



All photos by Bård Gudim, unless otherwise indicated.

News

January-June 2017

User partner workshop

The Certus User Partner Workshop took place during May 11 and 12, where Certus' partners and host institution gathered at the facilities of Simula Research Laboratory. French design team OKONI organised the workshop, which consisted of PhD presentations and creative problem solving using Arduino kits, which provides the user with equipment to construct small-scale electrical engineering projects.

The construction sessions are team building exercises designed to bring out the skills of the team members. The biannual workshops provide good opportunity to bring together partners from different regions and strengthen the collaborative bonds of the group.

Photo: Karoline Hagane



ecFeed: New adjacent project in collaboration with Testify

ecFeed aims to explore approaches for test oracle generation in a model-based tool for test case generation.

Dusica Marjan

Test case generation in ecFeed is based on a model of the input domain of the system under test. Given this model, ecFeed generates valid combinations of input data according to several strategies for combinatorial testing.

The tool also supports specifying simple constraints that map combinations of input values to expected outputs. The project seeks to evaluate effective and practical approaches for test oracle generation in the context of combinatorial testing. The funding source of the project is the Research Council of Norway. The project is led by research scientist Dusica Marijan from Simula, and Anders Olsen from Testify.



FightHPV presented at IAAI-17

FightHPV, the serious game co-designed by Simula and the Cancer Registry, for nudging people to attend cervical cancer screening and informing about the disease, has been presented at the [Innovative Applications of Artificial Intelligence Conference \(IAAI-17\)](#), San Francisco, CA, USA in Feb. 2017.

Dr. Gotlieb's presentation of the paper entitled "Constraint-Based Verification of a Mobile App Game Designed for Nudging People to Attend Cancer Screening" co-authored by A. Gotlieb, M. Louarn, M. Nygård, T. Ruiz-Lopez, S. Sen and R. Gori, focused on the usage of artificial intelligence technique to verify the gameplay of this serious game.



Sagar Sen



Arnaud Gotlieb

Certus and OKONI visit INNOROBO 2017

Certus and OKONI, the French design team that facilitate collaboration during the Certus UPW workshops, visited [INNOROBO 2017](#) in Paris in May 2017. This meeting is the most prominent event in Europe to promote innovation in robotics.



