Science Newsletter

2024 Volume 3 (Total 3) *Website: http://lib.jsut.edu.cn/2018/1015/c5474a113860/page.htm,*
Mar. 2024

Contents

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Introduction:

There are 3 main elements in the Science Newsletter is composed. In the first part, we provide articles about central issues for each discipline in this university, and they are provided with one subject for a time. In the second part, we select articles from the top journals in the whole science research. In the third part, we post information about calling papers for international conferences. Hopefully, some of the information in this manuscript may be useful for those who are dedicating to scientific career. Besides, the journals are also posted on the website of our library, and they are available to be accessed any time at http://lib.jsut.edu.cn/2018/1015/c5474a113860/page.htm. If there are any questions or suggestions, please send e-mails to 289595883@qq.com in no hesitate.

Ⅰ Topics

The key word of this month is **Computer Science.** We list several articles which are related to the top concerned topics of computer science researches. The articles are classified in 5 categories, and they are: **Adaptive Control, Information Systems, Signal Processing, Computer Vision and Pattern Recognition and Computer Networks and Communications**. Also, the listed articles are all arranged in a descending sort of impact factor in order to make it convenient to read. There are also links to both official site and full text for each article.

ADAPTIVE CONTROL

IEEE Transactions on Fuzzy Systems (impact factor: 11.93) 1 区

Prescribed-Time Adaptive Fuzzy Control for Pneumatic Artificial Muscle-Actuated Parallel Robots With Input Constraints

Shuzhen Diao · Gendi Liu · Zhuoqing Liu，et.al

Abstract:

With the advantages of natural flexibility, large force-weight ratios, and green cleanliness, pneumatic artificial muscle (PAM) actuators that mimic biological skeletal muscles have attracted much attention. However, the inherent defects of PAMs, such as high nonlinearities, limited contraction lengths and frequencies, and multiple input

constraints, pose significant challenges to the motion control of PAM-actuated parallel robots; meanwhile, most existing methods do not take into account motion constraints and working efficiency. To this end, a prescribedtime adaptive fuzzy motion control method is developed in this paper, where PAM-actuated parallel robots can accurately achieve prescribed tracking performance within an allowable input pressure range. Inparticular, regardless of the initial values of target trajectories, the expected tracking accuracy is achieved within the prescribed time by restricting the tracking errors to the improved performance constraints; also, the motion velocities remain within the preset dynamic constraints, thereby improving the working safety and efficiency. To our knowledge, this paper presents the first adaptive fuzzy motion control method for PAM actuated parallel robots, which can simultaneously achievemotion constraints and prescribed tracking performance. Moreover, the stability of all signals is proved through theoretical analysis, and then the effectiveness of the proposed method is fully verified by a series of hardware experiments.

Aerospace Science and Technology (impact factor: 5.62) 1 区

Global Adaptive Neural Network Control of Nonlinear Time-Varying Systems with Unknown Control Coefficients and Model Uncertainties

Zhenwei Ma · Hongbo Chen · Qiufeng Wang et.al

Abstract:

This paper investigates the adaptive control problem for the strict-feedback nonlinear time-varying system (NTVS) with unknown control coefficients and model uncertainties. To address the problem that the neural network (NN) can only achieve local approximation of unknown nonlinear functions, a novel NN control scheme is proposed. The scheme consists of a NN controller that operates inside the approximation domain and a robust controller that operates outside the approximation domain, and a novel switching function is designed to enable the two controllers to switch smoothly in the vicinity of the approximation domain to ensure that all signals of the closed-loop system are globally uniformly ultimately bounded. To address the problem that unknown time-varying control coefficients are difficult to handle, an adaptive fault-tolerant control scheme is proposed in combination with the congelation of variables method. The scheme employs classical adaptive control to adapt to the variation of unknown control coefficients and robust control to eliminate the time-varying disturbance terms, and introduces a positive integrable time-varying function to achieve asymptotic tracking of an arbitrary reference signal. The combination of these two schemes constitutes a global adaptive neural network control (GANNC) method for the NTVS with unknown control coefficients and model uncertainties. Finally, an adaptive attitude fault-tolerant controller for launch vehicles is designed by using the GANNC method, which can realize the accurate tracking of the attitude control system to the reference command under normal status, strong disturbances and actuator failures, and comparative experiments prove the effectiveness and superiority of the controller.

Alzheimer s & Dementia (impact factor: 14.04) 1 区

A Randomized, Double‐blind, Sham‐controlled, Adaptive‐Design Pivotal Trial of Sensory Stimulation in Subjects with Alzheimer’s Disease

Alyssa Boasso · Celine Houser · Mihaly Hajos, et.al

Abstract:

Background

In three prospective clinical trials (Overture: NCT03556280, Etude: NCT03661034, Flicker: NCT03543878) non-invasive, visual and auditory gamma (40 Hz) sensory stimulation diminished Alzheimer’s disease (AD) symptoms, including a reduction in decline in cognitive and functional symptoms. These trials initiated the design of the Cognito Therapeutics sponsored Hope pivotal trial which examines the safety and efficacy of Cognito Therapeutics’ Sensory Stimulation System.

Method

The US-based multicenter Hope trial will randomize (1:1) approximately 500 subjects aged 50 and older diagnosed with mild to moderate AD (MMSE 15-26) and will stratify them to active and sham in a blinded manner across MMSE score ranges: 15-20 and 21-26. Subjects in both study arms will self-administer therapy via the Sensory Stimulation System for 60 minutes daily for 12 months. An interim analysis will employ the promising zone methodology, allowing the sample size to be adjusted if the effect is trending toward success, but additional subjects are needed to maintain greater than 80% power.

Result

The primary outcome measure will be the Alzheimer’s Disease Cooperative Study – Activities of Daily Living (ADCS-ADL) test. Changes in function and cognition will be evaluated using a combined statistical test for ADCS-ADL and the Mini Mental State Exam (MMSE). The key secondary outcome is change in cognition using the MMSE. Other clinical efficacy assessments include instrumental activities of daily living (IADL), Zarit Burden Index (ZBI), the Clinical Dementia Rating Scale (CDR) and The Neuropsychiatric Inventory anxiety subscale (NPI – Anxiety). Key biomarker assessments include whole brain, white matter, and hippocampal volume and occipital cortical thickness. Sleep fragmentation will be assessed in a subgroup of subjects using actigraphy. Exploratory measures will include additional brain structural change, plasma biomarkers, EEG assessed coherence, and at-home tablet-based tasks. Safety will be evaluated via routine clinical laboratory assessments, review of adverse events, concurrent medication use, physical and neurological exams, vital signs, MRI, and a suicidality scale.

Conclusion

The Hope pivotal trial is designed to demonstrate the efficacy and safety of daily in-home gamma sensory stimulation in AD patients to support a regulatory filing with the FDA.

