

CONFERENCE PROGRAM

2021

ESSE
SPRA

2021 2nd European Symposium on
Software Engineering

2021 2nd Symposium on
Pattern Recognition and Applications

■ NOVEMBER 19-21, 2021

Organized by



Department of Digital Systems,
University of Thessaly,
Larissa, Greece

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Welcome Address

Dear All,

Welcome to attend the 2021 2nd European Symposium on Software Engineering (ESSE 2021), and 2021 2nd Symposium on Pattern Recognition and Applications (SPRA 2021) .

This year, the world is fighting against the outbreak of COVID-19, there is no doubt that the safety and well-being of our participants is of paramount importance to the conference organizing committee. In consideration of the health and safety of everyone, pervasive travel restrictions as well as most author's appeals, we had to make a tough decision and convert ESSE 2021, SPRA 2021 into fully virtual conference. We were looking forward to seeing everyone face to face, but we are excited for the opportunity to innovate by creating an engaging virtual conference that will be rewarding for both presenters and attendees.

The objective of the conference is to provide a premium platform to bring together researchers, scientists, engineers, academics and graduate students to share up-to-date research results. We are confident that during this time you will get the theoretical grounding, practical knowledge, and personal contacts that will help you build a long term, profitable and sustainable communication among researchers and practitioners in the related scientific areas.

We would like to express our gratitude to the distinguished keynote speakers: Prof. Eleni Stroulia from University of Alberta, Canada; Prof. Maria Virvou from University of Piraeus, Greece; and Prof. Ioannis Stamelos from Aristotle University of Thessaloniki, Greece. invited speakers: Prof. Johan DEBAYLE, from MINES Saint-Etienne, France, Prof. Bivas Mitra, from IIT Kharagpur, India, and other distinguished scholars for sharing their deep insights on future challenges and trends in the conferences. Special thanks to our committee members, all the reviewers, session chairs, presenters and listener attendees, researchers and students who participate in the conference. Hope you could enjoy the conference and have an unforgettable experience!

Let us also look forward to meeting each other in a physically face-to-face conference 2022.

With Warmest Regards on behalf of the ESSE 2021 & SPRA 2021 Organizing Committee
Prof. Vassilis C. Gerogiannis, Conference Chair, Department of Digital Systems, University of Thessaly, Greece

Agenda Overview

01

Notes & Timetable

p.4

02

Simple Version of Agenda

p.6

03

Introduction of Keynote Speakers & Invited Speakers

p.8

04

Introduction of Parallel Sessions

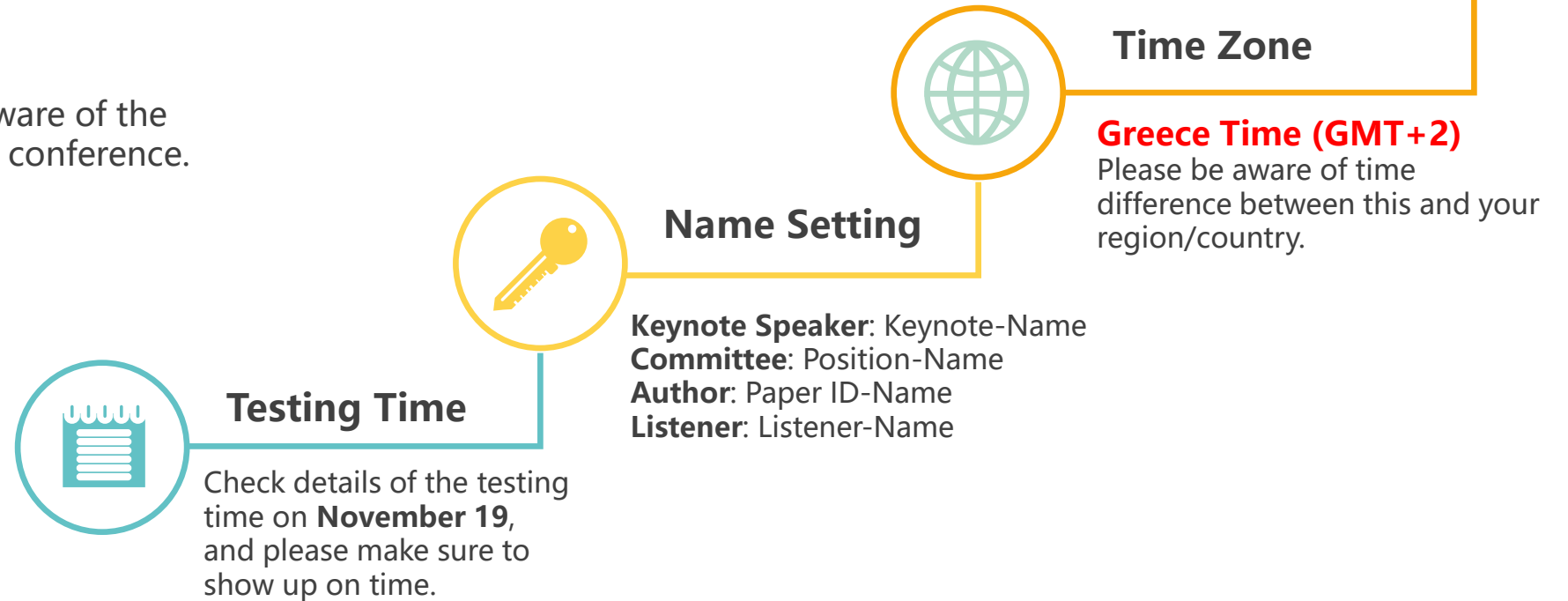
p.16

01 Notes

Greece Time (GMT+2) | November 19-21

Essential Information

Please make sure you are aware of the following details before the conference.



01 Test Timetable

Canada Time (GMT-7) | November 18

18:30-18:40

Prof. Eleni Stroulia

Greece Time (GMT+2) | November 19

9:00-9:10

Prof. Vassilis C. Gerogiannis

9:10-9:20

Prof. Maria Virvou

9:20-9:30

Prof. Ioannis Stamelos

9:30-9:40

Prof. Johan Debayle

9:40-10:10

S011, S017, S012, S020, S015, S022, S005

10:30-11:00

S010, S0001, S018, S019, S014, S021

11:00-11:30

S013, S0002, S003, S002, S001, S0003

Note

- a) We will test screen sharing, audio, video, and how to "Raise Hand" in Zoom. Please get your presentation slides and computer equipment prepared before hand.
- b) All the presenters are required to join the Zoom test to ensure the next two-day meeting runs smoothly.

