



كلية الحاسبات والمعلومات
قسم : الدراسات العليا

مذكرة

للعرض على السيد أ.د/ عميد الكلية

الموضوع : بشأن موافقة مجلس قسم تكنولوجيا المعلومات بتاريخ 2022/1/31 على اعتماد الخطة البحثية على النحو الموضح
تكنولوجيا المعلومات للعام 2025/2022

- بتاريخ 2022/ 2 /13 أوصت لجنة الدراسات العليا بالموافقة طبقا للقواعد

وكيل الكلية للدراسات العليا

كلية الحاسبات والمعلومات - جامعة المنصورة
تفقدت على عميد الكلية
شهر فبراير 2022
القنصل
وأمم الخاس حرمنا للدراسات
ع/ع 2022/ 2 /13

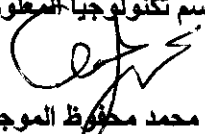


الي : السيد الأستاذ الدكتور / وكيل الكلية للدراسات العليا والبحوث
من : السيد الأستاذ الدكتور / رئيس قسم تكنولوجيا المعلومات

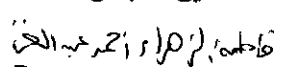
الموضوع : بشأن اعتماد الخطة البحثية لقسم تكنولوجيا المعلومات للعام الجامعي ٢٠٢٢-٢٠٢٥ .

القرار: وافق المجلس بجلسته رقم (١٨٧) المنعقدة في ٣١ / ١ / ٢٠٢٢ على اعتماد الخطة البحثية لقسم تكنولوجيا المعلومات طبقا للقواعد.
ولسيادتكم جزيل الشكر،،

رئيس قسم تكنولوجيا المعلومات


د/ محمد محفوظ الموجي

امين المجلس


د/ فاطمة الزهراء احمد الجمل

كلية الحاسبات والمعلومات - جامعة المنصورة
للعرض على مجلس قسم تكنولوجيا المعلومات
رئيس قسم
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رئيس قسم
٢٠٢٢ / ١ / ٣١

Research Topics Information Technology Department

المجالات البحثية المستهدفة في قسم تكنولوجيا المعلومات

يستهدف قسم تكنولوجيا المعلومات بكلية الحاسبات والمعلومات جامعة المنصورة من خلال الأبحاث التطبيقية التي يشرف عليها، أن يقدم إسهامات جديدة في المجالات البحثية الآتية:

1. Image and Video Processing

Image and Video Processing addresses the problems of acquisition, storage, retrieval, and processing of images, videos, and high dimensional signals for extraction and analysis of useful information for human users, robots, and autonomous systems.

1. Image/Video coding and transmission

- Still image and video coding.
- Stereoscopic and 3D coding.
- Distributed source coding.
- Source/channel coding.
- Image/video transmission over wireless networks.

2. Image/video processing

- Image and video filtering.
- Restoration and enhancement.
- Image segmentation.



- Video segmentation and tracking.
- Morphological processing.
- Stereoscopic and 3D processing.
- Feature extraction and analysis.
- Interpolation and super-resolution.
- Motion detection and estimation.
- Color and multispectral processing.
- Image visualization.
- Image registration.
- Image fusion.

3. Semantic Image and Video retrieval

- Content-based indexing, search, and retrieval of images & videos
- Semantic-based indexing, search, and retrieval of images & videos
- Affect-based indexing, search, and retrieval of images & videos
- Advanced descriptors and similarity metrics for images, audio and video
- Learning and relevance feedback in image/video retrieval
- 3D images and models
- Ontologies for annotation and search of images and videos
- Fusion of multimedia
- Image/video summarization and visualization
- Multimodal human computer interaction
- Evaluation of image and video retrieval systems
- Studies of information-seeking behavior among image/video users
- Query models, paradigms, and languages for image/video retrieval
- Database architectures for image/video retrieval
- Novel image data management systems and applications
- High performance image/video indexing algorithms

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- Image/video search and browsing on the Web
- Retrieval from multimodal lifelogs
- Applications in broadcast, web, cultural heritage, satellite, forensic, and (bio-)medical image and video collections.

4. Image formation

- Biomedical imaging.
- Remote sensing.
- Geophysical and seismic imaging.
- Optimal imaging.
- Synthetic-natural hybrid image systems.

5. Image scanning, display, and printing

- Scanning and sampling.
- Quantization and halftoning.
- Color reproduction.
- Image representation and rendering.
- Display and printing systems.
- Image quality assessment.

6. Image/video storage, Retrieval, and authentication

- Image and video databases.
- Image and video search and retrieval.
- Multimodality image/video indexing and retrieval.
- Authentication and watermarking.