Advanced Functional Materials (impact factor: 19.02) 1 ☒

A Strongly Robust Chitosan - Based Programmed Control Functional Hydrogel Improved Mitochondrial Function and Pro - Vascularization for Adaptive Repair of Myocardial Infarction

Zhentao Li · Qian Li · Weidong Cao, et.al

Abstract:

Hydrogel-based engineered cardiac patches (ECP) hold great promise as potential treatment options for myocardial infarction (MI). However, optimizing the preparation of ECP with better biocompatibility, mechanical stability, and adaptation to MI repair remains a challenge. In this study, a chitosan (CS) hydrogel with good mechanical robustness through programmed control of hydrogen bonding is constructed to adapt to the continuous beating of myocardial tissue. With the synergistic effects of lipoic acid (TA), proanthocyanidins (PAs), and Eu3+, a functional platform capable of improving mitochondrial function, antioxidation, and pro-vascularization is further constructed for the adaptive repair of the MI microenvironment. The fabricated functionalized chitosan hydrogel (CS/TA@PAs-Eu) possessed good mechanical stability and ionic conductivity, showing the potential for long-term adaptation to myocardial tissue pulsation. Also, the CS/TA@PAs-Eu hydrogel promoted cardiomyocytes (CMs) maturation and functionalization, and effectively improved mitochondrial function, scavenged reactive oxygen species (ROS) as well as promoted angiogenesis. Animal studies indicated that the CS/TA@PAs-Eu hydrogel can perform adaptive repair of MI to prevent left ventricular (LV) remodeling and restore cardiac function. This study highlights a functionalized hydrogel ECP with good biocompatibility and mechanical robustness for the adaptive repair of MI.

Information Systems

IEEE Transactions on Industrial Informatics (impact factor: 12.34) 1 ☒

Action-Dependent Heuristic Dynamic Programming With Experience Replay for Wastewater Treatment Processes

Junfei Qiao, Mingming Zhao, Ding Wang et.al

Abstract:

The wastewater treatment process (WWTP) is beneficial for maintaining sufficient water resources and recycling wastewater. A crucial link of WWTP is to ensure that the dissolved oxygen (DO) concentration is continuously maintained at the predetermined value, which can actually be considered as a tracking problem. In this article, an experience replay-based action-dependent heuristic dynamic programming (ER-ADHDP) method is developed to design the model-free tracking controller to accomplish the tracking goal of the DO concentration. First, the online ER-ADHDP controller is regarded as a supplementary controller to conduct the model-free tracking control alongside a stabilizing controller with a priori knowledge. The online ER-ADHDP method

can adaptively adjust weight parameters of critic and action networks, thereby continuously ameliorating the tracking result over time. Second, the ER technique is integrated into the critic and action networks to promote the data utilization efficiency and accelerate the learning process. Third, a rational stability result is provided to theoretically ensure the usefulness of the ER-ADHDP tracking design. Finally, simulation experiments including different reference trajectories are conducted to show the superb tracking performance and excellent adaptability of the proposed ER-ADHDP method.

IEEE Internet of Things Journal (impact factor: 10.62) 1 区

Routing With Minimum Activated Trusted Nodes in Quantum Key Distribution Networks for Secure Communications

Peng - Yong Kong

Abstract:
Cyber-physical systems rely heavily on communication networks for remote monitoring and control. It is crucial to protect the communication networks from cyberattacks because an attack on the physical subsystem can be indirectly launched from a compromised cyber subsystem. Since remote control devices have limited computational power, we ensure communication confidentiality and integrity using one-time-pad (OTP) symmetric cryptography, which despite simple is unconditionally secure. To provide OTP with secret keys, we use quantum key distribution (QKD) across multiple hops, where each intermediate relay is a trusted node. These nodes can be weak points in cyberattacks. Hence, this paper focuses on routing in multi-hop QKD networks that reduces the required number of trusted nodes. We formulate and solve an optimization problem to find the set of QKD routes that minimizes the number of activated trusted nodes while satisfying the secret key rate requirements of multiple communicating pairs. Extensive evaluation results confirm that the proposed scheme can indeed has fewer activated trusted nodes as compared to a benchmark scheme that finds only the shortest paths for communicating pairs.

IEEE Internet of Things Journal (impact factor: 10.62) 1 区

VisionScaling: Dynamic Deep Learning Model and Resource Scaling in Mobile Vision Applications

Pyeongjun Choi · Dongho Ham · Yeongjin Kim et.al

Abstract:
As deep learning technology becomes advanced, mobile vision applications such as augmented reality (AR) or autonomous vehicles are prevalent. The performance of such services highly depends on computing capability of different mobile devices, dynamic service requests, stochastic mobile network environment, and learning models. Existing studies have independently optimized such mobile resource allocation and learning model design with given other side of parameters and

computing/network resources. However, they cannot reflect realistic mobile environments since the time-varying wireless channel and service requests are assumed to follow specific distributions. Without these unrealistic assumptions, we propose an algorithm that jointly optimizes learning models and process/network resources adapting to system dynamics, namely VisionScaling by leveraging the state-of-the-art online convex optimization (OCO) framework. This VisionScaling jointly makes decisions on (i) the learning model and the size of input layer at learning-side, and (ii) the GPU clock frequency, the transmission rate, and the computation offloading policy at resource-side every time slot. We theoretically show that VisionScaling asymptotically converges to an offline optimal performance with satisfying sublinearity. Moreover, we demonstrate that VisionScaling saves at least 24% of dynamic regret which captures energy consumption and processed frames per second (PFPS) under mean average precision (mAP) constraint via real trace-driven simulations. Finally, we show that VisionScaling attains 30.8% energy saving and improves 39.7% PFPS while satisfying the target mAP on the testbed with Nvidia Jetson TX2 and an edge server equipped with high-end GPU.

IEEE Internet of Things Journal (impact factor: 10.62) 1 ☒

WiFi2Radar: Orientation Independent Single Receiver WiFi Sensing via WiFi to Radar Translation

Isura Nirmal · Abdelwahed Khamis · Mahbub Hassan et. al

Abstract:

Recent research has demonstrated the huge potential of WiFi for contactless sensing of human activities. Unfortunately, such sensing is highly sensitive to the relative orientation between the user and the WiFi receivers. To overcome this problem, existing solutions deploy multiple WiFi receivers at precise positions to capture orientation-independent view of the human activity. Orientation independent single receiver WiFi sensing is still considered an open problem. In this paper, we propose a deep neural network architecture that uses radar data during training to learn high-precision Doppler features of human activities from the noisy channel states observed by a single WiFi receiver. Once trained with radars, the network can be used to detect human activities at any arbitrary orientations based only on WiFi signals. Using extensive experiments with millimeter wave radars, we demonstrate that the proposed approach, called WiFi2Radar in this paper, significantly outperforms state-of-the-art for detecting human activities in untrained orientations using only a single WiFi receiver. Our results show that WiFi2Radar can detect orientation-independent human activities with up to 91% accuracy, which outperforms the state-of-the-art by 19%.

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Information Fusion (impact factor: 18.62) 1 区

Anomaly Diagnosis of Connected Autonomous Vehicles: A Survey

Yukun Fang · Haigen Min · Xia Wu et.al

Abstract:
Connected autonomous vehicles (CAVs) are revolutionizing the development of transportation due to their potential to improve transportation performance in many ways, such as enhanced traffic mobility, road compacity, operation safety, and environmental sustainability. Nevertheless, the issue of road vehicle safety in CAVs remains to be fully solved. Data collected from multiple sources provide information about the internal status of the system and the situation of its surroundings, and the occurrence of data anomalies indicates the existence of potential safety risks. Thus, anomaly diagnosis is of major importance to analyze the nature or cause of underlying safety risks and provide insightful information for the subsequent decision-making that ensures safety. Anomaly diagnosis consists of two basic tasks: anomaly detection and anomaly interpretation. In this paper, both of these two tasks are comprehensively surveyed. For anomaly detection, the following four aspects are covered: 1) formalized definition of an anomaly, 2) classification of anomalies, 3) taxonomies of anomaly detection techniques, and 4) review of recent advances for anomaly detection in CAV applications. For anomaly interpretation, related works are investigated in the context of 1) the anomaly detection process, and 2) the tested/monitored system/process, respectively. The novelty particularly lies in the latter, where the interpretation of anomalies combining the analysis of road vehicle safety risks is presented, and related works for anomaly interpretation in CAV applications are reviewed by analyzing 1) functional safety risks, 2) safety of the intended functionality (SOTIF) risks, and 3) cyber security risks, respectively. Finally, open issues, challenges, future directions, and emerging technologies for anomaly diagnosis in CAVs are discussed.

