approach based on landmarks, which seemed the most suitable method for

forensic face recognition. The structure from motion method uses landmarks in multiple images to reconstruct the shape of the face and estimates the rotation and translation of the face simultaneously. In the proposed shape reconstruction algorithm, the initial reconstruction is based on a pair of frames with a suitable 2D reprojection error. In an iterative procedure multiple frames were added to improve the 3D reconstruction and the estimates of the rotation and translation of the face in each frame. After the reconstruction of the shape, we triangulated the landmark model to obtain a surface for the texture of the face. Based on the Lambertian illumination model, we corrected and combined the texture from multiple views. The obtained 3D reconstruction is coarse. In the final proposed method we revised the reconstruction of the texture and incorporated a dense shape reconstruction method into the proposed reconstruction method. The dense reconstruction method used the coarse shape reconstruction method as initialization, and creates a dense 3D face reconstruction. The dense reconstruction method is based on an iterative procedure where the normals of the reconstructed face are used to optimize both the shape and the texture of the face. The reconstructed dense 3D models can be used to render frontal faces or faces under small pose. Additional recognition experiments showed that the reconstructed frontal faces outperformed the original non-frontal images in most of the cases. The proposed reconstruction method is unbiased by design and is therefore suitable in a forensic face comparison process.

The two-volume set LNCS 7066 and LNCS 7067 constitutes the proceedings of the Second International Visual Informatics Conference, IVIC 2011, held in Selangor, Malaysia, during November 9-11, 2011. The 71 revised papers presented were carefully reviewed and selected for inclusion in these proceedings. They are organized in topical sections named computer vision and simulation; virtual image processing and engineering; visual computing; and visualisation and social computing. In addition the first volume contains two keynote speeches in full paper length, and one keynote abstract.

In this thesis, we introduce a novel algorithm for reconstructing the 3D shape and texture model of human faces from two stereo images which are captured from calibrated cameras. Our approach works in a sparse to dense manner: we first build a coarse shape estimation based on 3D keypoints, and then use a linear morphable model to efficiently match the detailed shape and texture. The features used for the fitting processes are selected with the guidance of the quantitative evaluation of a state-of-the-art reconstruction algorithm. In our new direct evaluation method, the reconstructed 3D faces are first aligned to the ground truth and then the shape difference between the two 3D faces is described by signal-to-noise ratio and error maps illustrating the reconstruction errors on corresponding vertices. This local error information will be used to resample the reference frame whose vertices' coordinates stack up to be the feature vectors for face fitting. Compared with the previous works, our

algorithm can reconstruct the 3D face shape at a speed comparable with that of the fastest algorithm available, but gives a higher accuracy. It can also recover the more complete and realistic looking texture. Our results show that the new algorithm possesses significant characteristics of a 3D face model reconstruction system, and is especially useful for face recognition and animation applications in practice.