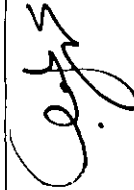
7. 3D images and models

- 3D imaging
- Advanced descriptors and similarity metrics for images, audio and video
- Affect-based indexing, search, and retrieval of images & videos
- Applications in broadcast, web, cultural heritage, satellite, forensic, and (bio-)medical image and video collections

- Case studies and emerging technologies
- Classification and clustering techniques
- Color and texture
- Compression methods
- Computational geometry
- Computer animation
- Computer art and entertainment (including games)
- Content-based indexing, search, and retrieval of images & videos
- Curves and meshes
- Database architectures for image/video retrieval
- e-Learning applications and computer graphics
- Emerging display technologies
- Evaluation of image and video retrieval systems
- Face recognition, face detection, and gesture recognition
- Fractal geometry and applications
- Fusion of multimedia
- Modeling techniques
- Multimedia Systems and Applications
- Multimodal display systems
- Multimodal human computer interaction
- Novel image data management systems and applications
- Object recognition
- Ontologies for annotation and search of images and videos
- Query models, paradigms, and languages for image/video retrieval
- Real-time collision detection algorithms
- Real-time rendering for VR
- Rendering methods
- Retrieval from multimodal lifelogs

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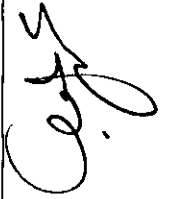
- Semantic-based indexing, search, and retrieval of images & videos
- Shadows, translucency and visibility
- Signal and speech processing
- Haptic devices and techniques
- High performance image/video indexing algorithms
- Human-computer interfaces
- Illumination and reflection techniques
- Image compression, coding, and encryption
- Image data structures for computer graphics
- Image feature extraction
- Image generation, acquisition, and processing
- Image geometry and multi-view geometry
- Image/video search and browsing on the Web
- Image/video summarization and visualization
- Image-based modeling and algorithms
- Immersive virtual reality
- Integration of virtual reality and multimedia
- Interactive digital media
- Interactive techniques
- Knowledge-based recognition
- Learning and assessment based on virtual reality approaches
- Learning and relevance feedback in image/video retrieval
- Machine learning technologies for vision
- Machine architectures/engines for graphics and VR
- Modeling of natural scenes and phenomena
- Simulation and virtual reality
- Software tools for computer graphics
- Software tools for virtual reality



- Sound rendering technologies
- Studies of information-seeking behavior among image/video users
- Surface modeling
- Virtual and augmented reality
- Virtual environments
- Virtual humans and artificial life
- Virtual laboratories
- Virtual reality and emerging applications
- Virtual reality software tools and languages
- Virtual reality techniques for behavioral and cognitive assessment
- Virtual reality, visualization, and education
- Visual computing and graphics
- Visualization
- Time-frequency analysis
- Nonlinear signal processing
- Nonstationary signal processing
- Adaptive signal processing
- Biomedical signal processing
- Signal transforms
- Multi-rate signal processing
- Signal processing methods and algorithms
- Signal processing applications.

8. Applications

- Biomedical sciences.
- Mobile imaging.
- Geosciences and remote sensing.
- Astronomy and space exploration.



- Document image processing and analysis.
- Image Processing for Geophysics
- Image Processing for Public Health and Safety
- Biomedical and Biological Image Processing
- Emerging Applications and System

2. Biometrics

Biometrics are body measurements and calculations related to human characteristics. Biometric authentication (or realistic authentication) is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance.

1. Biometric Recognition

- Palmprint, Iris, fingerprint, hand, ear, DNA, face, 3D face, gait, handwriting, voice, hand geometry, retina, periocular, anthropometry, facial thermogram, hand thermogram, knuckle, footprint, heartbeat.

2. Template protection

- Biometric encryption.
- Cancelable biometrics.
- Security and privacy.
- Anti-spoofing methods.
- Covariate analysis.
- Facial aging effects.
- Large scale deployments.
- Multi-biometric fusion.
- Novel biometrics.
- Novel sensors.
- Ocular recognition.
- Performance evaluation.
- Social impact analysis.
- Soft biometrics.

- Template aging.
- Usability studies.
- Feature quality improvements.

3. Multibiometric Systems

- Multi-classifiers fusion and score weighting.
- Machine vision and soft computing techniques in biometric fusion.
- Cognitive Biometrics.
- Emotion recognition.

4. Time-Varying Biometrics

- Age invariant biometrics recognition.
- Face Verification across age progression.

5. Mobile biometrics

- Continuous biometric recognition using wearable devices.
- Sensors for wearable technology (smartwatches, smart eyewear, smart t-shirt, etc.).
- Physical and behavioral in the mobile environment.
- Cognitive biometrics for wearable devices.
- Age and aging effects in mobile biometrics.
- Biometric template protection: challenges and solutions in the mobile environment.
- Usability, interfaces, and human factors.
- Hardware architectures and software for biometric recognition on mobile and wearable devices.
- Affective computing in biometric recognition.

Bioinformatics

Bioinformatics is a subdiscipline of biology and computer science concerned with the acquisition, storage, analysis, and dissemination of biological data, most often DNA and amino acid sequences. Bioinformatics uses computer programs for a variety of applications, including determining gene and protein functions, establishing evolutionary relationships, and predicting the three-dimensional shapes of proteins.

1. Genome analysis

- Genome assembly.
- Genome and chromosome annotation
- Gene finding,
- Alternative splicing
- EST analysis.
- Comparative genomics and metagenomics.

2. Sequence analysis

- Multiple sequence alignment.
- Sequence search and clustering.
- Function prediction.
- Motif discovery.
- Functional site recognition in protein.
- RNA and DNA sequences.

3. Structural Bioinformatics

- Structure matching.
- Prediction, analysis, and comparison, methods and tools for docking, protein design.