IEEE Transactions on Visualization and Computer Graphics (impact factor: 5.21) 1 区

Design and Evaluation of Controller-based Raycasting Methods for Efficient Alphanumeric and Special Character Entry in Virtual Reality

Tian Wan · Yushi Wei · Rongkai Shi et.al

Abstract:
Alphanumeric and special characters are essential during text entry. Text entry in virtual reality (VR) is usually performed on a virtual Qwerty keyboard to minimize the need to learn new layouts. As such, entering capitals, symbols, and numbers in VR is often a direct migration from a physical/touchscreen Qwerty keyboard—that is, using the mode-switching keys to switch between different types of characters and

symbols. However, there are inherent differences between a keyboard in VR and a physical/touchscreen keyboard, and as such, a direct adaptation of mode-switching via switch keys may not be suitable for VR. The high flexibility afforded by VR opens up more possibilities for entering alphanumeric and special characters using the Qwerty layout. In this work, we designed two controller-based raycasting text entry methods for alphanumeric and special characters input (Layer-ButtonSwitch and Key-ButtonSwitch) and compared them with two other methods (Standard Qwerty Keyboard and Layer-PointSwitch) that were derived from physical and soft Qwerty keyboards. We explored the performance and user preference of these four methods via two user studies (one short-term and one prolonged use), where participants were instructed to input text containing alphanumeric and special characters. Our results show that Layer-ButtonSwitch led to the highest statistically significant performance, followed by Key-ButtonSwitch and Standard Qwerty Keyboard, while Layer-PointSwitch had the slowest speed. With continuous practice, participants' performance using Key-ButtonSwitch reached that of Layer-ButtonSwitch. Further, the results show that the key-level layout used in Key-ButtonSwitch led users to parallel mode switching and character input operations because this layout showed all characters on one layer. We distill three recommendations from th results that can help guide the design of text entry techniques for alphanumeric and special characters in VR.

Institute of Electrical and Electronics Engineers (impact factor: 10.62) 1 区

A Self-Attention-Assisted TinyML With Effective Representation for UWB NLOS Identification

Yue Wu, Xu He, Lingfei Mo et.al

Abstract:
Ultra-Wide Band (UWB) Non-Line-of-Sight (NLOS) identification is a crucial task in wireless localization systems. Various Deep Learning (DL) solutions have demonstrated promising outcomes in UWB NLOS identification by utilizing Channel Impulse Response (CIR) and channel characteristics. However, effective and robust UWB NLOS identification on resource-constrained edge devices remains a challenge. Hence, this paper presents a self-attention-assisted Tiny Machine Learning (TinyML) solution that offers an effective representation for UWB NLOS identification. To overcome computational limitations, a feature selection method is devised for the proposed data-driven DL-based approach. By leveraging feature selection, the self-attention mechanism enhances the representation capability of a pre-trained model for UWB NLOS identification. The proposed method is evaluated on both personal computer (PC) and edge platforms, and compared against multiple baselines. The evaluation demonstrates its effective representation and optimal performance on both PC and edge platforms, as indicated by various metrics. Thanks to the effective representation, the proposed method also enables the quantized model to achieve State-

of-The-Art (SOTA) in UWB NLOS identification, while significantly accelerating inference efficiency at the edge.

IEEE Transactions on Visualization and Computer Graphics (impact factor:5.21) 1 ☒

Sketch2Stress: Sketching With Structural Stress Awareness

Deng Yu · Chufeng Xiao · Manfred Lau et.al

Abstract

In the process of product design and digital fabrication, the structural analysis of a designed prototype is a fundamental and essential step. However, such a step is usually invisible or inaccessible to designers at the early sketching phase. This limits the user's ability to consider a shape's physical properties and structural soundness. To bridge this gap, we introduce a novel approach Sketch2Stress that allows users to perform structural analysis of desired objects at the sketching stage. This method takes as input a 2D freehand sketch and one or multiple locations of user-assigned external forces. With the specially-designed two-branch generative-adversarial framework, it automatically predicts a normal map and a corresponding structural stress map distributed over the user-sketched underlying object. In this way, our method empowers designers to easily examine the stress sustained everywhere and identify potential problematic regions of their sketched object. Furthermore, combined with the predicted normal map, users are able to conduct a region- wise structural analysis efficiently by aggregating the stress effects of multiple forces in the same direction. Finally, we demonstrate the effectiveness and practicality of our system with extensive experiments and user studies.

IEEE Internet of Things Journal (impact factor: 10.62) 1 ☒

Multi-Layered Decentralized Coded Caching With Non-Uniform Popularity and Multi-Level Cache Capacity in Space-Air-Ground Integrated Networks

Jianrong Bao · Xieyu Peng · Chao Liu et.al

Abstract

To solve low resource utilization, complex storage and busy traffic in space-air-ground integrated networks (SAGINs), a new multi-layered decentralized coded caching (ML-DCC) scheme is proposed in hierarchical networks with non-uniform file popularity and multi-level cache capacity. First, a file popularity prediction is performed by a random forest model with grid search. Second, a multi-popularity coded caching (MPCC) strategy by grouping files is executed in a two-hop network with fixed cache size. Finally, a new ML-DCC scheme is proposed to adopt non-uniform file popularity and multi-level cache capacity with both block coded caching and zero-bit padding to obtain high resource utilization and efficient file exchange in file transmissions. The innovations are random forest classifier with bagging integration and grid search to

improve network traffic and link load, decentralized coded caching to reduce average transferred files, and coded caching and grouping files by popularity to improve network load. Simulation results show that the data payload of the proposed scheme is significantly improved by about 1.88, 1.18, 1.38, 3.53, and 4.39 times, when compared with those of the shared cache, multi-level popularity, hierarchical coded caching, MPCC, and uncoded caching schemes, respectively. Under the expected load of R=211.57F bits of the shared link, the cache size used by the proposed ML-DCC is only 1/42.85 and 1/24.39 of those of the highest-popularity first (HPF) and nonuniform cache schemes, respectively.

Computer Vision and Pattern Recognition

IEEE Transactions on Pattern Analysis and Machine Intelligence (impact factor: 23.62) 1 区

AnyFace++: A Unified Framework for Free-style Text-to-Face Synthesis and Manipulation

Sun Jun-qing · Qiyao Deng · Qi Li et.al

Abstract

Human faces contain rich semantic information that could hardly be described without a large vocabulary and complex sentence patterns. However, most existing text-to-image synthesis methods could only generate meaningful results based on limited sentence templates with words contained in the training set, which heavily impairs the generalization ability of these models. In this paper, we define a novel 'free-style' text-to-face generation and manipulation problem, and propose an effective solution, named AnyFace++, which is applicable to a much wider range of open-world scenarios. The CLIP model is involved in AnyFace++ for learning an aligned language-vision feature space, which also expands the range of acceptable vocabulary as it is trained on a large-scale dataset. To further improve the granularity of semantic alignment between text and images, a memory module is incorporated to convert the description with arbitrary length, format, and modality into regularized latent embeddings representing discriminative attributes of the target face. Moreover, the diversity and semantic consistency of generation results are improved by a novel semi-supervised training scheme and a series of newly proposed objective functions. Compared to state-of-the-art methods, AnyFace++ is capable of synthesizing and manipulating face images based on more flexible descriptions and producing realistic images with higher diversity.