Photos: Arnaud Gotlieb

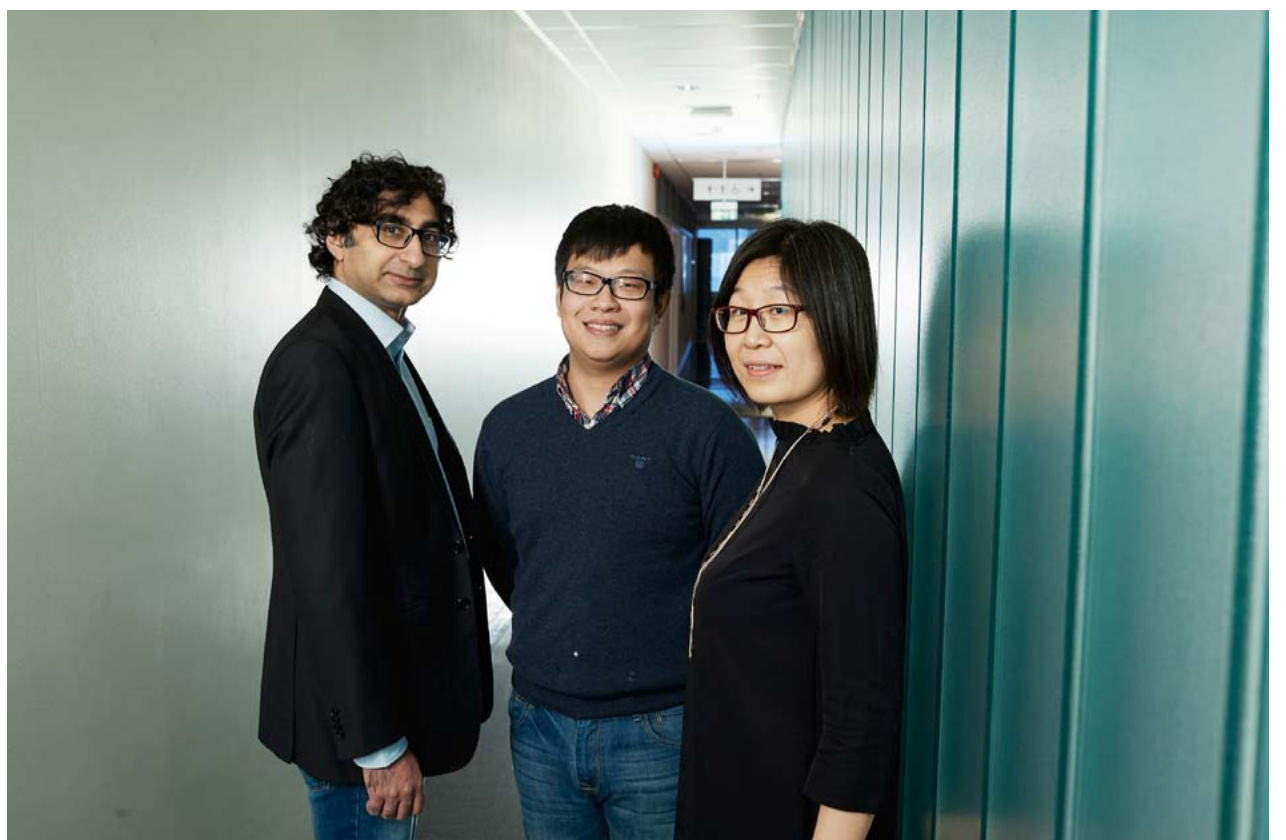
Dr. Shuai Wang co-organised A-MOST '17

Dr. Shuai Wang co-organized the [13th Workshop on Advances in Model Based Testing \(A-MOST\)](#) co-located with the 10th IEEE International Conference on Software Testing, Verification and Validation (ICST), which took place on March 17th in Japan. A-MOST 2017 managed to attract in total 44 registrations and more than 50 participants, which triggered a lot of interesting discussions between the speakers and audience during the workshop.

Certus paper receives best paper nomination in ICST'17

A Certus paper titled "CBGA-ES: A Cluster-Based Genetic Algorithm with Elitist Selection for Supporting Multi-objective Test Optimization" got the best paper nomination in the [10th IEEE International Conference on Software Testing, Verification and Validation \(ICST\)](#).

The paper aimed at improving the state-of-the-art of evolutionary computation for supporting multi-objective test optimization, which is co-authored between the four Simula's researchers (Dipesh Pohan, Shuai Wang, Shaukat Ali and Tao Yue) with our industrial partner Cisco (Marius Li-aen)



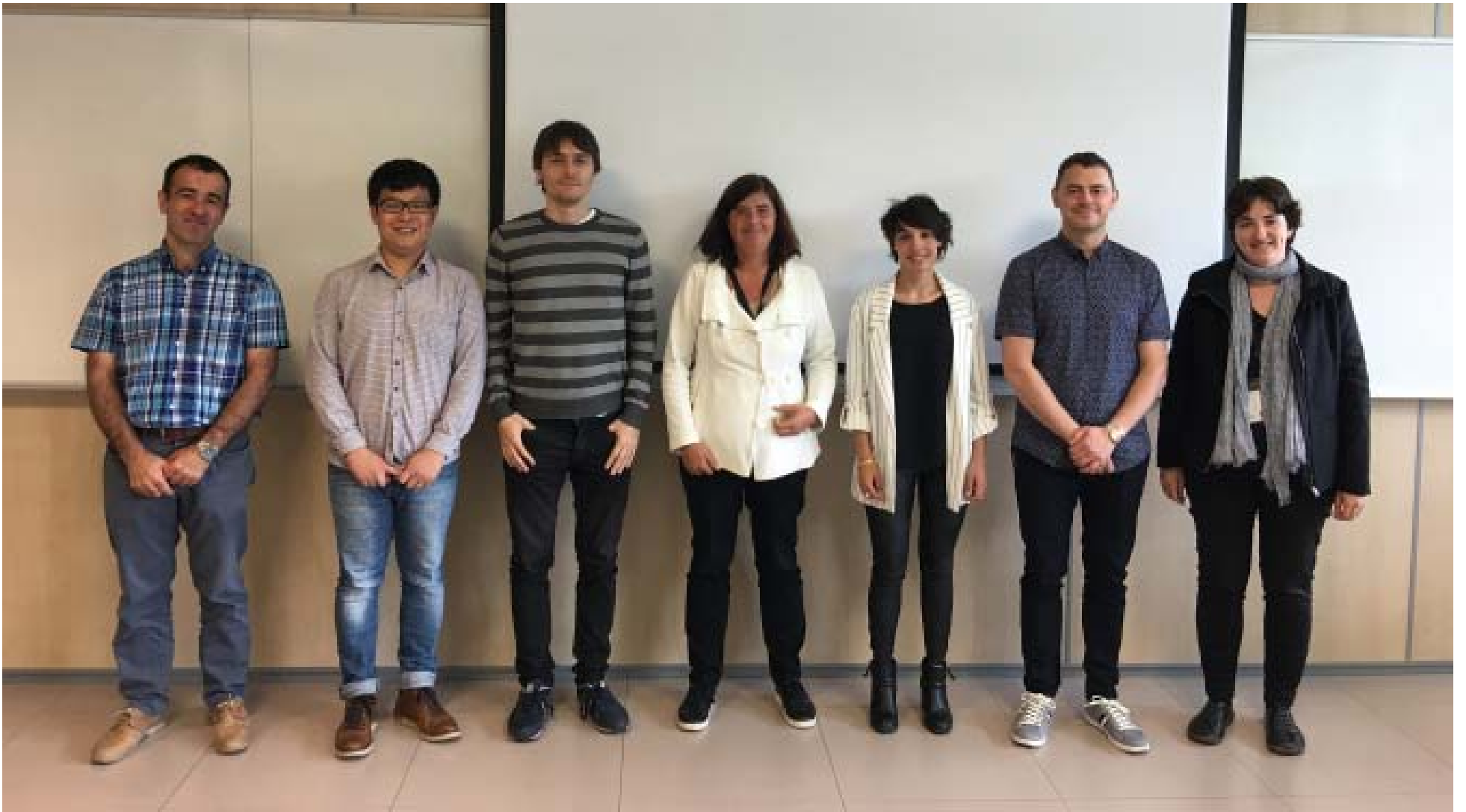
From left to right: Shaukat Ali, Shuai Wang, Tao Yue