4. Analysis of high-throughput biological data

- Microarrays (nucleic acid, protein, array CGH, genome tiling, and other arrays), EST, SAGE, MPSS, proteomics, mass spectrometry.

5. Genetic and population analysis

- Linkage analysis.
- Association analysis.
- Population simulation.
- Haplotyping.
- Marker discovery.
- Genotype calling.



6. Computational proteomics

- Filtering and indexing sequence databases.
- Peptide quantification and identification.
- Genome annotations via mass spectrometry.
- Identification of post-translational modifications.
- Structural genomics via mass spectrometry.
- Protein-protein interactions.
- Computational approaches to analysis of large-scale mass spectrometry data.
- Exploration and visualization of proteomics and genomics.
- Querying and retrieval of proteomics and genomics data.

Computer vision, computer graphics and pattern recognition

Computer vision is a field of artificial intelligence (AI) that enables computers and systems to derive meaningful information from digital images, videos and other visual inputs — and take actions or make recommendations based on that information. **Computer graphics** is a sub-field of computer science which studies methods for digitally synthesizing and manipulating visual content. **Pattern recognition** is a data analysis method that uses machine learning algorithms to automatically recognize patterns and regularities in data.

1. Computer Vision

- Color and Photometry in computer vision.
- Feature detection and matching.
- Structure from motion.
- Dense motion estimation.
- Image stitching.
- Computational photography.
- Stereo correspondence.
- 3D reconstruction.
- Image-based rendering.
- Big data in 3D computer vision.

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- Video event categorization, tagging and retrieval.
- Underwater vision.
- Computer vision in vehicle technology.
- 3D representation and recognition.
- Understanding human activities.
- Wearable computer vision systems.
- Large-scale video search and mining.
- Computer vision for autonomous driving.
- Computer vision in sports.
- Embedded vision.
- Statistical machine learning.
- Structural and syntactic pattern recognition.
- Neural Network.
- Kernel methods.
- Graphical models.
- Bayesian methods.
- Computational optimization.
- Feature selection.
- Voting and fusion schemes.
- Compressed sensing detection and estimation.
- Animation.
- Artistic rendering.
- Font rendering & typography.
- Image warping & morphing.
- Visual simulation.
- Automatic Panoramic Image Stitching.
- Scene Segmentation.
- 3D Object Recognition.



- People Localization and Tracking.
- 3D Computer Vision
- Action Recognition
- Big data and Large Scale Methods
- Biometrics, face and gesture
- Biomedical image analysis
- Computational photography, photometry, shape from X
- Deep Learning
- Low-level vision and Image Processing
- Motion and Tracking
- Optimization methods
- Recognition: detection, categorization, indexing and matching
- Robot Vision
- Segmentation, grouping and shape representation
- Statistical learning
- Video: events, activities and surveillance
- Vision for X
- Hardware-Implemented Vision Systems
- Vision for the Real World: Robustness, learning, adaptability, self-assessment, failure recovery
- Vision for Action: Robotics, perception-action loops
- Vision in Context: Context awareness, knowledge representations, reasoning, goal specification
- Biological Vision: Computer vision inspired by biology or psychology
- Cognitive Vision Systems
- Human-computer interaction: Monitoring, supervised learning, scene interpretation
- Human-Robot Collaboration: Gesture recognition, scene understanding
- Performance Evaluation: benchmarks, methods and metrics

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2. Computer Graphics

- Modeling
- Rendering
- HCI/user interfaces
- Graphical models
- Model Validation
- Computer Art
- 3-D object Extraction
- AI techniques
- Computer Aided Design

3. Animation

- Computer Animation
- Algorithms & Techniques
- Animation Systems
- Mobile Control Kinematics
- Plausible Motion Simulation
- Animation Languages
- Robotics
- Behavioral Animation
- Human Figure Animation
- Character Animation

4. Visualization

- Visualization, Virtual Reality and Augmented Reality
- Media immersion
- Graphics User Interface
- Information Visualization
- Visualization Software



- Computer Games
- Graph and Network Visualization
- Real-Time Simulation
- Human Perception

5. Pattern Recognition

- Artificial Intelligence Technologies in Pattern Recognition
- Bioinformatics Clustering
- Biometrics (including face recognition)
- Data Mining and Big Data
- Dataset: a new public dataset and baseline
- Deep Learning and Neural Networks for Pattern Recognition
- Document Processing and Recognition
- Fuzzy and Hybrid Techniques in PR
- High Performance Computing for Pattern Recognition
- Image Processing and Analysis
- Kernel Machines
- Mathematical Morphology
- Mathematical Theory of Pattern Recognition
- Medical Image Processing and Analysis
- Application of Natural Language Processing and Recognition
- Object Detection, Tracking and Recognition
- Pattern Recognition Principles
- Pattern Recognition for optimization
- Real Systems, Applications and Case Studies of Pattern Recognition (e.g. health, environment, weather prediction, natural disasters, transportation, etc.)
- Pattern Recognition in Robotics
- Remote Sensing



- Shape and Texture Analysis
- Signal Processing and Analysis
- Social Media and HCI
- Signal Processing and Analysis
- Statistical Pattern Recognition
- Syntactical and Structural Pattern Recognition
- Time series prediction
- Voice and Speech Recognition

Security

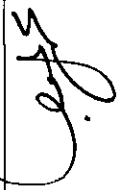
Computer security basically is the protection of computer systems and information from harm, theft, and unauthorized use. It is the process of preventing and detecting unauthorized use of your computer system. There are various types including Information security, Computer Security, Network Security, and Cybersecurity.