IEEE Transactions on Pattern Analysis and Machine Intelligence (impact factor: 23.62) 1 区

RIGA: Rotation-Invariant and Globally-Aware Descriptors for Point Cloud Registration

Han - Qing Yu • Jun Hou • Qiang Zheng et.al

Abstract

Successful point cloud registration relies on accurate correspondences established upon powerful descriptors. However, existing neural descriptors either leverage a rotation-variant backbone whose performance declines under large rotations, or encode local geometry that is less distinctive. To address this issue, we introduce RIGA to learn descriptors that are Rotation-Invariant by design and Globally-Aware. From the Point Pair Features (PPFs) of sparse local regions, rotation-invariant local geometry is encoded into geometric descriptors. Global awareness of 3D structures and geometric context is subsequently incorporated, both in a rotation-invariant fashion. More specifically, 3D structures of the whole frame are first represented by our global PPF signatures, from which structural descriptors are learned to help geometric descriptors sense the 3D world beyond local regions. Geometric context from the whole scene is then globally aggregated into descriptors. Finally, the description of sparse regions is interpolated to dense point descriptors, from which correspondences are extracted for registration. To validate our approach, we conduct extensive experiments on both object- and scene-level data. With large rotations, RIGA surpasses the state-of-the-art methods by a margin of 8°in terms of the Relative Rotation Error on ModelNet40 and improves the Feature Matching Recall by at least 5 percentage points on 3DLoMatch.

IEEE Transactions on Pattern Analysis and Machine Intelligence (impact factor: 23.62) 1 区

Unified 3D and 4D Panoptic Segmentation via Dynamic Shifting Networks

Fangzhou Hong · Ling-Dong Kong · Hui Zhou, et.al

Abstract

With the rapid advances in autonomous driving, it becomes critical to equip its sensing system with more holistic 3D perception. However, widely explored tasks like 3D detection or point cloud semantic segmentation focus on parsing either the objects (e.g. cars and pedestrians) or scenes (e.g. trees and buildings). In this work, we propose to address the challenging task of LiDAR-based Panoptic Segmentation, which aims to parse both objects and scenes in a unified manner. In particular, we propose Dynamic Shifting Network (DS-Net), which serves as an effective panoptic segmentation framework in the point cloud realm. DS-Net features a dynamic shifting module for complex LiDAR point cloud distributions. We observe that commonly used clustering algorithms like BFS or DBSCAN are incapable of handling complex autonomous driving scenes with non-uniform point cloud distributions and varying instance sizes. Thus, we present an efficient learnable clustering module, dynamic shifting, which adapts kernel functions on the fly for different instances. To further explore the temporal information, we extend the single-scan processing framework to its temporal version, namely 4D-DS-Net, for the task of 4D Panoptic Segmentation, where the same instance across multiple frames should be given the same ID prediction. Instead of naïvely appending a tracking module to DS-Net, we propose to solve the 4D panoptic

segmentation in a more unified way. Specifically, 4D-DS-Net first constructs 4D data volume by aligning consecutive LiDAR scans, upon which the temporally unified instance clustering is performed to obtain the final results. Extensive experiments on two large-scale autonomous driving LiDAR datasets, SemanticKITTI and Panoptic nuScenes, are conducted to demonstrate the effectiveness and superior performance of the proposed solution. The code is publicly available at https://github.com/hongfz16/DS-Net.

IEEE Transactions on Pattern Analysis and Machine Intelligence (impact factor: 23.62) 1 ☒

Unsupervised Object-Centric Learning From Multiple Unspecified Viewpoints

Jinyang Yuan · Tonglin Chen · Zhimeng Shen et al

Abstract

Visual scenes are extremely diverse, not only because there are infinite possible combinations of objects and backgrounds but also because the observations of the same scene may vary greatly with the change of viewpoints. When observing a multi-object visual scene from multiple viewpoints, humans can perceive the scene compositionally from each viewpoint while achieving the so-called "object constancy" across different viewpoints, even though the exact viewpoints are untold. This ability is essential for humans to identify the same object while moving and to learn from vision efficiently. It is intriguing to design models that have a similar ability. In this paper, we consider a novel problem of learning compositional scene representations from multiple unspecified (i.e., unknown and unrelated) viewpoints without using any supervision and propose a deep generative model which separates latent representations into a viewpoint-independent part and a viewpoint-dependent part to solve this problem. During the inference, latent representations are randomly initialized and iteratively updated by integrating the information in different viewpoints with neural networks. Experiments on several specifically designed synthetic datasets have shown that the proposed method can effectively learn from multiple unspecified viewpoints.

IEEE Transactions on Visualization and Computer Graphics (impact factor: 5.21) 1 ☒

Design and Evaluation of Controller-based Raycasting Methods for Efficient Alphanumeric and Special Character Entry in Virtual Reality

Tian Wan · Yushi Wei · Rongkai Shi et.al

Abstract

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However, there are inherent differences between a keyboard in VR and a physical/touchscreen keyboard, and as such, a direct adaptation of mode-switching via switch keys may not be suitable for VR. The high flexibility afforded by VR opens up more possibilities for entering alphanumeric and special characters using the Qwerty layout. In this work, we designed two controller-based raycasting text entry methods for alphanumeric and special characters input (Layer-ButtonSwitch and Key-ButtonSwitch) and compared them with two other methods (Standard Qwerty Keyboard and Layer-PointSwitch) that were derived from physical and soft Qwerty keyboards. We explored the performance and user preference of these four methods via two user studies (one short-term and one prolonged use), where participants were instructed to input text containing alphanumeric and special characters. Our results show that Layer-ButtonSwitch led to the highest statistically significant performance, followed by Key-ButtonSwitch and Standard Qwerty Keyboard, while Layer-PointSwitch had the slowest speed. With continuous practice, participants' performance using Key-ButtonSwitch reached that of Layer-ButtonSwitch. Further, the results show that the key-level layout used in Key-ButtonSwitch led users to parallel mode switching and character input operations because this layout showed all characters on one layer. We distill three recommendations from th results that can help guide the design of text entry techniques for alphanumeric and special characters in VR.

COMPUTER NETWORKS AND COMMUNICATIONS

APL Photonics (impact factor: 5.62) 1 区

Silicon nitride electric-field poled microresonator modulator

Boris Zabelich · Christine Lafforgue · Edgars Nitišs et.al

Abstract

Stoichiometric silicon nitride is a highly regarded platform for its favorable attributes, such as low propagation loss and compatibility with complementary metal-oxide-semiconductor technology, making it a prominent choice for various linear and nonlinear applications on a chip. However, due to its amorphous structure, silicon nitride lacks second-order nonlinearity; hence, the platform misses the key functionality of linear electro-optical modulation for photonic integrated circuits. Several approaches have been explored to address this problem, including integration with electro-optic active materials, piezoelectric tuning, and utilization of the thermo-optic effect. In this work, we demonstrate electro-optical modulation in a silicon nitride microring resonator enabled by electric-field poling, eliminating the complexities associated with material integration and providing data modulation speeds up to 75 Mb/s, currently only limited by the electrode design. With an estimated inscribed electric field of 100 V/μm, we achieve an effective second-order susceptibility of 0.45 pm/V. In addition, we derive and confirm the value of the material's third-order susceptibility, which is responsible

for the emergence of second-order nonlinearity. These findings broaden the functionality of silicon nitride as a platform for electro-optic modulation.