02 Meeting Agenda

Greece Time (GMT+2) | November 20

TIME	ACTIVITY (Each talk includes 3 mins for Q&A)	PRESENTER
8:15-8:20	Welcome Speech	Rector: Prof. Zissis Mamuris University of Thessaly, Greece
8:20-8:25	Opening Remarks	Conference Chair: Prof. Vassilis C. Gerogiannis University of Thessaly, Greece
8:25-8:55	Keynote Speech I “Smart Buildings: Opportunities and Challenges”	Prof. Eleni Stroulia University of Alberta, Canada
8:55-9:25	Keynote Speech II “A new era in Artificial Intelligence - empowered interactive software”	Prof. Maria Virvou University of Piraeus, Greece
9:25-9:55	Keynote Speech III “Open Source Software Policies and New OSS Research Directives”	Prof. Ioannis Stamelos Aristotle University of Thessaloniki, Greece
9:55-10:05	Break Time	
10:05-10:25	Invited Speech I “Digital Twins for Image Analysis of Granular Media”	Prof. Johan Debayle MINES Saint-Etienne, France
10:30-12:15	Session 1: Computer Science and Information Technology	S011, S017, S012, S020, S015, S022, S005
12:15-14:00	Break Time	
14:00-15:30	Session 2: Software Development and Application	S010, S0001, S018, S019, S014, S021

02 Meeting Agenda

Greece Time (GMT+2) | November 21

TIME	ACTIVITY (Each talk includes 3 mins for Q&A)	PRESENTER
7:30-9:00	Session 3: Software Design and Testing	S013, S0002, S003, S002, S001, S0003
9:10-9:30	Invited Speech II “Developing Smartphone Keyboard Interaction based Emotion Detection System”	Prof. Bivas Mitra IIT Kharagpur, India
9:30-11:15	Session 4: Software and Image Processing	DS0003, DS0008-A, DS0017, DS0015, SE0002, SE0003, SE4001

03 Keynote Speaker /



Prof. Eleni Stroulia

University of Alberta,
Canada

November 20

8:25-8:55

(GMT+2)

Bio: Dr. Eleni Stroulia is a Professor in the Department of Computing Science, at the University of Alberta. From 2011-2016, she held the NSERC/AITF Industrial Research Chair on Service Systems Management, with IBM. Her research focuses on addressing industry-driven problems, adopting AI and machine-learning methods to improve or automate tasks. Her flagship project in the area of health care is the Smart Condo in which she investigates the use of technology to support people with chronic conditions live independently longer and to educate health-science students to provide better care for these clients. In 2011, the Smart-Condo team received the UofA Teaching Unit Award. She has played leadership roles in the GRAND and AGE-WELL Networks of Centres of Excellence. In 2018 she received a McCalla professorship, and in 2019 she was recognized with a Killam Award for Excellence in Mentoring. She has supervised more than 60 graduate students and PhDs, who have gone forward to stellar academic and industrial careers. Since 2020, she is the Director of the University of Alberta's AI4Society Signature Area, and since 2021, she serves as the Vice Dean of the Faculty of Science.

03 Keynote *Speaker I*



Prof. Eleni Stroulia

University of Alberta,
Canada

November 20

8:25-8:55

(GMT+2)

Speech Title: Smart Buildings: Opportunities and Challenges

Abstract: The digitization of building information has the potential to transform the way professionals design, construct and operate facilities and the way occupants interact with them. In particular, building information models (BIMs) enable the digital representation of a building's physical and functional characteristics; and building automation systems (BASs) enable advanced building controls that can respond to occupant activities. In this presentation, we will review the state of the art and our recent work on building design (BIM-kit) and building simulation (SIM-sis).

To automate building design, we have developed a simple, yet extendable, domain-specific language for computationally representing building interior design rules and a method for evaluating rules in this language against a BIM model. Relying on this model-checking service, our automated-design process heuristically explores the space of potential designs to identify the ones that meet a set of requirements.

To evaluate the performance of a building, we have developed a powerful building toolkit, consisting of a realistic agent-simulation component and an engine generating realistic event streams of a variety of different sensors over time.

Together, these two projects aim to support the key challenges in building optimization through model-driven software engineering.

03 Keynote Speaker II



Prof. Maria Virvou

University of Piraeus,
Greece

November 20

8:55-9:25

(GMT+2)

Bio: Prof. Maria Virvou was born in Athens, Greece. She received a B.Sc. Degree in Mathematics from the University of Athens, Greece, a M.Sc. Degree in Computer Science from the University of London (University College London), U.K. and a Ph.D. Degree in Computer Science and Artificial Intelligence from the University of Sussex, U.K. She is a FULL PROFESSOR, HEAD OF THE DEPARTMENT. She is AUTHOR/CO-AUTHOR of over 350 research papers published in international journals, books and conference proceedings and of 7 books and monographs in Computer Science published by Springer and other publishers. She is currently EDITOR-IN-CHIEF of the Springer book series "Learning and Analytics in Intelligent Systems". She has been EDITOR of over 20 collections of papers in conference proceedings or books, published by major academic publishers, such as IEEE, Springer and IOS Press. She was GENERAL CO-CHAIR of numerous conferences.

Prof.-Dr. Virvou has received an honorary award by UNESCO in honour and recognition of her outstanding scholarly achievements and contributions to the field of Computer Science. According to Microsoft Academic Search exploring entity analytics of 262,751,231 Authors she has been ranked as top 1st author in the Computer Science area of EDUCATIONAL SOFTWARE. Moreover, she has been ranked among the top 40 researchers worldwide in publications for the Computer Science area of MULTIMEDIA among the top 50 authors in the area of USER INTERFACE and HUMAN COMPUTER INTERACTION. She is among the top 2% of the most influential scientists worldwide in the area of ARTIFICIAL INTELLIGENCE, according to PLoS Biology, 18(10), e3000918.

03 Keynote *Speaker II*



Prof. Maria Virvou

University of Piraeus,
Greece

November 20

8:55-9:25

(GMT+2)

Speech Title: A new era in Artificial Intelligence - empowered interactive software

Abstract: User interfaces of software and Human-Computer Interaction are undergoing major advances in the new era of Artificial Intelligence- empowered interactive software which encompasses large modules of intelligent systems that adapt dynamically to many users' characteristics and actions within the cyberspace. AI automatically draws inferences about users' goals, plans, problems, preferences, cognitive status, navigation, emotions to name but a few. As such, system decisions are made by the AI- empowered interactive software using underlying reasoning mechanisms that include classical AI techniques and theories, Machine Learning and Deep Learning in the context of information systems, Web, Internet of Things, big data and robotic features. As such, the new interactive paradigms replace the classical human-computer interaction model that was based on static user interface design by dynamic and intelligently predicting AI- based interactions which are largely appreciated by humans in terms of ease of use and high functionality but needs more explainability of AI and privacy protection.