Face and Facial Expression Recognition from Real World Videos

Intelligence and Safety for Humanoid Robots: Design, Control, and Applications

MultiMedia Modeling

Convergence of Ergonomics and Design

Three Dimensional Human Face Reconstruction and Expression Modelling

Advances in Visual Informatics

The six-volume set LNCS 12742, 12743, 12744, 12745, 12746, and 12747 constitutes the proceedings of the 21st International Conference on Computational Science, ICCS 2021, held in Krakow, Poland, in June 2021.* The total of 260 full papers and 57 short papers presented in this book set were carefully reviewed and selected from 635 submissions. 48 full and 14 short papers were accepted to the main track from 156 submissions; 212 full and 43 short papers were accepted to the workshops/ thematic tracks from 479 submissions. The papers were organized in topical sections named: Part I: ICCS Main Track Part II: Advances in High-Performance Computational Earth Sciences: Applications and Frameworks; Applications of Computational Methods in Artificial Intelligence and Machine Learning; Artificial Intelligence and High-Performance Computing for Advanced Simulations; Biomedical and Bioinformatics Challenges for Computer Science Part III: Classifier Learning from Difficult Data; Computational Analysis of Complex Social Systems; Computational Collective Intelligence; Computational Health Part IV: Computational Methods for Emerging Problems in (dis-)Information Analysis; Computational Methods in Smart Agriculture; Computational Optimization, Modelling and Simulation; Computational Science in IoT and Smart Systems Part V: Computer Graphics, Image Processing and Artificial Intelligence; Data-Driven Computational Sciences; Machine Learning and Data Assimilation for Dynamical Systems; MeshFree Methods and Radial Basis Functions in Computational Sciences; Multiscale Modelling and Simulation Part VI: Quantum Computing Workshop; Simulations of Flow and Transport: Modeling, Algorithms and Computation; Smart Systems: Bringing Together Computer Vision, Sensor Networks and Machine Learning; Software Engineering for Computational Science; Solving Problems with Uncertainty; Teaching Computational Science; Uncertainty Quantification for Computational Models *The conference was held virtually.

The usability and design in technological systems is imperative due to their abundance in numerous professional industries. Computer interfaces have seen significant advancement in their design and development as they have become an integral part of today's society. As humans continue to interact with technology on a regular basis, it is essential for professionals, professors, and students to keep pace with innovative research on interface design and the various applications interfaces have in professional fields. Interactivity and the Future of the Human-Computer Interface is a collection of innovative research on the development and application of interfaces in today's modern society and the generational implications for design of human and technology interaction. While highlighting

topics including digital gaming, augmented reality, and e-learning, this book is ideally designed for educators, developers, web designers, researchers, technology specialists, scientists, and students seeking current research on modern advancements and applications in human-computer interaction.

Personalized 3D face reconstruction has produced exciting results over the past few years. However, traditional methods usually require complicated setups or controlled environments to get the detailed shape of a person's face. Most methods focus solely on the face area and mask out the hair due to the non-rigid nature and complicated layer structure of hairstyles. In this work, we explore data-driven approaches to reconstruct a person's 3D face or head including the hair from the devices that can be easily accessed by everyone. The first part of our work introduces an algorithm that takes a single frame of a person's face from a commercial depth camera Kinect and produces a high-resolution 3D mesh of the input leveraging a large research dataset of 3D face meshes. We divide the input depth frame into semantically significant regions (eyes, nose, mouth, cheeks) and search the database for the best matching shape per region. We further combine the input depth frame with the matched database shapes into a single mesh that results in a high-resolution shape of the input person. In order to free people from the capturing session, the larger portion of this thesis focuses on reconstructing not only the face, but also the rest of the head using in-the-wild image collections and videos. We first introduce a boundary-value growing algorithm to model a person's head from the person's large collection of photo data. We target reconstruction of the rough shape of the head. Our method is to gradually "grow" the head mesh starting from the frontal face and extending to the rest of the views using photometric stereo constraints. Results on photos of celebrities downloaded from the Internet are given. However, in this algorithm, we have not reconstructed a complete head model and a specific model of the hair is lacked. We further utilize a person's in-the-wild video to recover the full head model considering the multi-view information and hairstyle consistency across video frames. Given a video of a person's head, e.g., a TV interview, our method automatically reconstructs a 3D hair model leveraging a 3D hairstyle database. The resultant 3D hair model can be later deformed to change the hair shape, to make it brighter or darker. Our head reconstruction also includes facial modeling from the video, which is used to combine with the hair model. The method is completely automatic and requires as input only a single video taken "in the wild", found as is on the web or a selfie video taken by a smart phone. We demonstrate the capability of our method on a variety of celebrity videos and selfie videos, as well as comparing to the state of the art.