APL Photonics (impact factor: 5.62) 1 ☒

Boron tin oxide for filterless intrinsic-narrowband solar-blind ultraviolet detectors with tunable photoresponse peak from 231 to 275 nm

Changshan Xu · C. F. Zhang · Lemin Jia, et.al

Abstract:
Solar-blind ultraviolet (SBUV) detection has a great prospect in a wide range of applications, in which the synthesis of semiconductor materials with a suitable bandgap can be an important research focus. In this work, BSnO films with good selectivity for SBUV were grown by magnetron sputtering with the bandgap adjusted from 4.1 to 5.3 eV. Based on the BSnO films, filter-less narrowband SBUV detectors were fabricated first, exhibiting a narrow detection range and an ultra-high responsivity (113 A/W) required by the detection of extremely weak SBUV signals. In addition, graphene/BSnO/SiC heterojunction photovoltaic detectors were also fabricated, with a high photo-to-dark current ratio and an ultra-fast response exhibited under 0 V bias, confirming their ability to handle the detection of transient signals.

APL Photonics (impact factor: 5.62) 1 ☒

Present and future of micro-transfer printing for heterogeneous photonic integrated circuits

Günther Roelkens · Jing Zhang · Laurens Bogaert, et al

Abstract:
We present the current state of the art in micro-transfer printing for heterogeneously integrated silicon photonic integrated circuits. The versatility of the technology is highlighted, as is the way ahead to make this technology a key enabler for next-generation photonic systems-on-chip.

npj Quantum Information (impact factor: 10.76) 1 ☒

Probabilistic state synthesis based on optimal convex approximation

Seiseki Akibue · Go Kato · Seiichiro Tani

Abstract:
When preparing a pure state with a quantum circuit, there is an unavoidable approximation error due to the compilation error in fault-tolerant implementation. A

recently proposed approach called probabilistic state synthesis, where the circuit is probabilistically sampled, is able to reduce the approximation error compared to conventional deterministic synthesis. In this paper, we demonstrate that the optimal probabilistic synthesis quadratically reduces the approximation error. Moreover, we show that a deterministic synthesis algorithm can be efficiently converted into a probabilistic one that achieves this quadratic error reduction. We also numerically demonstrate how this conversion reduces the T-count and analytically prove that this conversion halves an information-theoretic lower bound on the circuit size. In order to derive these results, we prove general theorems about the optimal convex approximation of a quantum state. Furthermore, we demonstrate that this theorem can be used to analyze an entanglement measure.

npj Quantum Information (impact factor: 10.76) 1 区

Cross-platform comparison of arbitrary quantum processes

Congcong Zheng · Xutao Yu · Kun Wang

Abstract:

In this work, we present a protocol for comparing the performance of arbitrary quantum processes executed on spatially or temporally disparate quantum platforms using Local Operations and Classical Communication (LOCC). The protocol involves sampling local unitary operators, which are then communicated to each platform via classical communication to construct quantum state preparation and measurement circuits. Subsequently, the local unitary operators are implemented on each platform, resulting in the generation of probability distributions of measurement outcomes. The max process fidelity is estimated from the probability distributions, which ultimately quantifies the relative performance of the quantum processes. Furthermore, we demonstrate that this protocol can be adapted for quantum process tomography. We apply the protocol to compare the performance of five quantum devices from IBM and the “Qianshi" quantum computer from Baidu via the cloud. The experimental results unveil two notable aspects: Firstly, the protocol adeptly compares the performance of the quantum processes implemented on different quantum computers. Secondly, the protocol scales, although still exponentially, much more favorably with the number of qubits, when compared to the full quantum process tomography. We view our work as a catalyst for collaborative efforts in cross-platform comparison of quantum computers.

Ⅱ Concentration

PHYSICS

Interactions between electromagnetic radiation and biological systems

Lingyu Liu, Bing Huang, Yingxian Lu, et al.

Abstract

Even though the bioeffects of electromagnetic radiation (EMR) have been extensively investigated during the past several decades, our understandings of the bioeffects of EMR and the mechanisms of the interactions between the biological systems and the EMRs are still far from satisfactory. In this article, we introduce and summarize the consensus, controversy, limitations, and unsolved issues. The published works have investigated the EMR effects on different biological systems including humans, animals, cells, and biochemical reactions. Alternative methodologies also include dielectric spectroscopy, detection of bioelectromagnetic emissions, and theoretical predictions. In many studies, the thermal effects of the EMR are not properly controlled or considered. The frequency of the EMR investigated is limited to the commonly used bands, particularly the frequencies of the power line and the wireless communications; far fewer studies were performed for other EMR frequencies. In addition, the bioeffects of the complex EM environment were rarely discussed. In summary, our understanding of the bioeffects of the EMR is quite restrictive and further investigations are needed to answer the unsolved questions.

Light-driven nanoscale vectorial currents

Pettine, Jacob, Padmanabhan et al.

Abstract

Controlled charge flows are fundamental to many areas of science and technology, serving as carriers of energy and information, as probes of material properties and dynamics1 and as a means of revealing or even inducing broken symmetries. Emerging methods for light-based current control offer particularly promising routes beyond the speed and adaptability limitations of conventional voltage-driven systems. However, optical generation and manipulation of currents at nanometre spatial scales remains a basic challenge and a crucial step towards scalable optoelectronic systems for microelectronics and information science. Here we introduce vectorial optoelectronic metasurfaces in which ultrafast light pulses induce local directional charge flows

around symmetry-broken plasmonic nanostructures, with tunable responses and arbitrary patterning down to subdiffractive nanometre scales. Local symmetries and vectorial currents are revealed by polarization-dependent and wavelength-sensitive electrical readout and terahertz (THz) emission, whereas spatially tailored global currents are demonstrated in the direct generation of elusive broadband THz vector beams. We show that, in graphene, a detailed interplay between electrodynamic, thermodynamic and hydrodynamic degrees of freedom gives rise to rapidly evolving nanoscale driving forces and charge flows under the extremely spatially and temporally localized excitation. These results set the stage for versatile patterning and optical control over nanoscale currents in materials diagnostics, THz spectroscopies, nanomagnetism and ultrafast information processing.

A universal scaling law for Lagrangian snowflake accelerations in atmospheric turbulence

Dhiraj K. Singh, Eric R et al.

Abstract

We use a novel experimental setup to obtain the vertical velocity and acceleration statistics of snowflakes settling in atmospheric surface-layer turbulence, for Taylor microscale Reynolds numbers ( ) between 400 and 67 000, Stokes numbers (St) between 0.12 and 3.50, and a broad range of snowflake habits. Despite the complexity of snowflake structures and the non-uniform nature of the turbulence, we find that mean snowflake acceleration distributions can be uniquely determined from the value of St. Ensemble-averaged snowflake root mean square (rms) accelerations scale nearly linearly with St. Normalized by the rms value, the acceleration distribution is nearly exponential, with a scaling factor for the (exponent) of −3/2 that is independent of and St; kurtosis scales with , albeit weakly compared to fluid tracers in turbulence; gravitational drift with sweeping is observed for St < 1. Surprisingly, the same exponential distribution describes a pseudo-acceleration calculated from fluctuations of snowflake terminal fall speed in still air. This equivalence suggests an underlying connection between how turbulence determines the trajectories of particles and the microphysics determining the evolution of their shapes and sizes.