This talk presents an overview of the state-of-the-art discussing neural networks, fuzzy logic, cognitive reason and decision making techniques in user interfaces, as well as the author's personal viewpoint on creating and maintaining development strategies in the new intelligent interactive software by highlighting benefits and revealing challenges.

03 Keynote Speaker III



Prof. Ioannis Stamelos

Aristotle University of
Thessaloniki, Greece

9:25-9:55

November 20

(GMT+2)

Bio: Ioannis Stamelos is a Professor at the School of Informatics of the Aristotle University of Thessaloniki, Greece, where he carries out research and teaching in the area of Software Engineering and Information Systems. Before joining Aristotle University he worked as a Senior Researcher for the Italian Telecommunications (1985-1994) and as Systems Integration Director for a mobile operator company in Athens, Greece (1995-1996). He holds a diploma of Electrical Engineering (1983) and a PhD in Computer Science by the Aristotle University of Thessaloniki (1988). He has published approx. 250 articles in refereed international journals, conferences, etc. He is/was the scientific coordinator or principal investigator for his University in 30+ research and development projects in Information & Communication Technologies with funding from national and international organizations. He is currently the Head of the Board of Directors of the Greek Alliance for Open Technologies.

03 Keynote *Speaker III*



Prof. Ioannis Stamelos

Aristotle University of
Thessaloniki, Greece

9:25-9:55

November 20

(GMT+2)

Speech Title: Open Source Software Policies and New OSS Research Directives

Abstract: Digitally advanced countries, including EU members, have developed government policies that favor the adoption of open source software (OSS) and try to foster openness, collaboration and sharing among their public agencies. Although such policies suggest a major shift in the ways public sectors develop, acquire and manage their software solutions, it appears that widespread use of open source will necessitate long times. Open Source Program Offices (OSPOs) is one type of organization entities that will help this difficult task. An OSPO needs careful staffing and tooling to achieve its manyfold purpose: provide facilitating, cataloguing, selecting, supporting, communicating and promoting services to interested public sector agencies.

Beyond the organizational issues that need to be addressed for a productive OSPO, such work groups pose or re-pose hard technical problems that redefine the research field of open source. Major efforts are needed for measuring, assessing, comparing and ultimately decision making when evaluating critical OSS project aspects. Moreover, the need to somehow monitor entire OSS ecosystems emerges. The dynamic nature of the rapidly changing global OSS environment makes all of the above harder to transform into working computer tools.

The lecture will review the research field of OSS and the trends that emerged throughout the past twenty years. Next, specific software engineering and interdisciplinary research directions will be reviewed, aiming to resolve the issues that OSPO personnel will need to address. It is anticipated that major research efforts will be needed for the interpretation of OSS project measurements, systematic project evaluation and comparison, dynamic modeling of OSS project behavior, management of OSS project related knowledge. Another aspect that is expected to draw even more attention is the learning opportunities that OSS projects provide to software engineering students and instructors.

Advanced statistical and AI techniques will be needed to empower a continuous stream of case studies and longitudinal studies that will provide convincing evidence for any new theory or tool. The agile and traditional closed source development paradigms will both gain from this new research activity and will offer solutions to OSS communities, as has already happened in the past. The lecturer hopes to be able to describe to the Conference audience this exciting research future.

03 Invited Speaker I



Prof. Johan Debayle

MINES Saint-Etienne, France

November 20

10:05-10:25

(GMT+2)

Bio: Prof. Johan Debayle is a Full Professor at the Ecole Nationale Supérieure des Mines de Saint-Etienne (MINES Saint-Etienne) in France, within the SPIN Center and the LGF Laboratory, UMR CNRS 5307, where he leads a research group interested in image analysis of granular media. His research interests include image processing and analysis, pattern recognition and stochastic geometry. He is Associate Editor for 5 international journals: Pattern Analysis and Applications (Springer), Journal of Electronic Imaging (SPIE), Pattern Recognition Letters (Elsevier), Journal of Imaging (MDPI) and Image Analysis and Stereology (ISSIA). He is the General Chair of the International Conferences ISIVC' 2020, ECSIA' 2021, ICIVP' 2021 and ICPRS' 2022. He is Member of SPIE, ISSIA, IAPR, Member of the Executive Board of AFRIF (IAPR France Section), Senior Member of IEEE and Vice-President Membership for the IEEE France Section.

Speech Title: Digital Twins for Image Analysis of Granular Media

Abstract: Industrial processes involving granular media (population of particles: powders, crystals...) are numerous and present in various industrial contexts (pharmaceuticals, nuclear, materials, agronomy, etc.). The geometric characterization of such particles has always been an issue. For this purpose, the acquisition of 2-D images allows a direct visualization of the projected particles that needs to be exploited. One of the major problems is the overlapping of particles, a consequence of the projected view. From such data, advanced image processing and analysis methods can be used to individualize and characterize particles (size, shape, spatial dispersion, etc.). However, these methods are not very effective when the granular medium is dense.

To overcome this limitation, methods based on random (or stochastic) geometry provide tools to model and characterize these images of granular media. Digital twins of granular media are then defined: synthetic images are simulated and statistically fitted to real data. The morphological characterization of the particles is then indirectly accessible. These different advanced methods of image analysis and random geometry therefore provide tools for characterizing the morphology of granular media. The methods will be particularly illustrated on real applications of multiphase flow processes. Current works with machine learning techniques will be also discussed.

03 Invited Speaker II



Prof. Bivas Mitra

IIT Kharagpur, India

November 21

9:10-9:30

(GMT+2)

Bio: Dr. Bivas Mitra is an Associate Professor in the Department of Computer Science & Engineering at IIT Kharagpur, India. He obtained his PhD in Computer Science & Engineering from IIT Kharagpur in 2011. After his PhD, he was employed as a postdoctoral researcher for two years at the French National Centre for Scientific Research (CNRS), Paris, France and Universite catholique de Louvain (UCL), Belgium. Dr. Mitra has been working on the different aspects of the socio-mobile applications, affective & ubiquitous computing for a long time. He has a wide ranging competence on smartphone applications, data science, peer to peer networks, social network analysis and he has been successful in using concepts of network evolution, percolation, community formation in explaining/optimizing various performances of such complex technological systems. He was a part of the Samsung Electronics, Noida, India as a Chief Engineer where he played a key role in innovating novel solutions in the domain of smartphones. Recently, Dr. Mitra is closely collaborating with the academia and industry experts on the different aspects of mobile computing including socio-mobile applications, ubiquitous computing, energy optimization in smartphones and smart localization technique for landmark identification, automatic fault detection etc. He regularly publishes at top venues such as IEEE TKDE, IEEE TMC, IEEE T-AFFEC, ACM WSDM, ICWSM, ACM SIGCHI, ACM MobileHCI, IEEE Infocom, IEEE PerCom, ACM IUI, ACII, IEEE TNSM etc.