3D Face Reconstruction from Front and Profile Image

Advances in Computer Graphics

Visual Informatics: Sustaining Research and Innovations

3D Face Reconstruction Using the Orthogonal Model to Approximate the Perspective Model

Proceedings of ACED SEANES 2020

Face Reconstruction by Deforming 3D Head Model

This unique books looks at a cost-efficient, fast and accurate means of facial reconstruction--from segmented, decomposed, or skeletal remains--using computer-graphic and computational means. Computer-Graphic Facial Reconstruction is designed as a valuable resource for those scientists designing

new research projects and protocols, as well as a practical handbook of methods and techniques for medico-legal practitioners who actually identify the faceless victims of crime. It looks at a variety of approaches: artificial intelligence using neural networks, case-based reasoning, Bayesian belief systems, along with a variety of imaging methods: radiological, CT, MRI and the use of imaging devices. The methods described in this book complement, or may even replace, the less-reliable, more traditional means of securing identification by presumptive means, i.e., recognition of clothing, personal effects and clay reconstruction. - Covers cutting-edge technologies in the context of historical forensic reconstruction methods - Features stellar authors from around the globe - Bridges the areas of computer graphics, animation, and forensic anthropology

The 30-volume set, comprising the LNCS books 12346 until 12375, constitutes the refereed proceedings of the 16th European Conference on Computer Vision, ECCV 2020, which was planned to be held in Glasgow, UK, during August 23-28, 2020. The conference was held virtually due to the COVID-19 pandemic. The 1360 revised papers presented in these proceedings were carefully reviewed and selected from a total of 5025 submissions. The papers deal with topics such as computer vision; machine learning; deep neural networks; reinforcement learning; object recognition; image classification; image processing; object detection; semantic segmentation; human pose estimation; 3d reconstruction; stereo vision; computational photography; neural networks; image coding; image reconstruction; object recognition; motion estimation.

Three dimensionality (3D) face modeling is an advanced and challenging feature for computer vision, and our goal is to implement it using various methods to bring 3D models closer to reality. Although many algorithms for construction of 3D model from two dimensional (2D) images are present, we propose a new approach using front and profile images with various image processing techniques for small computing devices. Basic methods such as resizing, denoise, overlay, blending etc. will be used for generation of the UV-map of texture, but as its core element, it relies on the Haar Cascade face detection algorithm. For structure or mesh, a shape detector with 68 landmarks to identify the shape of the face in the image and compare it with our own dataset for most similar structure. Though we have achieved good results from the proposed approach, there is potential to improve by making the model an identical replica.

*Unconstrained 3D Face Reconstruction from Photo Collections
International Workshop, Stockholm, Sweden, August 24, 2014, Revised Selected Papers*

Data-driven Approaches for Personalized Head Reconstruction

Computer-Graphic Facial Reconstruction

Pattern Recognition and Computer Vision

Second International Visual Informatics Conference, IVIC 2011, Selangor, Malaysia, November 9-11, 2011, Proceedings, Part II

Both pattern recognition and computer vision have experienced rapid progress in the

last twenty-five years. This book provides the latest advances on pattern recognition and computer vision along with their many applications. It features articles written by renowned leaders in the field while topics are presented in readable form to a wide range of readers. The book is divided into five parts: basic methods in pattern recognition, basic methods in computer vision and image processing, recognition applications, life science and human identification, and systems and technology. There are eight new chapters on the latest developments in life sciences using pattern recognition as well as two new chapters on pattern recognition in remote sensing. The 4-volume set LNCS 13019, 13020, 13021 and 13022 constitutes the refereed proceedings of the 4th Chinese Conference on Pattern Recognition and Computer Vision, PRCV 2021, held in Beijing, China, in October-November 2021. The 201 full papers presented were carefully reviewed and selected from 513 submissions. The papers have been organized in the following topical sections: Object Detection, Tracking and Recognition; Computer Vision, Theories and Applications, Multimedia Processing and Analysis; Low-level Vision and Image Processing; Biomedical Image Processing and Analysis; Machine Learning, Neural Network and Deep Learning, and New Advances in Visual Perception and Understanding.

Quality, Reliability, Security and Robustness in Heterogeneous Systems
Computer Vision - ACCV 2006
3D Imaging for Safety and Security
Saliency Detection and 3D Face Reconstruction Using GAN.