1. Communications and network security

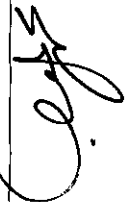
- Cognitive radio security.
- Internet security.
- Security and privacy in emerging networks.
- Security and privacy in cloud computing.
- Wireless network security.
- Intrusion detection.

2. Information and computer security

- Access control and database security.
- Anonymity and E-voting.
- Authentication.
- Black Ciphers and Hash functions.
- Broadcast encryption and Traitor tracing.
- Combinatorial aspects.



- Covert channels and information flow.
- Critical infrastructures.
- Cryptanalysis.
- Dependability.
- Digital rights management.
- Digital signature schemes.
- Digital steganography.
- Economic aspects of information security.
- Elliptic curve cryptography and number theory.
- Embedded systems aspects.
- Embedded systems security and forensics.
- Financial cryptography.
- Firewall security.
- Formal methods and security verification.
- Human aspects.
- Information warfare and survivability.
- Java and XML security.
- Key distribution.
- Key management and secret sharing.
- Malware.
- Multi-party computation and threshold cryptography.
- Peer-to-peer security.
- PKIs, public-key and hybrid encryption.
- Quantum cryptography.
- Risks of using computers.
- Software obfuscation.
- Stream ciphers.
- Trust models.



- Watermarking and fingerprinting.
- Computer Forensics.

3. Cybersecurity

- Anti-malware techniques: detection, analysis, and prevention
- Security and privacy of mobile and smartphone platforms
- Anti-phishing, anti-blackmailing, anti-fraud techniques
- Security and privacy of systems based on machine learning and AI
- APTs, botnets, DDoS
- Security for cloud and edge computing
- Autonomous vehicles, industrial control systems
- Security for cyber-physical systems
- Cyber-attack prevention, detection, investigation, and response
- Security for emerging networks.

Human Computer Interaction (HCI)

Human-Computer Interaction (HCI) is a multidisciplinary field of study focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers. While initially concerned with computers, HCI has since expanded to cover almost all forms of information technology design.

1. General Topics

- Practice-oriented approaches to Sustainable HCI.
- The Theory and Practice of Embodied Interaction in HCI and Interaction Design.
- Social Media and Collaborative Systems for Crisis Management.
- Data Mining for Understanding User Needs.
- User Interface Description Languages for Next Generation User Interfaces.
- Aesthetics of Interaction.
- Web Accessibility.
- Information Systems for an Aging Society.



- Recommender Systems Interfaces.
- Sensing-based Interaction.
- Mobile and Adaptive Conversational Interfaces.
- Modeling Multiple and Collaborative Tasks.
- Human-Computer Interaction and Collaborative Virtual Environments.
- Human-Computer Interaction with Mobile Systems.
- Interface Issues and Designs for Safety-Critical Interactive Systems.
- Speech in Interactive Computing.
- Virtual Reality Software and Technology.

2. Interfaces

- Graphical user interfaces.
- Intelligent user interfaces.
- Adaptive user interfaces.
- Multi-modal user interfaces.
- Context-based interfaces.
- Virtual reality and 3D interfaces.
- Applications of Speech and natural language interfaces.
- Interfaces for collaborative systems.
- Interfaces for restricted environments.
- Internationalization and reflections of culture on interface design.
- Interfaces for disadvantaged users.
- Interface specification and design.
- Interface prototyping.
- Interface testing.
- Interface evaluation.
- Interface generators and other tools for developing interfaces.
- Data visualization Applications.



- Visualization techniques.
- Interactive visualization.

3. HCI and sustainability

- What is the scope of sustainable HCI research presently?
- How does sustainable CHI align with global sustainability challenges?
- How could CHI research and practice support overcoming societal barriers to positive environmental changes?
- How does CHI relate to circular economies and life cycle thinking?
- What methods and methodologies support sustainable CHI research?
- How can CHI challenge unsustainable everyday practices?
- How can CHI support building sustainable cultures?
- How can CHI help develop sustainable behaviors among children and youth?

4. Human-centered industrial technologies

- Human-centered process optimization and systems integration.
- Human-centered chains; Human-centered risk management and nano-technology.
- Human-centered automation processes and technologies.
- Human-in-the-middle for micro and nano technology simulations; Industry chains and human-robot and human-agents interaction.
- Micro and nano technology-oriented human challenges.
- Human-oriented manufacturing processes
- Human aspects for reliable process chains.
- Risk management on nano-particles/interaction with human beings.
- Human-skills and nano-technologies (e.g., additive manufacturing).
- Industry 4.0 human-oriented challenges.

5. Organic user interfaces

- Interface-oriented materials and devices.
- Physical and digital representation.
- Sensing and display technologies.
- Rollable and foldable displays with tactile properties.