Speech Title: Developing Smartphone Keyboard Interaction based Emotion Detection System

Abstract: There are different modes of interaction with a software keyboard on a smartphone, such as typing and swiping. Patterns of such touch interactions on a keyboard may reflect emotions of a user. In this talk, we focus on identifying different features of touch interactions with a smartphone keyboard that lead to a personalized model for inferring user emotion. Since distinguishing typing and swiping activity is important to record the correct features, we designed a technique to correctly identify the modality. The ground truth labels for user emotion are collected directly from the user by periodically collecting self-reports. We jointly model typing and swiping features and correlate them with user provided self-reports to build a personalized machine learning model, which detects four emotion states (happy, sad, stressed, relaxed). We combine these design choices into an Android application TouchSense and evaluate the same in a 3-week in-the-wild study involving 22 participants. Our key evaluation results and post-study participant assessment demonstrate that it is possible to predict these emotion states with an average accuracy (AUCROC) of 73% (std dev. 6%, maximum 87%) combining these two touch interactions only.

04 Parallel Sessions - Introduction



01

No-Show Policy

A paper not presented or presented by a non-author without prior written approval by the Conference TPC will be removed from the final conference proceedings.

No refund will be approved to authors of those papers.



02

Duration of Presentation

A 15-minute report online, 2-3 min for question & answer is included.

Presenter's certificate will be sent out by email, normally a week after the meeting.



03

Report File

One out of three

- i. PowerPoint file
- ii. PDF file
- iii. Pre-recorded video

Please join the meeting at least 10 min before your session starts and get your presentation prepared beforehand.



04

"Best Presentation" Award

It will be selected from each session by the session chair.

The presenter will receive a certificate of "Best Presentation".

Session Chair: Prof. Ilias Savvas, University of Thessaly, Greece & Prof. Giuliani Donatella, University of Bologna, Italy

Time: 10:30-12:15 (GMT+2)

Time & ID	Presentation
S011 10:30-10:45	<p>"Safe Reinforcement Learning in Simulated Environment of Self-Driving Laboratory "</p> <p>Andrey Chernov, Ilias Savvas, Maria Butakova, Asst. Prof. Oleg Kartashov Southern Federal University, Russia</p> <p>Abstract—Today we see tremendous potential in applying artificial intelligence (AI), deep reinforcement learning, and agent-based simulation to complex real-world problems. AI helps people support and automate decision-making penetrating almost all daily life aspects and research areas. One of the reasons for this potential is that AI helps us solve problems at a lower cost of resources and time. Materials research acceleration often relies upon AI using and automation of laboratory experiments, bringing significant fruitful results and advances. Self-driving laboratories include closed-loop chemistry experimentation and assist in designing new functional nanomaterials and optimizing their known parameters with AI and machine learning approaches. Due to the possibility of involving in the nanomaterials design process and some hazardous components, routine experimentation under chemists' continuous monitoring is usually required. Shifting to new intelligent technologies in self-driving laboratories with automated closed-loop experimentation requires excluding risks and accidents because of improper AI applications. This paper discusses safe deep reinforcement learning and its application in a simulated environment in self-driving laboratories experimenting with new functional materials. We proposed an approach to solving the problem of safe reinforcement learning by learning the intelligent agent to find a hidden reward and implemented that approach by constructing and using the heatmap from observation of the hidden reward neighborhood.</p>
S017 10:45-11:00	<p>"An Empirical Evaluation of Machine Learning Algorithms for Indoor Localization using Dual-Band WiFi"</p> <p>Ashraf Tahat, Ms. Rozana Awwad, Nadia Baydoun, Shuruq Alnabih, Talal A. Edwan Princess Sumaya University for Technology, Jordan</p> <p>Abstract—WiFi based indoor localization systems relying on received signal strength indicator (RSSI) have attained large acceptance over the past few years as mobile devices with WiFi capability are prevalent in everyday routines and practices, this is in view of the demand for low-cost indoor positioning systems (IPSs). Extant RSSI reliant WiFi based IPSs utilize raw RSSI of signals received from access points (APs) to evaluate device locations. However, the particular raw RSSI of signals may readily fluctuate and may be susceptible to interference as a consequence to multipath propagation channels, other wireless local area networks, device diverseness, and noise. To overcome these prevailing issues, we investigate performance enhancement of WiFi fingerprinting-based IPSs for increased accuracy and robustness in positioning over dual-band WiFi (such as IEEE 802.11n) that employs both of the 2.4 GHz and 5 GHz frequency spectrum bands as a conceivable substitute. To that end, based on empirical concurrent measurements, we conduct a comparative performance analysis of a collection of machine learning (ML) classification algorithms to evaluate their classification capacities in determining the location of a WiFi receiver device in a single and a dual frequency band operation setting. Numerical results demonstrated that in our IPS, the location could be effectively predicted by means of a subset of the collection of considered ML classification algorithms when using the raw RSSI of both of the 2.4 GHz and 5 GHz frequency bands. Computed evaluation metrics to characterize performance of the IPS contended to identify an optimum ML algorithm based on attained results to accurately localize the device, and the existence of dual frequency information renders the positioning process to be more robust.</p>

