Software Technology

The Software Technology track at HICSS is about methods, tools and techniques related to software, as distinct from the context in which it is deployed or its applications. Software Technology is among the oldest tracks at HICSS and has provided a central point of interaction among all participants in the conference, as well as a natural forum to foster new technologies. Among the topics that the Software Technology track has covered are: software engineering, security, networking, software-based product-lines, open source software, pervasive computing, artificial intelligence, agile methods, mobile/ad hoc networking, cloud computing, virtualization, parallel and distributed computing, and software assurance. The Software Technology track continues to invite novel and emerging areas of research in what remains a dynamic and exciting field.

Minitracks:

- Agile and Lean: Organizations, Products and Development
- Big Data Engineering
- Cybercrimes, Cyber-Physical Innovations, and Emerging Investigation Challenges
- Cybersecurity and Software Assurance
- CyberWarfare: Offensive and Defensive Software Technologies
- Digital Forensics: Education, Research, and Practice
- eSourcing of Business Processes and Software Products and Services
- IS Risk and Decision-Making
- Mobile App Development
- Modern Trends in Parallel Computing
- Securing The Cloud and the Internet of Things
- Software Product Lines: Engineering, Services, and Management
- Wireless Networks

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Agile and Lean: Organizations, Products and Development Minitrack

In this minitrack, we seek research papers and experience reports that explore agile development, lean product management and agile/lean organizations.

• What evidence-based guidance can we provide to product leaders, managers and developers to help motivate, create and sustain better agile/lean behaviors and more profitable outcomes?

• How can we incorporate product design, architecture, engineering, risk reduction, budgeting and offshoring into agile/lean while preserving experimentation and adaptation?

• What common behaviors do we see in agile (including Scrum, Kanban, Extreme Programming/XP, etc.) teams and lean product management (including Lean Startup, Customer Development, etc.) and how do those behaviors affect outcomes?

• How do organizations and cultures restructure to support these philosophies and when they do not restructure, what happens?

• Which metrics help enterprises, teams and individuals adapt and improve?

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Big Data Engineering Minitrack

This minitrack, titled Big Data Engineering, will cover advances in the broad range of activities that are required to cost-effectively plan, design, build, evolve and manage big data systems. The sheer scale and pace of change mandates the computer science and software engineering communities develop new methods and tools to plan, design, build, evolve and manage big data systems that derive on-going business value. Big Data Engineering (BDE) provide a focus for the synergies that must be developed across technical disciplines to reliably deliver production-level applications that handle unprecedented amounts of data, new variety of data type and real time velocity.

To this end, this minitrack will solicit papers in the following areas:

- New system architectures and methods for big data sourcing/harnessing, ingestion, storage, processing, exploration, analysis and visualization.
- Methods for integration, interoperability and metadata modeling for big data access.
- Hybrid architectures/models for big data systems coexisting with traditional data warehouses
- Software engineering methods and decision support tools for massively scalable systems development
- Advanced technologies: MPP, NoSQL databases, real time stream processing, in-memory processing frameworks, scalable analytics, big data cloud technologies and platforms,
- Engineering methods for generating and facilitating innovation and/or new business models from big data collections and analytics.
- New programming models and languages for big data
- Engineering approaches for big data governance, compliance, privacy and security
- Novel big data engineering approaches in specific application domains.
- Other relevant topics related to big data engineering such as education/curriculum issues for producing big data engineers.

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Cybercrimes, Cyber-Physical Innovations, and Emerging Investigation Challenges Minitrack

As technology is incorporated into more aspects of daily life, cybercrimes evolve and diversify, resulting in data intensive environments. Increasing smart-phone sales, increasing digital evidence requests in legal environments, the increasing generation and storage of digital transactions through the integration of the ‘Internet of Things’, and the development of cyber-physical attacks all point to the broad societal impacts of technology. The dangers of cyber-physical threats are evidenced by a recent attack on a German steel mill that destroyed a blast furnace [1].

A variety of responses are needed to address the resulting concerns. There is a need to research a) technology investigation efficiency, b) technical integration and solution impact, c) the abuse of technology through cyber-physical attacks along with d) the cost effective analysis and evaluation of large data repositories. Hence, identifying and validating technical solutions to access data from new technologies, investigating the impact that these solutions have on industry, and understanding how technologies can be abused from a cyber-physical perspective is crucial to the viability of government, commercial, and legal communities.