- Skin-based input.
- Analog input interaction design.
- Flexible display technologies.
- Functional-based display forms.
- Flexible-computing and curve computer interactions.
- 3D continuous display interfaces

6. Haptic interfaces

- Fundamental of haptic interactions.
- Tangible user interfaces.
- Bidirectional information flow.
- Haptography.
- Haptic feedback and control.
- Bodyware (embedded sensors; as flexible structures, associative memories, actuation and power systems).
- Magnetic levitation haptic interfaces.
- Kinetic motion-based interaction.
- Kinetic motion and haptic design.
- Mindware (learning, adaptation, head-hand coordination, bimanual coordination; discovering affordance, interaction and imitation).
- Language of motion / Gesture annotation; Interfaces with kinetic properties.
- Sensor actuator design, development and evaluation; Linear haptic display.
- Fingertip haptic display.
- Pen based force display.
- High bandwidth force display.
- Quality of experience model for haptic interactions.
- Haptics rendering.

7. Interactive systems

- Highly interactive systems.
- Intelligent agents and systems.

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- Adaptive systems.
- Context-aware systems.
- Multi-user multi-interface systems.
- Collaborative systems.
- Computer-supported cooperative work.
- Communicators and advisory systems.
- Interaction through wireless communication networks.

8. Interaction devices

- General input and output devices.
- Virtual reality input and output devices.
- Interaction devices for immersive environments.
- Shareable devices and services.
- Mobile devices and services.
- Pervasive devices and services.
- Small displays.
- Very large displays.
- Tangible user interfaces.
- Wearable computing.
- Interaction devices for disadvantaged users.
- Interaction devices for computer games.

9. Interaction & interface design & evaluation

- Interface metaphors.
- Interaction styles.
- Interaction paradigms.
- Requirements specification methods and tools.
- Analysis methods and tools.
- Design methods and tools.

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- Evaluation paradigms.
- Evaluation methods and tools.
- Evaluation frameworks.
- Scenarios.
- Task analysis.
- Conceptual design.
- Physical design.
- Information architecture.
- Information design for websites.
- Guidelines and heuristics.
- Experience design; Environmental design.
- Ethnography.
- Contextual design.
- Service design.

10. User modeling and user focus

- Usability and user experience goals.
- User testing.
- User modeling.
- User profiling.
- Predictive models (e.g., for user delay prediction).
- Human perceptible thresholds.
- User support systems; Psychological foundations for designing interactive system; Human information processing; Digital human modeling; Engineering psychology; Ergonomics; Hearing and haptics; Affective computing

11. Children-computer interaction

- Using interface-oriented technology toys.
- Psychological basis for children interfaces.
- Children interfacing thinking.

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- Smart interfaces for autistic children.
- Interactive application for Children with Mixed Abilities.
- Mining children's behaviors.
- Interaction with children with visual impairments.
- Kids haptic, wearable, tangible learning.
- Kids vocal interfaces.
- Immersive gameplay interfaces.
- Speech loudness interfaces.
- Children cognitive interfacing skills.
- Conveying children's emotions.
- Deformable interfaces for children.
- Incentivizing children crowdsourcing activities.
- Children and destructive games.
- Children and interacting fictions.
- Children and biotic game.
- Children participatory design.
- Children and visual design.
- Children emotional perception.
- Object-oriented drawing at young age.
- Children-powered access paradigms and technologies.
- Children social interaction experiences.
- Children online gaming behavior.
- Children and wearable devices.
- Children-oriented design interaction shortcuts.
- Teen's health self-care.
- Self-care technologies



12. Designing for an aging population

- Smart environments for elders
- Rethinking mobile interfaces for older users.
- Motion-based video games in care home settings.
- Interacting assistive approaches for elders.
- Detecting elderly emotion.
- Human-machine interaction for disabled users.
- Adult opportunistic device interactions.
- Elderly social interaction.
- Degrading skills adaptation for elderly interfaces.
- Robots' collaboration for elderly emergency.
- Unmanned systems for elderly.
- Applications of ecological interface design

13. Traditional and emerging paradigms

- Interaction paradigms.
- Mobile computing.
- Wearable computing.
- Location-aware computing.
- Context-aware computing.
- Ubiquitous computing.
- Pervasive computing.
- Transparent computing.
- Attentive environments.
- Virtual reality.
- Augmented reality and tangible bits.
- Immersive environments.
- Human-based computation.

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- Visual languages and environments.
- End-user programming.
- Hypermedia advances and applications.
- New visions of human-computer interaction

14. Usability and universal accessibility

- Interaction and interface design for people with disabilities.
- Interaction and interface design for the young and the elderly.
- Universal access and usability.
- Usability engineering.
- Usability testing and evaluation.
- Usability and internationalization.

15. Human-Web Interaction

- Keyword-based query interfaces.
- Hybrid query interfaces.
- Emotional behavior.
- Adaptive Web interfaces.
- Learning User Profiles.
- Personalized Interfaces.
- Remembrance Agents.
- Interaction visualization.
- Social and psychological challenges.

16. Human-robot interaction

- Fundamentals of human-robot cooperation.
- Cognitive models of human-robot interaction.
- Adaptable autonomy and knowledge exchange.
- Autonomy and trust.
- Awareness and monitoring of humans.



- Task allocation and coordination.
- Human guided robot learning.
- User evaluations of robot performance.
- Metrics for human-robot interaction.
- Long-term interaction robotics.
- Health and personal care robotics.
- Social Robotics.
- Multi-modal human-robot communication.
- Robot intermediaries.
- Experiments and applications.