Time & ID	Presentation
S012 11:00-11:15	<p>“Improving Multiclass Classification of Cybersecurity Breaches in Railway Infrastructure using Imbalanced Learning” Aleksandr Nebaba, Ilias Savvas, Maria Butakova, Prof. Andrey Chernov, Petr Shevchuk Southern Federal University, Russia</p> <p>Abstract-Machine learning approaches and algorithms are spreading in wide areas in research and technology. Cybersecurity breaches are the common anomalies for networked and distributed infrastructures which are monitored, registered, and described carefully. However, the description of each security breaches episode and its classification is still a difficult problem, especially in highly complex telecommunication infrastructure. Railway information infrastructure usually has a large scale and large diversity of possible security breaches. Today's situation shows the registering of the security breaches has a mature and stable character, but the problem of their automated classification is not solved completely. Many studies on security breaches multiclass classification show inadequate accuracy of classification. We investigated the origins of this problem and suggested the possible roots consist in disbalance the datasets used for machine learning multiclass classification. Thus, we proposed an approach to improve the accuracy of the classification and verified our approach on the really collected datasets with cybersecurity breaches in railway telecommunication infrastructure. We analyzed the results of applying three imbalanced learning methodologies, namely random oversampling, synthetic minority oversampling technique, and the last one with Tomek links. We have implemented three machine learning algorithms, namely Naïve Bayes, K-means, and support vector machine, on disbalances and balanced data to estimate imbalance learning methodologies with comparing results. The proposed approach demonstrated the increase of the accuracy for multiclass classification in the range from 30 to 41%, depending on the imbalanced learning technique.</p>
S020 11:15-11:30	<p>“An Exploratory Teaching Proposal of Greek History Independence Events based on STEAM Epistemology, Educational Robotics and Smart Learning Technologies” Spyridon Kourtis, Asst. Prof. Apostolos Xenakis, Konstantinos Kalovrektis, Antonios Plageras, Ioanna Chalvantzi University of Thessaly, Greece</p> <p>Abstract-Digital technologies help students to delve into the process of scientific discovery. Curriculum integration of STEM contents based on constructivism theories of learning as a context to implement the Science, Technology, Engineering, Mathematics (STEM) epistemology. In this work, we proposed an Inquiry based STEM constructivist teaching and learning methodology for Historical events of the Greek Revolution, enriched with smart learning technologies and engineering practices, while combining Educational Robotics approach. In particular, students design and built a history – line and program their robot to move towards each station, which represent an important timestamp event for Greek Revolution. The robot reads the station’s QR code, via a smartphone attached to it, and then returns back to its base. Students retrieve information regarding historical events and according to an APP on their smartphone, they play a knowledge game, concerning these events. This work also highlights, via qualitative results, the additional value that smart learning technologiesand educational robotics give to theoretical subjects, such as History, which should need to be taught in an exploratory way. In that way, students are actively involved in hands – on activities and engineering design process, gaining knowledge from subjects as technology, computer science and engineering.</p>
S015 11:30-11:45	<p>“A Lightweight Development of Outbreak Prevention Strategies Built on Formal Methods and xDSLs” Assoc. Prof. Akram Idani Univ. Grenoble Alpes, France</p> <p>Abstract-Because of the Covid-19 pandemic, several organisations around the world applied social distancing rules with workplace controls. Most of these rules can be automated and supervised using software systems that interact with connected devices such as smart cameras, motion sensors, smart door locks, etc. Given the critical nature of a pandemic prevention application, it seems essential to use techniques such that the possibility of failures is minimised. The integration of formal reasoning within software development is obviously a way to achieve this goal. Unfortunately, often formal methods are deemed too difficult and hence their application is somehow limited. This study builds on real-life pandemic prevention strategies, and shows how a formal method and domain-specific languages can be mixed in a lightweight development process. Our approach extends Meeduse, a language workbench that embeds an animator and model-checker and allows one to define proved executable Domain-Specific Languages (xDSLs) using the B method. In addition to the benefits of using xDSLs together with a formal approach during the development process the originality of this work is two-fold: (1) first, we propose a novel refinement-based approach that allows DSL developers to produce several versions of the application without breaking down the global safety properties; and (2) second, we use the verified specification of the DSL semantics at runtime so that the implementation effort is highly reduced.</p>

Time & ID	Presentation
S022 11:45-12:00	<p>"On the Computational Efficiency of Geometric Multidimensional Scaling" Prof. Gintautas Dzemyda, Martynas Sabaliauskas Vilnius University, Lithuania</p> <p>Abstract- Real-life applications often deal with multidimensional data. In our case, multidimensional data means a table of numbers whose rows correspond to different objects and columns correspond to features characterizing the objects. In the general case, the number of objects is large, and the dimensionality (number of features) is greater than it is possible to represent the objects as points in 2D. The goal is to reduce the dimensionality of data to such one that objects, characterized by a large number of features, be represented as points on a plane. Multidimensional scaling (MDS) is an often-used method to reduce the dimensionality of multidimensional data nonlinearly and to present the data visually. MDS minimizes some stress function. We have proposed in [9] and [10] to consider the stress function and multidimensional scaling, in general, from the geometric point of view, and the so-called Geometric MDS has been developed. Geometric MDS allows finding the proper direction and step size forwards the minimum of the stress function analytically. In this paper, we disclose several new properties of the Geometric multidimensional scaling and compare the simplest realization (GMDS1) of Geometric MDS experimentally with the well-known SMACOF version of MDS.</p>
S005 12:00-12:15	<p>"A Framework for the Adoption of Agile within Software SMEs in Saudi Arabia" Mr. Fahad S Altuwaijri, Maria Angela Ferrario Lancaster University, UK</p> <p>Abstract-Agile is an established and globally adopted software development methodology for managing software projects, known for reducing time to market and costs, and improving customer satisfaction. However, in developing countries, such as those in the Middle East, Agile is still in the early stages of adoption compared to Europe and North America. This is problematic, specifically in the case of Saudi Arabia, which is increasingly looking at the software industry to diversify its economy to reduce the reliance on the oil industry. It is important to understand the factors that influence the decision of Saudi software organisations to adopt Agile. Hence, this study aims to critically review the influential factors identified in the Agile adoption framework that may support or challenge the adoption of Agile in small and medium-sized enterprises (SMEs) in Saudi Arabia. To this end, we carried out a focus group study with five software practitioners working in different software SMEs. The main findings indicate the apparent influence of all the identified factors in the developed framework except those related to process, with a high level of importance attached to culture, people and knowledge factors. This study refines the framework and helps software organisations assess their readiness for adopting Agile during the development process.</p>

Break time:12:15-14:00 (GMT+2)

Session Chair: Prof. Vassilis C. Gerogiannis, University of Thessaly, Greece

Time: 14:00-15:30 (GMT+2)