MATERIALS

Dopant-additive synergism enhances perovskite solar modules

Ding, Bin, Ding, et al.

Abstract

Perovskite solar cells (PSCs) are among the most promising photovoltaic technologies due to their exceptional optoelectronic properties1,2. However, the lower efficiency, poor stability, and reproducibility issues of large-area PSCs compared to laboratory-scale PSCs are major drawbacks that hinder their commercialisation3. Here we report a synergistic dopant-additive combination strategy using methylammonium chloride (MACl) as the dopant and a Lewis-basic ionic-liquid additive, 1,3-bis(cyanomethyl)imidazolium chloride ([Bcmim]Cl). This strategy effectively inhibits the degradation of the perovskite precursor solution (PPS), suppresses the aggregation of MACl, and results in phase-homogeneous and stable perovskite films with high crystallinity and less defects. This approach enabled the fabrication of perovskite solar modules (PSMs) that achieved a certified efficiency of 23.30% and ultimately stabilised at 22.97% over a 27.22 cm2 aperture area, marking the highest certified PSM performance. Additionally, the PSMs displayed long-term operational stability, maintaining 94.66% of the initial efficiency after 1000 h under continuous one-sun illumination at room temperature. The interaction between [Bcmim]Cl and MACl was extensively studied to unravel the mechanism leading to an enhancement of device properties. Our approach holds significant promise for bridging the benchtop-to-rooftop gap and advancing the production and commercialisation of large-area perovskite photovoltaics.

Bioresorbable shape-adaptive structures for ultrasonic monitoring of deep-tissue homeostasis

Jiaqi Liu, Naijia Liu, Yameng Xu et al.

Abstract

Monitoring homeostasis is an essential aspect of obtaining pathophysiological insights for treating patients. Accurate, timely assessments of homeostatic dysregulation in deep tissues typically require expensive imaging techniques or invasive biopsies. We introduce a bioresorbable shape-adaptive materials structure that enables real-time monitoring of deep-tissue homeostasis using conventional ultrasound instruments. Collections of small bioresorbable metal disks distributed within thin, pH-responsive hydrogels, deployed by surgical implantation or syringe injection, allow ultrasound-based measurements of spatiotemporal changes in pH for early assessments of anastomotic leaks after gastrointestinal surgeries, and their bioresorption after a recovery period eliminates the need for surgical extraction. Demonstrations in small and large animal models illustrate capabilities in monitoring leakage from the small intestine, the stomach, and the pancreas.

Highly stabilized and efficient thermoelectric copper selenide

Hu, Haihua, Ju, et al.

Abstract

The liquid-like feature of thermoelectric superionic conductors is a double-edged sword: the long-range migration of ions hinders the phonon transport, but their directional segregation greatly impairs the service stability. We report the synergetic enhancement in figure of merit (ZT) and stability in Cu1.99Se-based superionic conductors enabled by ion confinement effects. Guided by density functional theory and nudged elastic band simulations, we elevated the activation energy to restrict ion migrations through a cation–anion co-doping strategy. We reduced the carrier concentration without sacrificing the low thermal conductivity, obtaining a ZT of ~3.0 at 1,050 K. Notably, the fabricated device module maintained a high conversion efficiency of up to ~13.4% for a temperature difference of 518 K without obvious degradation after 120 cycles. Our work could be generalized to develop electrically and thermally robust functional materials with ionic migration characteristics.

CHEMISTRY

Fast growth of single-crystal covalent organic frameworks for laboratory x-ray diffraction

Jing Han, Jie Feng , Jia Kang, et al.

Abstract

The imine-exchange strategy makes single-crystal growth of covalent organic frameworks (COFs) with large size (>15 microns) possible but is a time-consuming process (15 to 80 days) that has had limited success (six examples) and restricts structural characterization to synchrotron-radiation sources for x-ray diffraction studies. We developed a CF3COOH/CF3CH2NH2 protocol to harvest single-crystal COFs within 1 to 2 days with crystal sizes of up to 150 microns. The generality was exemplified by the feasible growth of 16 high-quality single-crystal COFs that were structurally determined by laboratory single-crystal x-ray diffraction with resolutions of up to 0.79 angstroms. The structures obtained included uncommon interpenetration of networks, and the details of the structural evolution of conformational isomers and host-guest interaction could be determined at the atomic level.

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Aminative Suzuki–Miyaura coupling

Polpum Onnuch, Kranthikumar Ramagonolla, Richard Y. Liu

Abstract

The Suzuki–Miyaura and Buchwald–Hartwig coupling reactions are widely used to form carbon-carbon (C–C) and carbon-nitrogen (C–N) bonds, respectively. We report the incorporation of a formal nitrene insertion process into the Suzuki–Miyaura reaction, altering the products from C–C–linked biaryls to C–N–C–linked diaryl amines and thereby joining the Suzuki–Miyaura and Buchwald–Hartwig coupling pathways to the same starting-material classes. A combination of a bulky ancillary phosphine ligand on palladium and a commercially available amination reagent enables efficient reactivity across aryl halides and pseudohalides, boronic acids and esters, and many functional groups and heterocycles. Mechanistic insights reveal flexibility on the order of bond-forming events, suggesting potential for expansion of the aminative cross-coupling concept to encompass diverse nucleophiles and electrophiles as well as four-component variants.

Identifying general reaction conditions by bandit optimization

Wang, Jason Y., Stevens, et al.

Abstract

Reaction conditions that are generally applicable to a wide variety of substrates are highly desired, especially in the pharmaceutical and chemical industries1,2,3,4,5,6. Although many approaches are available to evaluate the general applicability of developed conditions, a universal approach to efficiently discover these conditions during optimizations is rare. Here we report the design, implementation and application of reinforcement learning bandit optimization models7,8,9,10 to identify generally applicable conditions by efficient condition sampling and evaluation of experimental feedback. Performance benchmarking on existing datasets statistically showed high accuracies for identifying general conditions, with up to 31% improvement over baselines that mimic state-of-the-art optimization approaches. A palladium-catalysed imidazole C–H arylation reaction, an aniline amide coupling reaction and a phenol alkylation reaction were investigated experimentally to evaluate use cases and functionalities of the bandit optimization model in practice. In all three cases, the reaction conditions that were most generally applicable yet not well studied for the respective reaction were identified after surveying less than 15% of the expert-designed reaction space.

BIOLOGY

Bioresorbable shape-adaptive structures for ultrasonic monitoring of deep-tissue homeostasis

Jiaqi Liu, Naijia Liu, Yameng Xu, et al.

Abstract

Monitoring homeostasis is an essential aspect of obtaining pathophysiological insights for treating patients. Accurate, timely assessments of homeostatic dysregulation in deep tissues typically require expensive imaging techniques or invasive biopsies. We introduce a bioresorbable shape-adaptive materials structure that enables real-time monitoring of deep-tissue homeostasis using conventional ultrasound instruments. Collections of small bioresorbable metal disks distributed within thin, pH-responsive hydrogels, deployed by surgical implantation or syringe injection, allow ultrasound-based measurements of spatiotemporal changes in pH for early assessments of anastomotic leaks after gastrointestinal surgeries, and their bioresorption after a recovery period eliminates the need for surgical extraction. Demonstrations in small and large animal models illustrate capabilities in monitoring leakage from the small intestine, the stomach, and the pancreas.

Effect of gut microbiome modulation on muscle function and cognition: the PROMOTe randomised controlled trial

Ni Lochlainn, Mary, Bowyer, et al.