17. Agents and human interaction

- Principles of agent-to-human interaction.
- Models for human-agent interaction.
- Social persuasion in human-agent interaction.
- Designing for human-agent interaction.
- Socially intelligent agents and the human in the loop.
- Agents for human-human interaction.
- Agent-based human-computer-interaction.
- Human cooperation and agent-based interaction.
- Human interaction with autonomous agents Agent-based human-robot interaction.
- Human and artificial agents emotional interaction.

18. Social aspects of human-computer interaction

- Societal implications of human-computer interactions.
- Social computing and software Online communities Weblogs and other community building tools Online support for discovery and creativity.
- Tool support for discovery and innovation Expressive and attentive interfaces and environments Affective aspects of human-computer interaction Emotional design.

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19. Computer and gaming

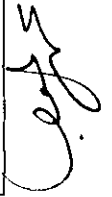
- Computer game technology.
- Computer game engineering.
- Development processes and supporting tools.
- Management aspects of computer game development.
- Architectures and frameworks for computer games.
- Game-based training and simulation; Serious games.
- Multi-user games.
- Online gaming.
- Game theories.
- Audio, video and text in digital games.
- New computer games and case studies.
- Performance improvements in computer games.
- Social impact of games and gaming.

20. Human-computer interaction in education and training

- Interactive systems for education and training.
- Online and communications support for education and training.
- Interfaces, interactions and systems for distance education.
- Software tools for courseware development and delivery.
- Collaborative systems for teaching, studying and learning.
- Handheld mobile devices for education and training.
- Advisory and recommendation systems Techniques and tools for information localization, retrieval & storage.
- Web annotation systems.
- Case studies and applications.

21. Applications in medicine

- Interactive systems for medical applications.
- Interactive systems for telemedicine.



- Interactive systems for telehealth.
- Interactive systems for telepathology.
- Interactive systems for telecardiology.
- Interactive systems for telesurgery.
- Interactive personal medical devices.
- Digital imagery and visualization frameworks.
- Role of colors and color imaging in medicine.
- Multidimensional projections with application to medicine.
- Data mining and image retrieval techniques for medical applications.
- Imaging interfaces and navigation.
- Internet imaging localization, retrieval and archiving.
- Video techniques for medical images.
- Internet support for remote medicine.
- Computer-controlled communications for medical applications.
- Medical informatics.
- Software and devices for patient monitoring.
- Interactive software for therapy and recovery.

22. Teleconferencing

- Fundamentals for teleconferencing.
- Platforms for teleconferencing.
- Devices for teleconferencing.
- Videoconferencing, Web Conferencing.
- Performance in teleconference applications.
- Real-time aspects in teleconferencing.
- Privacy and security in teleconference applications.
- Teleconferencing services.
- Business models for teleconferencing.



23. Other domain applications

- Interactive interfaces and systems for scientific applications.
- Interactive interfaces and systems for engineering applications.
- Interactive interfaces and systems for business applications.
- Interactive interfaces and systems for activities in arts & humanities.
- Interactive interfaces and systems for scientific research.
- Other applications of interactive interfaces and systems.

Communication Networks

Communication Network refers to the structure and flow of communication and information between individuals within a group. Within many groups, formal and informal communication is often characterized by a top-down hierarchical pattern, in which members direct communication to others at the same level or below but not above.

1. General topics

- Ad-hoc and sensor networking.
- Communication and information system security.
- Communication QoS, reliability and modeling.
- Cognitive radio networks.
- Communications software and services.
- Next-generation networking.
- Optical networks and systems.
- Signal processing for communications.
- Wireless communications.
- Wireless networks.
- Satellite and space communication.
- 5G/6G Cellular Systems and Heterogeneous Networks
- Big Data / IoT Analytics in Networking
- Blockchain and Distributed Ledger



- Communication Network Architectures, Protocols and Design
- Emerging Technologies for Next Generation Network
- Energy Saving Protocols for Ad hoc and Sensor Networks
- Future Internet Architecture, Protocols and Services
- Information / Content centric networks (ICN)
- Internet Measurement and Modeling
- Internet of Things (IoT)
- Machine Learning and AI in Networking
- Mobile Ad hoc and Sensor networks
- Mobile and Wireless Networks
- Network Applications, Operation and Management
- Network Security and Privacy
- Network Services and Applications
- Nomadic Computing. Applications and Services Supporting the Mobile User
- OS and Middleware Support for Mobile Computing and Networking
- Performance of Mobile and Wireless Networks and Systems
- Satellite Communications
- SDN/NFV and Network Programmability
- Software-defined networking (SDN) and network virtualization
- Ubiquitous and Cloud Computing
- Vehicle-to-everything (V2X) and autonomous cars
- Vehicular Networks & Intelligent Transportation
- VR/AR Streaming
- Wireless Multimedia Systems

Big Data and Data Analytics

Big Data Analytics is the process used to extract meaningful insights, such as hidden patterns, unknown correlations, market trends, and customer preferences from a collection of data that is huge in volume, yet growing exponentially with time.