Time & ID	Presentation
S010 14:00-14:15	<p>"Incorporating energy efficiency measurement into CI\CD pipeline" Artem Kruglov, Giancarlo Succi, Xavier Vasquez Innopolis University, Russia</p> <p>Abstract- In this paper we present the method and tool for linking the analysis of a software at the development stage with the efficiency of the developed product during operation mode from the energy consumption perspective. The purpose of the method is to recognize the bottlenecks of a program and provide recommendations for improving the structure and run-time behavior of the software. The developed tool consists of two subsystems: first is responsible for static analysis of the code and relevant software metrics, second performs analysis of the power consumption of the application. Analysis of the outputs of both components allows us to create a close-loop system for continuous analysis and optimization of the developing software product.</p>
S0001 14:15-14:30	<p>"Software Acceleration of the Deformable Shape Tracking Application-How to eliminate the Eigen Library Overhead" Assoc. Prof. Nikos Petrellis, Stavros Zogas, Panagiotis Christakos, Panagiotis Mousoulitis, Georgios Keramidas, Nikolaos Voros, Christos Antonopoulos University of Peloponnese, Greece</p> <p>Abstract- Shape tracking is based on landmark detection and alignment. Open-source code and pre-trained models are available for an implementation that is based on an ensemble of regression trees. The C++ Deformable Shape Tracking (DEST) implementation of face alignment that is using Eigen template library for algebraic operations is employed in this work. The overhead of the C++ Eigen library calls is measured and selected computational intensive operations are ported from Eigen implementation to custom C code achieving a remarkable acceleration in the shape tracking application. An important achievement of this work is the fact that the restructured code can be directly implemented with reconfigurable hardware for further speed improvement. Driver drowsiness and distraction detection applications are exploiting shape tracking by measuring landmark distances in order to detect eye blinking, yawning, etc. Fast video processing and accuracy is mandatory in these safety critical applications. The modified software implementation of the original DEST face alignment method presented in this paper, is almost 250 times faster due to the custom implementation of computational intensive vector/matrix operations and rotations. Eigen library is still used in non-time critical parts of the code for compact description and higher readability. Flattening of nested routines and inline implementation is also used to eliminate excessive argument copies and data type checking and conversions.</p>
S018 14:30-14:45	<p>"Customer Satisfaction in Software Development Projects" Prof. Panos Fitsilis, Vyron Damasiotis, Sofia Sarmanioti University of Thessaly, Greece</p> <p>Abstract-In this study, research is being conducted about the Customer's Satisfaction (CS) along with factors that have an impact on it and on the Software Project Management. The research method of this study is the Systematic Literature Review (SLR) and the main conclusion derived from this study is that the customer's active involvement through agile methods in all phases of the IT project development, leads to a higher level of satisfaction.</p>

Time & ID	Presentation
S019 14:45-15:00	<p>“Software Development in Small Software Companies: Exploring the Usage of Procedures, Techniques, Methods and Models in Practice” Mr. Micheal Tuape, Victoria Hasheela-Mufeti, Anna Kayanda, Jussi Kasurinen University of Technology, Finland</p> <p>Abstract-Small software companies have a challenge with utilizing process tools, which affects practice with significant quality-related challenges. This affects the software industry significantly because SSCs dominate the industry, and most of all, over 80 percent of software products are produced by SSCs. This cross-sectional survey was conducted in 3 countries attracting 115 respondents with the primary objective of investigating the software practice concerning the utilization of process tools in SSCs. The study focused on the tools used in requirements engineering and software testing as critical process areas for quality software products. Our findings indicate that the number of personnel intertwines with the complexities arising from lengthy procedures of the tools and processes, aggregating into difficulty in tool usage. Due to the constant evolution of practices, the volatility in processes also causes slow adoption of other tools, for instance, testing that must accompany the main engineering tools during a project. These findings are significant in informing theory and communicating to the practitioners what they should do regarding process tools.</p>
S014 15:00-15:15	<p>“A Personalized Diagnostic Tool for Microbiome-Related Morbidities” Ms. Olympia Giannou, Ahmad Mustafa Shiri, Anastasios Giannou, Dimitra Zazara, Samuel Huber, Georgios Pavlidis University of Patras, Greece</p> <p>Abstract- A model-driven approach suitable for classifying microbiome-related morbidities such as ulcerative colitis on smart mobile devices is investigated in this manuscript. A novel scheme is proposed, which consists of a pre-trained image classifier on ImageNet and is deployed into the presented Android mobile application for this purpose. Endoscopic images of mouse colitis were used as input datasets for our experiments. The proposed approach offers an efficient classifier, based on the average of all its performance metrics: confusion matrix, accuracy, recall, precision, cross entropy, f1-score. The results are compared with these of the most representative image classifiers for the kind of classification we target, in terms of performance, as well as the size of the retrained frozen graph on our dataset. Such a classification could serve as a valuable tool in clinical medicine offering an automated, diagnostic tool for microbiome-related morbidities, thus allowing accurate early diagnosis and the design of personalized and targeted therapeutic approaches.</p>
S021 15:15-15:30	<p>“You don’t need a Microservices Architecture (yet)” Mr. Dimitrios Gravanis, George Kakarontzas, Vassilis Gerogiannis University of Thessaly, Greece</p> <p>Abstract- Within the past decade, the advent of cloud computing in terms of infrastructure, technology stacks, availability of services and tooling, along with the gradual improvement of its market environment, has driven many organizations to either consider or migrate many existing software systems to the cloud, either fully or partially. A common predicament in most cases, is the existence of a complex, monolithic application, potentially considered legacy at the time, that was not designed to be cloud-native and therefore requires a degree of redesign/reimplementation in order to benefit from cloud deployment. In such cases, the decomposition of the monolith to a set of loosely coupled, highly cohesive and self-contained microservices is a valid recommendation, provided that the organization is prepared to withstand the additional cost, in terms of human and financial resources, along with the unavoidable development overhead, which is inevitable during the early stages. However, the tendency of the tech world to embrace new trends and jump on hype trains for fear of obsolescence, has led to an excessive adoption of the microservices architecture (MSA), even in cases where such an architecture is not viable for the organization, or does not derive from any business requirements. This research focuses on establishing the position of a traditional monolith in the modern software architecture landscape and determine use cases that can still benefit from this paradigm, as well as use cases that could benefit from a partial or full transition to microservices architectures instead.</p>

Session Chair: Assoc. Prof. George Kakarontzas, University of Thessaly, Greece

Time: 7:30-9:00 (GMT+2)