Abstract

Studies suggest that inducing gut microbiota changes may alter both muscle physiology and cognitive behaviour. Gut microbiota may play a role in both anabolic resistance of older muscle, and cognition. In this placebo controlled double blinded randomised controlled trial of 36 twin pairs (72 individuals), aged ⩾60, each twin pair are block randomised to receive either placebo or prebiotic daily for 12 weeks. Resistance exercise and branched chain amino acid (BCAA) supplementation is prescribed to all participants. Outcomes are physical function and cognition. The trial is carried out remotely using video visits, online questionnaires and cognitive testing, and posting of equipment and biological samples. The prebiotic supplement is well tolerated and results in a changed gut microbiome [e.g., increased relative Bifidobacterium abundance]. There is no significant difference between prebiotic and placebo for the primary outcome of chair rise time ($\beta = 0.579$; 95% CI −1.080-2.239 $p = 0.494$). The prebiotic improves cognition (factor score versus placebo ($\beta = -0.482$; 95% CI,−0.813, −0.141; $p = 0.014$)). Our results demonstrate that cheap and readily available gut microbiome interventions may improve cognition in our ageing population. We illustrate the feasibility of remotely delivered trials for older people, which could reduce under-representation of older people in clinical trials. ClinicalTrials.gov registration:

NCT04309292.

Oligoadenylate synthetase 1 displays dual antiviral mechanisms in driving translational shutdown and protecting interferon production

Munesh K. Harioudh, Joseph Perez, Zhenlu Chong, Sharmila Nair, Lomon So, Kevin D. McC ormick, Arundhati Ghosh, Lulu Shao, Rashmi Srivastava, Frank Soveg, Thomas S. Ebert, M aninjay K. Atianand, Veit Hornung, Ram Savan, Michael S. Diamond, Saumendra N. Sarka r

Abstract

In response to viral infection, how cells balance translational shutdown to limit viral replication and the induction of antiviral components like interferons (IFNs) is not well understood. Moreover, how distinct isoforms of IFN-induced oligoadenylate synthetase 1 (OAS1) contribute to this antiviral response also requires further elucidation. Here, we show that human, but not mouse, OAS1 inhibits SARS-CoV-2 replication through its canonical enzyme activity via RNase L. In contrast, both mouse and human OAS1 protect against West Nile virus infection by a mechanism distinct from canonical RNase L activation. OAS1 binds AU-rich elements (AREs) of specific mRNAs, including IFNβ. This binding leads to the sequestration of IFNβ mRNA to the endomembrane regions, resulting in prolonged half-life and continued translation. Thus, OAS1 is an ARE-binding protein with two mechanisms of antiviral activity: driving inhibition of translation but also a broader, non-canonical function of protecting IFN expression from translational shutdown.

Ⅲ Calling for papers

IEEE SEAI 2024

Submission deadline: **Mar 20, 2024**
Conference date: **Jun 21, 2024 - Jun 23, 2024**
Full name: **2024 4th IEEE International Conference on Software Engineering and Artificial Intelligence (SEAI 2024)**
Location: **Xiamen, China**
Website: **www.seai.org**

Welcome to the 4th IEEE International Conference on Software Engineering and Artificial Intelligence (SEAI) during June 21-23, 2024, hosted in Xiamen, China. Co-sponsored by IEEE Beijing Section and Huaqiao University, and hosted by the College of Computer Science and Technology with co-hosting support from the School of Informatics at Xiamen University.

SEAI 2024 provides a global platform for academics, researchers, and scientists to exchange insights on cutting-edge topics such as Artificial Intelligence & Applications, Software Engineering Techniques and Production Perspectives, Software Engineering Methodologies, Software & System Quality of Service, and Software & System Security.

Expect engaging keynote speakers, thought-provoking presentations, and interactive sessions, offering a unique opportunity to explore the latest advancements in AI and Software Engineering. Whether you're contributing a paper or attending as a presenter or listener, join us in Xiamen for an intellectually stimulating and culturally enriching experience!

Call for Paper:

- Artificial Intelligence & Applications
- AI Algorithms
- Knowledge-based Systems
- CAD Design & Testing
- Software Engineering Techniques and Production Perspectives
- Requirements Engineering
- Software Analysis, Design and Modeling
- Software Maintenance and Evolution
- Multimedia and Hypermedia Software Engineering
- Software Engineering Methodologies
- Agent-based Software Engineering
- Software & System Quality of Service
- Soft Computing

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- Software and System Testing Methods
- Software & System Security
- Software and System Security and Privacy
- Mobile APP Security and Privacy
- Encryption Methods and Tools
- Security Service Systems

More topics via: http://www.seai.org/topic.html

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CVIT 2024

Submission deadline:	**Mar 20, 2024**
Conference date:	**Aug 16, 2024 - Aug 18, 2024**
Full name:	**2024 5th International Conference on Computer Vision and Information Technology**
Location:	**Beijing, China**
Website:	http://www.cvit.org/

2024 5th International Conference on Computer Vision and Information Technology (CVIT 2024) is to be held in the attractive and historic city of Beijing, during August 16-18, 2024. The Conference commences on Friday August 16 and will take place on three consecutive days. It is sponsored by School of Information Science and Technology, North China University of Technology (NCUT).

The Conference aims first to provide an international forum for researchers in Computer Vision and Information Technology to present the new results of their ongoing work. Secondly, the organisers invite contributions on all aspects of Computer Vision and Information Technology.

We are looking forward to meeting you in Beijing, China, during August 16-18, 2024. Definitely, CVIT 2024 will provide you a pleasant experience, new contacts and happy stay in Beijing. Through years'development, Beijing has become an international cosmopolis. North China University of Technology (NCUT), located on the western side of Beijing, is a multi-disciplinary university that combines the natural sciences and engineering with liberal arts, economics, management and law. Growing out of the former state-run Peking Advanced Vocational School of Technology, founded in 1946, NCUT has undergone dramatic changes ever since.

CVIT 2024 is the premier interdisciplinary forum for the presentation of new advances and research results in the fields of Computer Vision and Information Technology . The conference will bring together leading academic scientists, researchers and scholars in the domain of interest from around the world.

Computer Vision and Image Processing

Action and Event Recognition
Active Vision
Applications of Machine Vision
Artificial Intelligence for Machine Vision
Stereo Vision
Calibration and Geometry
Color and Texture Analysis
Early Vision
Face and Gesture Recognition
Illumination and Reflectance Modeling
Image and Video Retrieval

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Image Enhancement
Image Registration
Image understanding and recognition
Image-Based Modeling
Imaging Sensors
Medical Image Analysis
Morphology and Blob Analysis
Motion Analysis and Tracking
Physics-Based Modeling
Scene Understanding
Segmentation
Shape from XSimilarity/Dissimilarity MetricsSoft
Computing for Machine Vision
Stereo Vision
Structure from Motion
Video Analysis
Visual Navigation

Machine Learning and Pattern Recognition
Artificial Intelligence
Symbolic Learning
Biometrics Recognition
Classification
Clustering
Data Mining
Deep Learning
Face and Gesture Recognition
Feature Extraction
Feature Selection
Dimensionality Reduction
Manifold Learning
Information Retrieval
Invariance in Recognition
Information Retrieval
Kernel Methods
Support Vector Machines
Information Retrieval
Machine Learning
Multiresolution Techniques
Neural Networks
Recognition (2D and 3D)
Statistical Pattern Recognition
Syntactic Pattern Recognition
OCR, Document Analysis and Understanding