1. General Topics

- Big Data analytics.
- Big Data analytics platforms.
- Heterogeneous data integration.
- Assessment of quality of data for Big Data analysis.
- Applications of Sentiment analysis.
- Live drug response analysis.
- Security and privacy issues related to Healthcare information exchange.
- Metadata management.
- Information retrieval tools for efficient data searching.
- Efficient processing architectures for Big Data.
- Hadoop and MapReduce platforms for efficient stream processing.
- Big Data efficient visualization.
- Big Data visualization techniques.
- Mining Time-series, real-time, and contextual data.
- Techniques for data fusion, aggregation, and integration.
- Cloud Analytics and Analytics as a Service.
- Analysis of Streaming Data from Sensory Networks.
- Applications of data analytics in health systems, tourism, transportation systems, and the Internet of Things.

2. Big Data Infrastructure

- Cloud/Grid/Stream Computing for Big Data.
- High Performance/Parallel Computing Platforms for Big Data.
- Autonomic Computing and Cyber-infrastructure, System Architectures, Design and Deployment.
- Energy-efficient Computing for Big Data.
- Software Techniques and Architectures in Cloud/Grid/Stream Computing.
- Big Data Open Platforms.



3. Big Data Management

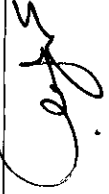
- Advanced database and Web Applications.
- Novel Data Model and Databases for Emerging Hardware.
- Data Preservation.
- Data Provenance.
- Interfaces to Database Systems and Analytics Software Systems.
- Data Protection, Integrity and Privacy Standards and Policies.
- Information Integration and Heterogeneous and Multi-structured Data Integration.
- Data management for Mobile and Pervasive Computing.
- Data Management in the Social Web.
- Crowdsourcing.
- Spatiotemporal and Stream Data Management.
- Scientific Data Management.
- Workflow Optimization.
- Database Management Challenges: Architecture, Storage, User Interfaces.

4. Big Data Search and Mining

- Social Web Search and Mining.
- Web Search.
- Systems for Big Data Search.
- Big Data Search Architectures, Scalability and Efficiency.
- Data Acquisition, Integration, Cleaning, and Best Practices.
- Visualization Analytics for Big Data.
- Large-scale Recommendation Systems and Social Media Systems.
- Mobility and Big Data.
- Multimedia and Multi-structured Data- Big Variety Data.

5. Big Data Security & Privacy

- Intrusion Detection for Gigabit Networks.



- Anomaly and APT Detection in Very Large-Scale Systems.
- High Performance Cryptography.
- Visualizing Large Scale Security Data.
- Threat Detection using Big Data Analytics.
- Privacy Threats of Big Data.
- Privacy Preserving Big Data Collection/Analytics.
- HCI Challenges for Big Data Security & Privacy.
- User Studies for any of the above.
- Sociological Aspects of Big Data Privacy.

6. Big Data Applications

- Complex Big Data Applications in Science, Engineering, Medicine, Healthcare, Finance, Business, Law, Education, Transportation, Retailing, Telecommunication.
- Big Data Analytics in Small Business Enterprises (SMEs).
- Big Data Analytics in Government, Public Sector and Society in General.
- Real-life Case Studies of Value Creation through Big Data Analytics.
- Big Data as a Service.
- Big Data Industry Standards.
- Experiences with Big Data Project Deployments.

7. Big Data Foundations

- New Computational Models for Big Data.
- Data and Information Quality for Big Data.
- New Data Standards.

8. Real-Time Big Data Analytics

- Applications and Evaluation of Real-Time Big Data Systems.

9. Big Data / Smart Cities

- Big Data for Improving Resilient Infrastructures

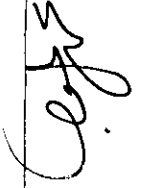
- Big Data Applications such as Healthcare and Transportation

Internet of Things (IoT)

The **Internet of Things** is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-Computer interaction.

1. General topics

- Device discovery and management in dynamic IoT environments.
- Cyber-physical and other IoT systems architectures.
- Network architecture and system design in IoT.
- IoT and Cloud computing.
- Integration with existing standards and protocols (e.g., RPL, 6LoWPAN, CoAP, MQTT).
- Data management in IoT.
- Vehicular Cloud.
- Wearable sensors for human activity monitoring.
- Context-aware computing for the Internet of Things.
- Service orchestration for the Internet of Things.
- Heterogeneous sensor data management for the Internet of Things.
- Machine-type Communication and Machine to Machine (MTC/M2M).
- Energy efficient management and sustainable operation of IoT/M2M objects.
- Information centric network for IoT.
- Social networks for IoT.
- Smart cities applications and architectures.
- IoT traffic characterization.
- Privacy, Security and Trust for IoT.
- Testbed, prototype, and practical systems for IoT use cases.



Embedded Systems

Embedded Systems are special-purpose computing systems embedded in application environments or in other computing systems and provide specialized support. The decreasing cost of processing power, combined with the decreasing cost of memory and the ability to design low-cost systems on a chip, has led to the development and deployment of embedded computing systems in a wide range of application environments.

1. General Topics

- Embedded System Architecture.
- Embedded Software Architectures.
- Embedded Storage and I/O Systems.
- Real-Time Embedded Systems.
- Distributed and Networked Embedded Systems.
- Fault Tolerant and Trusted Embedded Systems.
- Power and Thermal Aware Computing.
- Mixed-Criticality Embedded Systems.
- Heterogeneous SoC and Multicore Embedded Systems.
- Reconfigurable Embedded Computing.