The minitrack will solicit submissions in the following areas:

- Research agendas that investigate vulnerabilities and solutions to devices that belong to the ‘Internet of Things’.
- Research agendas that identify cyber-physical security vulnerabilities, solutions and approaches to solving cyber-physical investigations.
- Research agendas that investigate cost effective retrieval, analysis and evaluation of large data repositories.
- Papers that combine research and applied practice.

This minitrack provides a forum for integrating relevant, vital academic security research activity with the broader international community.


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Cybersecurity and Software Assurance Minitrack

Modern society is irreversibly dependent on software systems of astonishing scope and complexity. Yet despite best efforts, errors, vulnerabilities, failures, and compromises continue to persist. Networked systems with complex hardware and software components embody many pathways that adversaries can exploit. Experience shows that contemporary cybersecurity and software assurance methods are insufficient to meet this challenge. Each day, cybersecurity demands our attention. From working on laptops to loading apps on phones to evaluating the safety of software-enabled devices, we must decide how best to protect information and services in an enlightened approach that balances practical issues of cost and functionality. There is increasing recognition of the need for rigorous foundations for cybersecurity and software assurance. This minitrack focuses on how to enable development and application of these foundations. We ask: How should research and development move us toward a solid basis in understanding and principle? The goal is to develop science foundations, technologies, and practices that can improve the security and dependability of complex systems. This minitrack will bring together researchers in cybersecurity assurance in a multidisciplinary approach to these problems. Our minitrack invites work embracing multiple perspectives, levels of abstraction, and evaluation of best practices and policies that help us to understand and assure the security of complex systems. We welcome papers about tools and techniques in that apply scientific and rigorous approaches or reveal underlying commonalities and constructs.

The following topics will be included in the minitrack:

- Security ecosystem
- Designed-in security
- Tailored trustworthy spaces
- Moving target
- Cyber economics
- Science of security
- Multivariate detection and response
- Co-evolution of defense and offense
- Biologically-inspired security models
- Holistic risk analysis
- Hardware-enabled trust
- Layered adaptable defense
- Real-time coordinated response
- Automated system interoperability
- Authentication in ecosystem
- Practical use of continuous monitoring
- Confidence in activity prediction
- Security visualization and prediction
- Theories of vulnerability classification and control
- Security measurement
- Advances in information assurance theory and practice
- Advances in specification, design, and implementation of assured systems
- Advances in verification, testing, and certification of assured systems
- Advances in software security analysis
- Assurance for embedded systems and hardware components
- Assurance for large-scale infrastructure systems
- Information and software assurance in cloud computing environments
- Assurance in system maintenance and evolution
- Automated methods for information and software assurance
- Assurance through computation of software behavior
- Management of assurance operations
- Processes and metrics for information and software assurance
- Business case and ROI development for information and software assurance
- Supply chain and standards issues in information and software assurance
- Case studies of system assurance successes
- Software testing

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CyberWarfare: Offensive and Defensive Software Technologies Minitrack

This minitrack aims to bring together technical and non-technical cyberwarfare researchers, academics, and practitioners in this field to discuss the mechanics and implications of offensive and defensive cyberwarfare activities, and methods for teaching these concepts to students.

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Digital Forensics: Education, Research, and Practice Minitrack

This minitrack will bring together papers from academia and practitioners that address current directions in digital forensics. Digital forensics involves the use of software, computer science, software engineering, and criminal justice procedures to explore and investigate digital media with the objective of finding evidence to support a criminal or administrative case. It involves the preservation, identification, extraction, and documentation of computer or network evidence.

We solicit papers in the following areas:

- Papers that describe digital forensics degree programs or the teaching of digital forensics within other programs internationally.
- Papers that address a research agenda that considers practitioner requirements, multiple investigative environments and emphasizes real world usability such as visualization.
- Papers that present an experience report involving the discovery, explanation and presentation of conclusive, persuasive evidence from digital forensics investigations.
- Papers that are ‘forward thinking’ and identify approaches to solving the digital forensics challenges of the future.