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Pattern Recognition in Biomedical Applications

Information Theory and Information Processing

Artificial neural network
Communication Theory and Systems
Detection and imaging system
Image-Based Modeling
Intelligent Information Processing
Natural language processing
Network Communication Theory and Technology
Remote sensing information acquisition and processing
Sensing information extraction and processing
Signal Processing
Source coding and channel coding
Text mining, automated q/a
The multimedia information processing
Wireless communication theory and technology
Bionic information processing methods and techniques
Biological information processing and analysis
Computer communication theory and systems
Communication networks and Communication systems security
Medical information detection method and technology
Information System Modeling and Simulation

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ISDFS 2024

Submission deadline:	**Mar 20, 2024**
Conference date:	**Apr 29, 2024 - Apr 30, 2024**
Full name:	**12th International Symposium on Digital Forensics and Security**
Location:	**San Antonio, TX, USA**
Website:	https://isdfs.org/

ISDFS is an IEEE technically supported premier event that brings together industry professionals, academics, and engineers to exchange information and ideas on digital forensics, cybersecurity, big data privacy and security, artificial intelligence in security and forensics, software engineering, signal processing, and computer science in general.

The symposium will be held by "Trinity College" in San Antonio, Texas, USA, and will be available ONLINE as well. Special sessions, workshops, tutorials, keynotes, panel discussions, posters, and oral presentations will be included in the symposium program.

All papers will be reviewed by at least three independent reviewers (single-blinded review). Accepted full papers will be submitted for publication in IEEE Xplore Digital Library.

Topics within the scope of the symposium include, but are not limited to, the following areas:

Digital Forensics
Cyber Security
Data Privacy
Cryptography
Artificial Intelligence (AI) / Machine Learning (ML)
Big Data
Computer Science

Digital Forensics

Digital Forensics Process Model, Information Systems and Crime Analysis, Business Application of Digital Forensics, Digital Forensics Techniques and Tools, Legal and Policy Issues Related to Digital Forensics, Digital Forensics Case Studies, Database Forensics, Cloud Forensics, Mobile & Multimedia Forensics, Network Forensics, Digital Forensics Training and Education, Big Data and Digital Forensics, Cyber Forensics, Digital Forensics Tool Testing and Validation Process, Digital Forensics Trends, Digital Forensics & Law, Anti and Counter Forensics, Data Hiding and Recovery, Cyber Crime Investigations, Cyber Culture & Cyber Terrorism, Incident Response, Information Warfare & Critical Infrastructure Protection.

Cybersecurity

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Steganography and Steganalysis, Secure Multiparty Computation, Biometric Approaches, Computer Security, Mobile Communications Security, Operating System Security, Trusted Computing, Network Security, Wireless Security, Database Security, IPTV Security, E-commerce Protocols, Content filtering and tracing, Distributed System Security, Security Weaknesses on Information Technologies, Secure Code Development, Penetration Tests, Intrusion Detection Systems, Malicious Codes and spyware, Viruses, Spyware, Spamware, Scam, Energy/Cost/Efficiency of Security in Clouds, Security Risk Models and Clouds, Security Standards and Practices.

Data Privacy

Digital Signature, Certified Electronic Mail, Certificates and Certificate Management, Standards, Protocols, Trust Models, Key and Identity Management, Digital Signature Policies and Law, Validity of Digital Signature in Government, Finance, and Commerce, Effects of Digital Signature on Digital Signature Law, Responsibilities for Opponents to ESSP in Law in Digital Signature, Discrepancy between Digital Signatures, Judgments related to Digital Signatures, Digital Signature Law in Other Countries.

Cryptography

Block Ciphers, Stream Ciphers, Public Key Cryptography, Quantum Cryptography, Elliptic Curve Cryptography, Algebraic Curves in Cryptography, Homomorphic Encryption, Cryptographic Protocols, Zero-Knowledge, Secret Sharing, Cryptanalysis, Hash Functions, Applications of Coding Theory in Cryptography
Smart Card Applications and Security, Cryptographic Hardware and Embedded Systems, Special Purpose Hardware for Attacking Cryptographic Systems, Side-Channel Analysis and Countermeasures, Pairing Based Cryptography, Key and Identity Management.

Artificial Intelligence (AI) / Machine Learning (ML)

Artificial Intelligence, Artificial/Deep Learning, Machine Learning, Data Science, AI and ML in Information, System and Cybersecurity, AI and ML in Privacy, AI and ML in Cybersecurity Applications, AI and ML in Steganography, AI and ML in Cryptography, AI and ML in 4G, LTE, and 5G networks, AI and ML in Operating System Security, AI and ML in Database Security.

Big Data

Big Data Security, Big Data Forensics, robust deep learning, secure deep learning/machine learning, multi-party computing, edge/fog computing, energy consumptions, high performance, heterogeneous resources, cloud models, heterogeneous architecture, telehealth, resource allocation, load balance, multimedia, and QoS.

Computer Science

Artificial Intelligence, Artificial/Deep Learning, Cloud Computing, Data Mining/Big Data, High-Performance Computing, Internet of Things, Virtual and Augmented Reality, Secure Systems, Signal/Image/Video Processing, Human-Machine Interaction, Bioinformatics, Robotics, Social Networks, Algorithms and Data Structures, Game Theory, Soft Computing, Natural Language Processing, Operating System, Computer Graphics, Programming Languages, Software Engineering, Theory of Computation.

At the end of the symposium, a Best Paper Award and a Best Student Presentation Award will be granted by the ISDFS 2024 Program Committee. In order to qualify for the award(s), at least one of the authors must register and the paper(s) must be presented.

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DIDIT 2024

Submission deadline:	**Apr 9, 2024**
Conference date:	**Jun 17, 2024 - Jun 17, 2024**
Full name:	**1st International Workshop on Distributed Digital Twins (DiDiT)**
Location:	**Groningen, Netherlands**
Website:	https://distributeddigitaltwins.github.io/2024/

DiDiT 2024 - 1st International Workshop on Distributed Digital Twins

Welcome to DiDiT 2024! The premier workshop on distributed digital twins, colocated at the DisCoTec 2024 conferences June 17, Groningen, the Netherlands.

Scope

A digital twin (DT) is a virtual representation of a physical object, system, or process (including cities, and even ecosystems), synchronised with the real-world entity it replicates. It does so by using Internet of Things (IoT) technologies, such as sensors and actuators. Through the application of digital technologies, such as AI, data analytics and computer simulations, a DT application can be used to experiment, simulate, analyse, adapt, and optimise the behaviour, performance and maintenance of the real-world counterpart, including its interaction with other objects or systems. However, large industrial systems often consist of complex distributed and interconnected elements and sub-systems. Real-time representation of the complexity of such interconnections poses many scientific and industrial challenges.

This workshop provides a discussion platform for academia and industry to investigate the topic of distributed digital twins, shed light on the issues and challenges and propose solutions for the problems of distributed ecosystems in large-scale cyber-physical systems.

Main Topics:
We welcome papers with novel ideas in related topics, including (but not limited) to the following:

Digital Twin architectures
Theoretical models and foundations for distributed cyber-physical systems
Distributed cyber-physical communication and coordination models
Distributed digital twins properties, modelling and definitions
Management and orchestration of distributed control systems
Distributed decision-making with digital twins
Adaptability and variability frameworks for distributed cyber-physical systems
Testing and validation - approaches, frameworks, testbeds
Verification of properties, models and definitions
Real-world deployments and experimentations
Interdisciplinary aspects of digital twins

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