Time & ID	Presentation
S013 7:30-7:45	<p>"Design of Secure Connectors for Complex Message Communications in Software Architecture" Michael Shin, Dr. Taeghyun Kang, Hassan Gomaa University of Central Missouri, USA</p> <p>Abstract- This paper describes the design of secure connectors that deal with various message communications between application components in secure distributed component-based software architectures. The secure connectors are designed with more than one communication pattern between application components, security patterns required by the components, and security coordinators integrating security patterns and communication patterns. This paper describes the pseudocode of security coordinators. The secure connectors make application components free from maintaining complex message communication sequence logic and security concerns. To validate our design, we applied secure connectors to the model-view-controller (MVC) architecture for a secure distributed baseball game application.</p>
S0002 7:45-8:00	<p>"Digital Violence Against Women: A Time Series Analysis" Dr. Gregorio Arturo Reyes González, Francisco J. Cantu-Ortiz Tecnologicode Monterrey, México</p> <p>Abstract- Violence Against Women is a phenomenon that has grown in the last decades. In this research we address this phenomenon in Digital Space as Digital Violence Against Women. We trained a Support Vector Machine Classifier that predicted a 20.16% presence of Digital Violence Against Women in a Self-constructed Tweet dataset containing over 10 Million Spanish-language tweets in Mexico. A time series was constructed on the percentage of Digital Violence Against Women in tweets per day. Findings indicate increasing presence of violence on specific dates of fight for Women's Rights, such as 25th of November and 8th of March. Finally, forecasts under an ARIMA model gave a Root Mean Squared Error of 0.0062.</p>
S003 8:00-8:15	<p>"Merging Live Video Feeds for Remote Monitoring of a Mining Machine" Mr. Andrew Flangas, Javad Sattarvand, Sergiu M. Dascalu, Frederick C Harris University of Nevada, USA</p> <p>Abstract- This research entails using virtual reality to interpret video recordings in Unity from cameras on an unmanned machine used for mining excavations. The purpose of using a machine of this nature is to send it into hazardous mining environments rather than sending workers and having their lives jeopardized. This work is significant because it demonstrates how two separate fields, such as virtual reality and robotics, can be combined to complete useful tasks. It also illustrates how machines can be used to replace workers in hazardous conditions not only in the field of mining, but in other fields as well. The main contribution of the work presented in this paper is the creation of a panorama of live video feeds captured by several webcams, which can be seen using a VR headset. As also described in the paper the software developed for this engineering application has been created using appropriate software engineering techniques and tools. Results of merging live video feeds and testing camera placements are also presented and planned directions of future work are outlined.</p>

Time & ID	Presentation
S002 8:15-8:30	<p>"Systematizing the Meta-Analytical Process in Software Engineering" Letizia Jaccheri, Ms. Zamira Kholmatova, Giancarlo Succi Innopolis University, Russia</p> <p>Abstract- The generalization of knowledge is a necessary part of every scientific field. Meta-analysis is already advocated as a tool for generalization in different areas such as medicine, psychology, business, and this process is already standardized for them. Software engineering started using meta-analysis as a tool for aggregating results from families of experiments, but not so long for generalization of results coming from different studies, and for this purpose, the meta-analytical approach is not yet clarified. In this paper, we attempt to systematize the application of meta-analysis as a secondary study to the software engineering field suggesting our preliminary protocol. To see the reliability of the proposed protocol we conducted several studies using it. Following even uniform protocol with these studies, we identified the issues preventing the wide usage of meta-analysis in software engineering and proposed our solutions for them.</p>
S001 8:30-8:45	<p>"Synthesis of a Leadership Model for DevOps Adoption" Mr. Krikor Maroukian, Stephen Gulliver Microsoft, Greece</p> <p>Abstract- The first decade of DevOps-orientation in software-intensive organizational environments is often characterized with an emerging set of skills that support DevOps practice adoption, targeting a cross-functional collaborative culture; with an aim of achieving a shift in mindset, skillset, and toolset. We investigate DevOps adoption constructs to facilitate development of a formative measurement model to support leadership throughout the DevOps transitional journey. The model and its constructs are designed and validated with a multi-method approach. Initially an exploratory study of a survey is conducted with 250 respondents 76% of whom possess leadership roles, 93% work in Europe and Middle East, and two-thirds are practicing as DevOps practitioners. Pertinent model indicators are produced and grouped under constructs based on survey results and validated using PLS-SEM. The formative structural model is presented and validated in three separate focus group sessions, comprising of respectively seven (7), five (5), and seven (7) participants all of whom had held leadership positions; from countries including USA, UK, The Netherlands, UAE, Greece, Georgia, Switzerland. Seventeen (17) focus group participants provided additional responses through a focus group in-session survey, which allowed feedback on specific model constructs. Results indicate that a set of practices, a set of skills, a set of metrics, DevOps adoption planning and the existence of the DevOps adoption leader roles, should be part of organizational aspirations in the definition of leadership in a DevOps transition path.</p>
S0003 8:45-9:00	<p>"Nozzle-to-Work Distance Measurement and Control in Wire Arc Additive Manufacturing" Dr. Raven T. Reisch, Tobias Hauser, Jan Franke, Florian Heinrich, Konstantinos Theodorou, Tobias Kamps, Alois Knoll Technical University of Munich, Germany and Siemens AG, Germany</p> <p>Abstract- In multi-axes Wire Arc Additive Manufacturing, keeping the correct nozzle-to-work distance is crucial to avoid collisions and process defects. Measuring this distance is challenging as the welding arc complicates the usage of conventional distance measurements without positional offset in-process. For that reason, this study investigated and evaluated the usage of several sensors (wire feed sensor, current and voltage sensor, microphone, welding camera, spectrometer, structural acoustic sensor) for a direction independent in-process measurement. Features were extracted based on domain knowledge and selected by means of a correlation analysis. The spectrometer (Pearson's $r \approx 0.90$) showed the most robust measurements for stable process parameters when computing the relative intensity at a wavelength of 960 nm, followed by the welding camera (Pearson's $r = 0.84$) when analyzing the images with a convolutional neural network. Based on the findings, a closed-loop-control was created. As a system identification revealed a higher impact of the welding speed on the track height in comparison to the wire feed rate (Pearson's $r \approx 0.90$ vs 0.16), the closed-loop-control was realized by means of a simple P-control for the welding speed. The proposed approach enabled the manufacturing of multi-layer multi-bead parts with multi-axes deposition paths.</p>

Session Chair: Prof. Chuan Qin, University of Shanghai for Science and Technology, China

Time: 9:30-11:15 (GMT+2)

Time & ID	Presentation
DS0003 9:30-9:45	<p>"Reversible Data Hiding in Encrypted Images Based on Chinese Remainder Theorem and Secret Sharing Mechanism"</p> <p>Chuan Qin, Shengyan Gao, Chanyu Jiang, Heng Yao, Ching-Chun Chang University of Shanghai for Science and Technology, China</p> <p>Abstract - Secret sharing refers to a method for dividing a secret into several shares and distributing them among a series of participants. When enough shares are received, the secret can be reconstructed without information loss. This paper proposes a new method for reversible data hiding in encrypted images based on the Chinese remainder theorem (CRT) and secret sharing strategy. The most significant bit (MSB) and 7 least significant bit (LSB) layers are separately encrypted during the encryption procedure, in which 7 LSB layers are scrambled with a CRT secret sharing scheme. During the embedding phase, the additional bits are embedded into each share based on the strategies of MSB flipping and MSB substitution. The receiver side can recover the original image and extract the additional bits according to the characteristics of secret sharing and strong correlation between adjacent pixels. Experimental results have demonstrated the effectiveness of the proposed method.</p>
DS0008-A 9:45-10:00	<p>"A GAN Based End-to-End Network for Object Detection in Underwater Images"</p> <p>Jiaojiao Yuan Beijing University of Technology, China</p> <p>Abstract - In recent years, deep learning based object detection methods have achieved significant advances. However, these methods can not work well on underwater images due to some problems such as color degradation and texture distortion. To solve this problem, some methods try to enhance the images firstly, and then carry out detection, which regard the two modules as independent steps. Unfortunately, these approaches have been proved to further reduce the performance of detection. Different from previous methods, in this paper, we propose a novel method, which integrates image enhancement and object detection into a unified framework for end-to-end joint training. Firstly, the unsupervised cycleGAN is introduced to solve the problem of image enhancement. We collected a set of high-quality underwater images from Internet as the references set, which are considered without color degradation and low visibility. Secondly, a modified SSD is applied to detect objects. By doing in this way, the enhanced images are used as the input of detection, and the two modules are trained jointly. Experiments on the underwater robot picking contest datasets (URPC 2018) show that the proposed framework can achieve an absolute gain of 1.3% ~ 4.5% in average precision (AP) compared with using detection algorithm directly.</p>