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eSourcing of Business Processes, Software Products, and Services Minitrack

This minitrack is interested in contributions that help providers and customers to enhance their eSourcing maturity from simple cost-driven engagements to strategic partnerships bringing significant and sustained value. The minitrack welcomes but is not limited to contributions in the following areas:

- The design, adaptation, implementation, and/or validation of process reference models for the eSourcing life-cycle
- The design, adaptation, implementation, and/or validation of process assessment models for the eSourcing life-cycle
- The design, adaptation, implementation, and/or validation of new strategic initiatives such as platform-based BPO (Paas), enabling mass-customized, high-margin services
- New pricing models in eSourcing such as outcome-based (e.g., price per software function point), pay per use, and risk/reward models
- In depth investigation of eSourcing reference models, process assessment models, and enabling information systems in different industry verticals such as logistics, manufacturing, and health care

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IS Risk and Decision-Making Minitrack

The Information System (IS) today is a vital and ever-present part of our lives, from our computers and mobile devices to our online business and social sites; from the systems that are embedded in our planes, cars, and appliances to the medical devices that may be embedded in our own bodies. They are a source of benefits, but also of risk. Everyone who is responsible for building, acquiring, or maintaining these systems face questions of risk during the IS life cycle. Are the systems safe? Are they reliable? Are they secure? Based on answers to these questions, decisions must be made: should the new software be released or held for more testing? Should the next rocket to Mars be launched? Should a new insulin pump be approved for human use?

We are looking for contributions from researchers and practitioners, in both academia and industry, who can provide insight into decision-making throughout the IS life cycle and its impact on IS risk. What methods are being used for risk-informed decision-making? How are trade-offs for risk vs. cost, schedule, and performance handled? How are decisions affected by software or systems assurance? How are decisions affected by the cognitive biases of the decision-makers and the culture of the IS development organization? Cross-disciplinary submissions, including social and psychological factors in addition to technical ones, are particularly welcome.

Topics include but are not restricted to:
- Methods for risk-informed decision making
- Risk analyses for critical decisions, such as “certification for launch readiness”
- Handling trade-offs for risk, cost, schedule, and performance
- Assuring safety, reliability, or security during the IS life-cycle
- The role of government and industry standards
- The effect of cognitive biases on risk perception and decision-making
- The effect of organizational culture or economic pressures on risk perception and decision-making
- Analyses of actual success or failure of risk-critical decisions
- Processes and tools (e.g., risk analysis methods or decision support systems) with the potential for improving risk-critical decision outcomes

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Applications for mobile devices (apps) have facilitated the success of smartphones and tablet PCs. By using apps, the multi-purpose hardware of modern devices can be utilized to the full extent. Due to the proliferation of mobile devices as a tool for consumers, businesses increasingly embrace the topic. However, actually improving business processes or even finding a mobile strategy is not straightforward. Neither is the usage of so called business apps. In many cases, development of business apps is prone to problems and companies face technology choices they have little information for.

Developing business apps is much harder than general app development. Quality standards should be met, apps need to be secure and robust, and requirements need to be carefully engineering (and then met). Testing of apps has been found to be very cumbersome. Whether (and to what extent) methods of classical software engineering can be applied still is matter of discussion. Moreover, new challenges such as development for multiple platforms, device fragmentation, context-sensitivity, performance issues, mobility-dependent security issues and energy conservation arise. Therefore, new threads of research are needed to tackle these issues and pave the way for better business producibility.

The minitrack is devoted to (business) apps development and the technological background of mobile computing for corporate or other domain-specific non-consumer usage. Topics of interests include (but are not limited to):

- App development within a domain context
- Economic or social impact of mobile computing
- Requirements engineering for apps
- Development methods for apps
- Applicability of existing methods to app development
- Internet of things (IoT) and apps
- Testing of apps
- Business models for apps
- Enterprise distribution of apps
- Cross-platform development
- Webapps vs. native apps vs. hybrid apps
- Business app security
- Legal aspects of app development, distribution, and usage
- Energy efficient computing on mobile devices
- Mobile device management (MDM)
- Make-or-buy decisions in app development
- Sensor-usage for business apps

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Modern Trends in Parallel Computing Minitrack

Performance growth of computers is nowadays more driven by scaling-out (adding more cores, building grids, ...) rather than scaling-up (e.g. increasing clock rates, adding memory, ...). This is why significant performance gains of computer programs can only be achieved by writing software that is capable of utilizing new parallel infrastructures either in multi-core machines or machine grids.

This minitrack therefore wants to cover latest trends in techniques, algorithms, architectures, infrastructures, processes and so forth that aim at making efficient use of parallel resources. Parallel applications are becoming more and more important not only for systems with special requirements on performance, scalability or resilience but also for ‘ordinary’ software running on contemporary multi-core hardware. As an effect we see a renaissance of the functional programming paradigm with functional constructs introduced in mainstream programming languages like Java and C#.