2. Design Methodology & Tools

- Design Technologies of Embedded Systems
- IDE and Software Tools
- Hardware/Software Co-Design
- Model-based Design for Embedded Software
- Domain/Application-Specific Design Techniques
- Performance Evaluation Techniques and Tools
- Safety of Machine Learning for Embedded Systems

4. Emerging Embedded Applications and Interdisciplinary Topics

- Intelligent Embedded Systems.
- Internet-of-Things (IoT).



- Wearable Computing.
- Smart City.
- Robotics and Control Systems.
- Wireless Sensor Networks.
- Cyber-Physical Systems (CPS).
- Assured Autonomy for Safety-Critical CPS.
- Automotive and Avionics Systems.
- Medical Systems.
- Database & Multimedia Systems.
- Network Protocols and Security.
- Emergency and Disaster Management.
- Consumer Electronics.
- Mobile Cloud Computing.
- Industrial Practices and Case Studies.

Pervasive and Mobile Computing

Pervasive Computing, also called ubiquitous computing, is the growing trend of embedding computational capability (generally in the form of microprocessors) into everyday objects to make them effectively communicate and perform useful tasks in a way that minimizes the end user's need to interact with computers.

1. Advances in pervasive systems and infrastructures

- Data engineering for pervasive computing.
- Cloud, fog and edge computing.
- Integrations of smartphones in pervasive experiences.
- Applications of device-to-device coordination.

2. Domain-specific challenges and novel applications

- Urban/mobile crowdsensing & intelligence
- Percom for healthcare and well-being



- Smart homes and virtual assistants
- Innovative percom applications (e.g., sports analytics, crime prevention, pervasive nowcasting).

3. New techniques for user-level concerns

- Participatory and social sensing
- Trust, security, and privacy
- User interface, interaction, and persuasion
- Online and offline social networking and pervasive computing.

4. Technological innovations

- Architectures, protocols, and technologies for pervasive communications
- Energy-harvesting, self-powered, or battery-less systems
- Mobile and wearable systems
- Smart devices and environments
- Positioning and tracking technologies
- Wireless crowd-recharging
- Device-free human sensing.
- Pervasive computing for vehicular systems:
- Connected vehicles
- Vehicular ad-hoc networks
- Intelligent transport systems (ITS)
- Mobile and pervasive computing for/by vehicles
- Human-machine interface for vehicular systems
- V2x communications (vehicles, roadside units, infrastructure, drones, pedestrians)
- Mobile edge computing
- Autonomous/automated vehicles
- New applications for vehicular systems
- Security for vehicular systems
- Gender equality/neutrality in vehicular systems

Web Technology

Web Technology refers to the various tools and techniques that are utilized in the process of communication between different types of devices over the internet.

1. Web of People

- Crowdsourcing and Social Data Mining
- Human-Centric Computing
- Information Diffusion
- Knowledge Community Support
- Modelling Crowd-Sourcing
- Opinion Mining
- People Oriented Applications and Services
- Recommendation Engines
- Applications of Sentiment Analysis
- Situational Awareness Social Network Analysis
- Social Groups and Dynamics
- Social Media and Dynamics
- Social Networks Analytics
- User and Behavioral Modelling

2. Web of Data

- Big Data Analytics
- Big Data and Human Brain Complex Systems
- Cognitive Models
- Data-Driven Services and Applications
- Data Integration and Data Provenance
- Information Search and Retrieval
- Linked Data Management and Analytics



- Self-Organizing Networks
- Sensor Networks
- Web Science

3. Web of Things

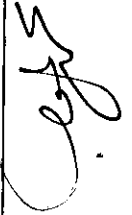
- Complex Networks.
- Dynamics of Networks.
- Industrial Multi-Domain Web.
- Intelligent Ubiquitous Web of Things.
- IoT Data Analytics.
- Location and Time Awareness.
- Open Autonomous Systems.
- Web Infrastructures and Devices Mobile Web.
- Wisdom Web of Things (W2T).

4. Web of Trust

- Blockchain analytics and technologies.
- Fake content and fraud detection.
- Hidden Web Analytics.
- Monetization Services and Applications.
- Trust Models for Agents.
- Ubiquitous Computing.
- Web Cryptography.
- Monetization services and applications.
- Web safety and openness.

5. Emerging Web in Health and Smart Living

- Big Data in Medicine.
- City Brain and Global Brain.
- Digital Ecosystems.



- Digital Epidemiology.
- Health Data Exchange and Sharing.
- Healthcare and Medical Applications and Services.
- Omics Research and Trends.
- Personalized Health Management and Analytics.
- Smart City Applications and Services.
- Time Awareness and Location Awareness Smart City.
- Wellbeing and Healthcare in the 5G Era.

6. Semantic Web and XML

- Semantic Web Architectures.
- Semantic Web Middleware.
- Semantic Web Services.
- Semantic Web Agents.
- Ontologies.
- Applications of Semantic Web.
- Semantic Web Data Management.
- Information Retrieval in Semantic Web.

7. Applications and uses

- E-Learning.
- E-Government.
- E-Health.
- E-Procurement.
- E-Society.
- Digital Libraries.
- Web Services/SaaS.
- Application Interoperability.
- Web-based multimedia technologies.

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8. Emergent Areas

- Digital Transformation.
- Applications of Blockchain.
- Bitcoin and other cryptocurrencies.

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