Time & ID	Presentation
DS0017 10:00-10:15	<p>"Automatic Smart Device Identification Based on Web Fingerprint and Neural Network" Le Yao, Honglin Zhuang, Qianye Su, Zhechao Lin and Jiaxiang Gu Institute of System Engineering AMS. PLA, China</p> <p>Abstract- Cyberspace smart devices refer to the general term for devices that can connect to the Internet and have data processing functions. With the development of the Internet of Things technology, new smart devices such as webcams have brought convenience to people's lives, but also exposed many security vulnerabilities. Discovering smart devices in cyberspace is the prerequisite and basis for implementing cyberspace security management. However, the traditional pattern matching identification method requires manual extraction of device keywords, and keeping the keywords intact and updating the fingerprint database hinders accurate and large-scale device discovery. In this regard, this paper proposes a smart device identification method based on Web fingerprints and neural network. We use asynchronous stateless scanning and web crawlers to obtain the target's HTTP response data, extract the text in the response data based on natural language processing technology, and use neural networks to build a classification model. After processing, the response data of each IP is converted into concise text as a feature vector, and these texts are finally used to train the neural network model to realize the identification of smart devices. In order to prove the effectiveness of the algorithm, this paper uses Python to implement a prototype system and conduct experimental verification to evaluate its performance. Experiments show that among the four neural network models used, the RCNN model can converge in the shortest time and reach a training accuracy of 98.66%, and an accuracy of 90.59% on the test set. It is verified that the algorithm proposed in this paper is feasible and has a good ability to recognize smart devices.</p>
DS0015 10:15-10:30	<p>"Research on Intelligent Monitoring and Maintenance of Civil Air Defense Alarm System Based on Internet of Things" Yang Lianguo Nanjing Houhua Communication Equipment Co., Ltd., China</p> <p>Abstract- The fourth industrial revolution represented by the new generation of digital technology has fully penetrated into all areas of the economy and society, leading the rapid changes in production methods and business management models. Aiming at the problems encountered during the digital transformation of civil air defense alarm systems, such as inadequate state monitoring of alarm equipment, irregular manual inspections, etc., this paper proposes a system upgrade and transformation program based on the Internet of Things technology, and discusses the key technical points involved. The upgrade plan includes the development of an intelligent terminal monitoring the working condition of electronic siren of civil air defense and a set of integrated management platform software of civil air defense alarm system. Through the introduction of intelligent and digital management methods, it provides a scientific basis for the construction and decision-making of the alarm system, and provides technical support for future use in wartime. This work has important practical significance and strategic value.</p>
SE0002 10:30-10:45	<p>"Software safety test case design method based on Fuzzy Fault Tree Analysis" Shiran Cai and Wei Zhang China Aerospace Academy of Systems Science and Engineering, China</p> <p>Abstract- Aiming at the problems of insufficient software safety testing and incomplete aerospace data, combined with fuzzy set theory, a design methodology for safety test cases of aerospace software is proposed. A fuzzy fault tree of aerospace software is established on the basis of fault tree analysis technology and expert investigation method, the trapezoidal fuzzy numbers are used to replace the failure probabilities of the bottom events, and then obtain the minimum cut sets through the qualitative analysis of the fault tree, the minimum safety test cases is designed according to the minimum cut sets. Finally, different test cases are prioritized by the cut set importance results calculated by the quantitative analysis of the fuzzy fault tree. According to the experimental results, the proposed method provides a reference for improving the safety of the aerospace system while reducing the number of test cases and ensuring the sufficiency and efficiency of the software safety test cases.</p>

Time & ID	Presentation
SE0003 10:45-11:00	<p>"Automatic Modeling Method for PThread Programs Based on Program Dependence Net"</p> <p>Cheng Chen, Shuo Li and Zhijun Ding Tongji University, China</p> <p>Abstract - Program Dependence Net (PDNet) based on Coloured Petri Net (CPN) is a kind of multi-threaded program model describing and distinguishing program dependences. This paper presents an automatic modeling method to construct a PDNet which is consistent with the behavior of multi-threaded C programs (PThread programs) from source code. A big challenge for modeling multi-threaded programs is shared function in different threads. To handle it, we set independent places to represent variables, and simulate address space and thread stack through different fields in colour set. Another challenge is to describe complicated data structures including array, pointer and struct when programs operate on them. Native arc expressions for PDNet can't describe pointer reference or array operator. We design a recursive function to translate program expressions into native arc expressions automatically, which solve the problem of calculating complicated program expressions. On the basis of our method, we also implement our tool and prove the usefulness, high efficiency and scalability of our method through experiments in our benchmarks including a subset benchmarks of SV-COMP which is a famous competition on software verification.</p>
SE4001 11:00-11:15	<p>"Embedded controller Visual Configuration software design analysis"</p> <p>Yufeng Liang Dalian Jiaotong University, China</p> <p>Abstract - Facing the massive data information and logic control pages of different engineering projects, the use of embedded visual controllers to control a variety of electronic equipment or devices, automated processing tasks, has become a modern industrial remote command monitoring, one of the development trends of functional service expansion. In this case, the use of Windows operating system, Modbus /TCP protocol, and ROM, Flash and other memory, to develop and design a visual configuration software for SmartIC industrial project control, including the upper computer visual configuration software, the lower computer ARM configuration software, by the upper computer's dynamic linked list Technology, sends the configuration file for logic instruction control and function execution, and the lower computer performs the configuration file reception, identification and operation.</p>

The background is a solid blue gradient. On the right side, there is a stylized globe composed of binary code (0s and 1s) arranged in a circular pattern. A network of thin white lines connects various blue dots of different sizes, creating a web-like structure that spans the left and bottom portions of the image.

THANK YOU