Certus Master's student Thomas Schwitalla successfully defends his thesis

Thomas Schwitalla has successfully defended his Master Thesis titled with “A Rule-Based Framework for Supporting Automated Change Impact Analysis in the Cancer Registry of Norway”. His thesis lies in the context of the MBE-CR project, collaborating with the Cancer Registry of Norway.

Double PhD evaluation by Dr. Shuai Wang

Dr. Shuai Wang visited the University of Mondragon during June and played as one of the jury members for two PhD project middle-stage evaluations. The two PhD projects are “Test Optimisation for Highly-Configurable Cyber-Physical Systems” proposed by the PhD candidate Urtzi Markiegi and “Data variability visualization in Product Line Engineering of Monitoring Functionality in Industrial Cyber-Physical Systems” proposed by the PhD candidate Iglesias Aitziber. In addition, Dr. Wang discussed the potential collaborations with the Prof. Sagardui and Prof. Etxeberria at the University of Mondragon for the further joint papers, exchange students and EU proposals.



Dr. Shuai Wang (second from left) is on-scene for one of the PhD evaluations.

Photo: Shuai Wang

FightHPV won the Best Poster Award at Papillomavirus Conference

Sagar Sen from Certus and Simula, and Tomas Ruiz-Lopez, Mari Nygård, and Elisabeth Jackobsen from the Cancer Registry of Norway won the Best Poster Award at the [International Papillomavirus Conference 2017](#) in Cape Town in March 2017.

The poster in question was “FightHPV: A game to raise HPV awareness and nudge people to take action against cervical cancer in Norway.”



Photo: Sagar Sen

Conferences attended

Since our last newsletter, Certus researchers have presented papers, or demonstrated Certus or adjacent project technologies at a number of conferences and workshops:

- Certus attended the [10th IEEE International Conference on Software Testing, Verification and Validation \(ICST\)](#), Japan, March 2017. A paper co-authored between four Simula's researchers (Dipesh Praphan, Shuai Wang, Shaukat Ali and Tao Yue) with our industrial partner Cisco (Marius Liaaen) was presented, and got the best paper nomination.
- Dusica Marijan presented a paper on the tool developed collaboratively with Cisco, TITAN: Test Suite Optimization for Highly Configurable Software, at [ICST 2017](#). The paper is co-authored by D. Marijan, A. Gotlieb, M. Liaaen, S. Sen, and C. Ieva.
- Certus attended the [13th Workshop on Advances in Model Based Testing \(A-MOST\)](#) in March in Japan, which was co-organised by Dr. Shuai Wang.
- Certus and Fight-HPV was represented at the [International Papillomavirus Conference 2017](#) in Cape Town in March 2017.
- FightHPV was presented at the Innovative Applications of Artificial Intelligence Conference (IAAI-17), San Francisco, CA, USA in Feb. 2017
- Certus and OKONI visited [INNOROBO 2017](#) in Paris in May 2017.
- Arnaud Gotlieb presented Certus and the automated testing of robotic systems at [GDR-GPL 2017](#), Montpellier, France in June 2017.
- [TAROT Summer School on Software Testing](#), Napoli, Italy in June 2017, Dr. Gotlieb gave a lecture on Intelligent Test Optimization.
- Two papers on testing Cisco video conferencing systems and co-authored by Cisco presented at [IEEE 18th International Symposium on High Assurance Systems Engineering \(HASE\) 2017](#) by Dusica Marijan.
- Certus attended the [IEEE Congress on Evolutionary Computation \(CEC\)](#), Spain, June 2017, where Shaukat Ali presented a paper co-authored by Yan Li, Tao Yue, Shaukat Ali and Li Zhang.
- Certus PhD Student Helge Spieker got a paper accepted at the [International Symposium on Software Testing and Analysis \(ISSTA\) 2017](#). His paper "Reinforcement Learning for Automatic Test Case Prioritization and Selection in Continuous Integration", is co-authored by H. Spieker, A. Gotlieb, D. Marijan and M. Mossige, and will be published in the Proceedings of 26th International Symposium on Software Testing and Analysis, Santa Barbara, CA, USA, July 2017 (ISSTA'17), 2017.