Anticipated submissions are not limited to but in the scope of the following topics:

- Programming and language paradigms for parallel system development
- In-Memory middleware for process communication and alternatives
- The Reactive Manifesto and its implications on Software Technology
- Design considerations for parallel system
- Testing of parallel systems and identification of Race-Conditions
- Actor-based systems and their advantages for parallel system development
- Real-time considerations for parallel systems
- Performance analysis of parallel system development approaches
- Impact on the software development process
- Languages designed for parallel computing
- Parallel system development for the cloud
- Infrastructures for parallel computing

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Securing The Cloud and the Internet of Things Minitrack

Having run for several years now the minitrack on Secure Cloud Computing, we want to expand it to cover the growing area of the Internet of Things (IoT). This is not just about IoT. It is about the converging security issues faced by IoT and the infrastructure it runs on, i.e., the Cloud.

As a result, we want to expand the scope of the minitrack to cover this new combination. We anticipate design science contributions with deep technical focus as well as broader management or legal orientation contributions. The growing security challenges in these areas are tremendous. There are huge gaps to be filled and this minitrack should contribute at bridging some of them. In particular, the minitrack attempts to bring together computer science and industrial researchers, as well as software architects and implementers that are currently working in these areas.

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Software Product Lines: Engineering, Services, and Management Minitrack

Software has become the key asset for competitive products and services in all industries. Thus, competitiveness in software development, maintenance, and related services has become a concern for organizations. There are two primary strategies to deal with this concern: increasing the competitiveness (1) internally through methods such as the strategic acquisition, creation, and reuse of software assets or (2) externally by outsourcing software development, maintenance, and related services to third party service providers. A viable third strategy is to enact both strategies in parallel. This minitrack will focus on the first strategy but submissions dealing with the third strategy are very welcome as well.

This minitrack welcomes contributions to the mainstream product line body of knowledge. Authors with a strong software engineering focus are encouraged to relate their work with the relevant work (e.g., on agile methods) in the other minitracks of the Software Technology track. To help integrate new bodies of knowledge in product line research and practice, we especially welcomes contributions including but not limited to

- Business models and strategies for product lines
- Economic valuation of product lines
- Organizational and process designs for product lines
- Distributed leadership in developing open source platforms and product lines
- Knowledge management practices and systems for product lines
- Service systems and their implications for product lines
- International standardization initiatives related to product lines
- Theory building and/or validation from the viewpoints of design and behavioral science

The minitrack is also interested in industrial experiences in product line engineering if they can be used to validate or challenge existing theories and/or create new theories relevant to the software product line engineering body of knowledge.

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Wireless Network Minitrack

The research area of wireless networks spans such diverse technologies and applications as wireless security, mobile broadband networks, wireless data networks and wireless sensor networks. It includes technologies such WiMAX and LTE, WiFi and Zigbee, and ranges from deployments on a national scale to small experimental networks. Papers in this field provide innovative solutions to challenges, whether new or well known, where the most interesting portion of the network is wireless. Such issues and solutions will primarily be technical, but relevant social, environmental, or economic issues are also appropriate.

The defining property of wireless networks is the use of the wireless medium, with all its challenges and opportunities, to support communication, often among mobile systems. Issues for such systems are as diverse as security and spectrum and channel allocation all the way to game-theoretic incentive designs and routing protocols. Support for mobility may range from cellular handoff to vehicle-to-roadside VANET applications and ad-hoc wireless networks. Novel applications of wireless networks are also appropriate, especially if these applications are enabled by recent improvements in the technology. Non-technical issues that may affect the success or usefulness of a new technology, or issues of scale and experimentation and evaluation of existing, practical networks are very relevant to this topic.

The following is a partial list of research topics of interest for this minitrack:

- Security in wireless networks
- Networking issues, including physical, mac, routing, transport, application, or cross-layer protocols and algorithms
- Theoretical issues of interest in the design or implementation of wireless networks, including communications, scalability, coordination, access control, and other advances in the field
- Mobile broadband wireless networks
- Ad hoc wireless networks including mesh networks
- Wireless sensor networks
- Mixed wired and wireless networks
- Embedded systems using wireless networks
- Network management and localization or dealing with approximate location
- Novel applications of wireless networks
- Social and environmental benefits and consequences of increased use of wireless networks and new applications.

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