The Certus team, May 2017



Adjacent project updates

U-Test

- On April 4, 2017, the second European Commission's review took place in Brussels. An expert panel reviewed the overall project and evaluated the project to be "Good". The quality of scientific results was assessed to be significant and initiation of the new standard on Uncertainty Modelling at the Object Management Group was appraised. The experts also appreciated the significant efforts made by the consortium to demonstrate the project results to the industry with dissemination and standardization activities.
- The revised submission of the UML Test Profile (UTP) V.2 was voted to be adopted by the Object Management Group (OMG) during the OMG's technical meeting held in Brussels (June 5 to June 9, 2017).
- A paper titled "An Empirical Evaluation of Mutation and Crossover Operators for Multi-Objective Uncertainty-Wise Test Minimization" was presented at the Search-Based Software Testing Workshop co-located with International Conference on Software Engineering held in Buenos Aires, Argentina from May 20 to May 28, 2017.
- On March 9th 2017, Oslo Medtech and other representatives of U-Test project hosted a workshop with the theme of IoT solutions in the healthcare sector. The workshop was held in Oslo Science Park and introduced the U-Test's values for the reliability of IoT solutions in the healthcare sector.
- As a step closer towards standardising Uncertainty Modelling, The Object Management Group (OMG) hosted a webinar entitled "Introduction to Uncertainty Modelling" on January 25th, 2017. In the webinar, Tao Yue, Shaukat Ali, and Bran Selic presented the Uncertainty Modelling RFI (Request For Information). This is a big step in the standardisation activities of the project, a corner stone for building U-Test's community. The webinar went well with 215 registered, 137 live viewings, 123 downloads as counted 1 week after the webinar.
- U-Test was presented at the Smart Cyber-Physical Systems Concertation Event in Brussels, Belgium, on January 30 2017. The event aimed to bring together the Cyber-Physical Systems, embedded intelligent systems and advanced computing communities across Europe and is set to reinforce exchange and strengthen the links between the Horizon2020 CPS projects, Artemis-IA, HIPEAC and the larger CPS community.

MBT4CPS

- Shaukat Ali gave a keynote on "Uncertainty-Wise Testing" at the Advances in Model-Based Testing workshop co-located with the 10th IEEE International Conference on Software Testing, Verification and Validation (ICST 2017) held in Tokyo, Japan from March 13 to March 17, 2017
- A paper titled "Empowering Testing Activities with Modeling" co-authored with Marius Liaaen from Cisco was presented at The International Conference on Model-Driven Engineering and Software Development (MODELSWARD), held in Porto, Portugal from February 19 to February 21, 2017.

Shaukat Ali



Publications

January to June 2017

Journal articles

A. GOTLIEB AND D. MARIJAN

Using Global Constraints to Automate Regression Testing
AI Magazine 38, no. Spring (2017).

M. MOSSIGE, A. GOTLIEB AND H. MELING

Deploying Constraint Programming for Testing ABB's Painting Robots
AI Magazine (Column on AI in Industry) 39, no. Summer (2017).

M. ZHANG, S. ALI, T. YUE AND R. NORGRÉN

Uncertainty-Wise Evolution of Test Ready Models
Information and Software Technology (IST) (2017).

H. ZHANG, S. WANG, T. YUE, S. ALI AND C. LIU

Search and similarity based selection of use case scenarios: An empirical study
Empirical Software Engineering (2017): 1-78.

Proceedings, refereed

M. MOSSIGE, A. GOTLIEB, H. SPIEKER, H. MELING AND M. CARLSSON

Time-aware Test Case Execution Scheduling for Cyber-Physical Systems
In Proceedings of Principles of Constraint Programming (CP'17), 2017.

Q. PLAZAR, M. ACHER, S. BARDIN AND A. GOTLIEB

Efficient and Complete FD-Solving for Extended Array Constraints
In Int. Joint Conf. on Artificial Intelligence (IJCAI'17), Aug. 2017, Melbourne, Australia., 2017.

H. SPIEKER, A. GOTLIEB, D. MARIJAN AND M. MOSSIGE

Reinforcement Learning for Automatic Test Case Prioritization and Selection in Continuous Integration
In Proceedings of 26th International Symposium on Software Testing and Analysis, Santa Barbara, CA, USA, July 2017 (ISSTA'17), 2017.

A. ARRIETA, S. WANG, U. MARKIEGI AND G. SAGARDUI

Search-Based Test Case Generation for Cyber-Physical Systems
In IEEE Congress on Evolutionary Computation (CEC). IEEE, 2017.

D. MARIJAN, A. GOTLIEB, M. LIAAEN, S. SEN AND C. IEVA

TITAN: Test Suite Optimization for Highly Configurable Software
In International Conference on Software Testing, Verification and Validation (ICST 2017), 2017.

S. A. SAFDAR, H. LU, T. YUE AND S. ALI

Mining Cross Product Line Rules with Multi-Objective Search and Machine Learning
In Genetic and Evolutionary Computation Conference (GECCO). ACM, 2017.

S. ALI, Y. LI, T. YUE AND M. ZHANG

An Empirical Evaluation of Mutation and Crossover Operators for Multi-Objective Uncertainty-Wise Test Minimization
In 10th International Workshop on Search-based Software Testing., 2017.

D. MARIJAN AND S. SEN

Detecting and Reducing Redundancy in Software Testing for Highly Configurable Systems
In IEEE International Symposium on High Assurance Systems Engineering (HASE). ACM/IEEE, 2017.

D. MARIJAN AND M. LIAAEN

Test Prioritization with Optimally Balanced Configuration Coverage
In IEEE International Symposium on High Assurance Systems Engineering. ACM/IEEE, 2017.

S. ALI, M. LIAAEN, S. WANG AND T. YUE

Empowering Testing Activities with Modeling
In The International Conference on Model-Driven Engineering and Software Development (MODELSWARD). SCITEPRESS – Science and Technology Publications, 2017.

J. L. DE LA VARA, M. BORG, K. WNUK AND L. MOONEN

Safety Evidence Change Impact Analysis in Practice
In International Conference on Software Engineering. ACM/IEEE, 2017.

D. PRADHAN, S. WANG, S. ALI, T. YUE AND M. LIAAEN

CBGA-ES: A Cluster-Based Genetic Algorithm with Elitist Selection for Supporting Multi-objective Test Optimization
In 10th IEEE International Conference on Software Testing, Verification and Validation (ICST 2017). IEEE, 2017.

A. GOTLIEB, M. LOUARN, M. NYGÅRD, T. RUIZ-LOPEZ, S. SEN AND R. GORI

Constraint-Based Verification of a Mobile App Game Designed for Nudging People to Attend Cancer Screening
In Proceedings of Innovative Applications of Artificial Intelligence (IAAI-17), Feb. 2017, San Francisco, USA., 2017.

Talks, keynote

L. MOONEN

Leveraging Machine Learning to Guide Software Evolution

In 8th IEEE International Workshop on Empirical Software Engineering in Practice (IWESEP), Tokyo, Japan. IEEE, 2017.

Technical reports

S. ALI, Y. LI, T. YUE AND M. ZHANG

Uncertainty-Wise and Time-Aware Test Case Prioritization with Multi-Objective Search

Simula Research Laboratory, 2017.

S. ALI, Y. LI, T. YUE AND M. ZHANG

An Empirical Evaluation of Mutation and Crossover Operators for Multi-Objective Uncertainty-Wise Test Minimization

Simula Research Laboratory, 2017.

S. ALI, H. MUHAMMAD, H. LU, J. NYGÅRD, S. WANG AND T. YUE

A Pilot Experiment to Assess Interactive OCL Specification in a Real Setting

Simula Research Laboratory, 2017.

Edited books

S. WANG, P. ARCAINI AND X. DEVROEY

The Proceeding of the 13th Workshop on Advances in Model Based Testing (A-MOST)

Vol. 13. Tokyo, Japan: IEEE, 2017.