

Seminar topics

The seminar *Software Engineering* offers in the summer semester 2015 different topics to dig into different tools, methods and techniques. If you are interested in any topic, please read the long description and follow the application procedure.

Version of file

This file will be updated with each application. It could be possible, that we expand our offered topics.

Version	Description
1.0	Initial version.
1.1	New topics added (#20 - #23)
1.2	New topic added (#24)
1.3	Changed topic #23

Procedure for getting a seminar topic

The procedure for getting a topic will be announced at the kick-off meeting. It would help, if you already know the topics that are interesting to you.

Short list of offered topics

#	Mentor + E-Mail	Topic	Ba	Ma
1	Hadil Abukwaik abukwaik@cs.uni-kl.de	Comparison between software interoperability and software reuse models	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2		Reflection on API-documentation improvement studies	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Taslim Arif	Monitoring Techniques for SaaS (Software as a Service)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	taslim.arif@iese.fraunhofer.de	Modeling and Formalization of Service Level Agreements	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Alexander Klaus	Concurrency in Industry	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Alexander.Klaus@iese.fraunhofer.de	Concurrency Testing	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Manuel Rudolph Denis Feth manuel.rudolph@iese.fraunhofer.de denis.feth@iese.fraunhofer.de	Domain Modelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	Denis Feth denis.feth@iese.fraunhofer.de	Recommendation Systems	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9	Manuel Rudolph manuel.rudolph@iese.fraunhofer.de	Domain Specific Languages	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	Konstantin Holl Konstantin.holl@iese.fraunhofer.de	State of the Practice "Mobile App Testing"	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11	Kai Simon Kai.simon@iese.fraunhofer.de	The release phase in secure software development models	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12	Sebastian Müller	Real-time fault tree for environment hazards	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13	sebastian.mueller@cs.uni-kl.de	Time-dependent certificates	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
14	Markus Damm	Multi-core systems in safety-critical applications	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
15	damm@cs.uni-kl.de	Mixed-criticality multicore systems and virtualization	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
16		Application of Category theory in software engineering	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17		Category theory and model-driven engineering	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18	Christian Wolschke	Dynamic and Static Analysis of (Cross-compiled) Binaries	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
19	wolschke@cs.uni-kl.de	Use of Emulation and Virtual Machines for Integration Testing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
20	Christian Jung	Activity Recognition with Cell Phones	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
21	Christian.jung@iese.fraunhofer.de	An Overview of Context Modeling Approaches	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
22	Philipp Diebold Philipp.Diebold@iese.fraunhofer.de	How does Agile Software Development fit to Best-Practice-Assessment models? Current State of the Art	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
23	Patrik Feth patrik.feth@iese.fraunhofer.de	Safety in the context of Open Adaptive Systems	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24	Felix Möhrle moehrle@cs.uni-kl.de	Car-to-X Communication	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sum			14	24

Long description of topics

Topic	Comparison between software interoperability and software reuse models
Mentor	Hadil Abukwaik
E-Mail	abukwaik@cs.uni-kl.de
Short description	Organizations can build or extend their software systems by reusing already existing software systems/components or by exchange information and services with them. To systematically perform such reuse or interoperation, models assist in: (1) measuring the mismatch level between two systems, (2) estimating the implementation cost, and (3) measuring the implementation progress. The goal of this seminar topic is to survey interoperability and reuse models, to analyze and classify them (according to their features and according to the aspects they cover), and to draw conclusions on their usages.
Link to papers	Possible but not limited-to References: <ol style="list-style-type: none">1. Frakes, William, and Carol Terry. "Software reuse: metrics and models." ACM Computing Surveys (CSUR) 28.2 (1996): 415-435. Online: http://dl.acm.org/citation.cfm?id=2345312. Carney, David, and Patricia Oberndorf. "Integration and interoperability models for systems of systems." Proceedings of the system and software technology conference (2004). Online: http://sei.cmu.edu/library/assets/sstcin cose.pdf
Bachelor/Master	Master
Supported Language	English
Required knowledge	None

Topic	Reflection on API-documentation improvement studies
Mentor	Hadil Abukwaik
E-Mail	abukwaik@cs.uni-kl.de
Short description	API documentations of software systems play a vital role in the effectiveness and efficiency of interoperability analysis performed by interested clients. Different studies propose guidelines to improve the quality of such API documentations with different goals. The aim of this seminar topic is to explore these studies, analyze and classify their proposed guidelines, and reflect on their benefits for the conceptual level of interoperability analysis (e.g., architecture, context, quality, etc.).
Link to papers	<p>Possible but not limited-to References:</p> <ol style="list-style-type: none"> 1. Jeong, Sae Young, et al. "Improving documentation for eSOA APIs through user studies." End-User Development. Springer Berlin Heidelberg, 2009. 86-105. 2. Robillard, Martin P. "What makes APIs hard to learn? Answers from developers." Software, IEEE 26.6 (2009): 27-34. 3. Robillard, Martin P., and Robert DeLine. "A field study of API learning obstacles." Empirical Software Engineering 16.6 (2011): 703-732.
Bachelor/Master	Master
Supported Language	English
Required knowledge	None

Topic	Monitoring Techniques for SaaS (Software as a Service)
Mentor	Taslim Arif
E-Mail	taslim.arif@iese.fraunhofer.de
Short description	Software systems offered as service need to be monitored at runtime for various reasons including service level enforcement. In this seminar, the student needs to summarize what has to be monitored, what are the associated challenges, what monitoring techniques are available for software systems and provide a comparative analysis.
Link to papers	<ol style="list-style-type: none"> 1. http://ojs.academypublisher.com/index.php/jsw/article/viewFile/0603395403/2806 2. http://www.cloudbus.org/papers/Cloud-Mon-SPE2014.pdf
Bachelor/Master	Masters
Supported Language	English
Required knowledge	Knowledge on Software Architecture and Requirements Engineering would be beneficial.

Topic	Modeling and Formalization of Service Level Agreements
Mentor	Taslim Arif
E-Mail	taslim.arif@iese.fraunhofer.de
Short description	Service level agreements(SLAs) are effective means to establish contract between service providers and consumers. Besides the functional requirements, quality attributes are also described in the SLAs. In this seminar, the student needs to investigate what quality attributes need to be specified in case of SaaS (Software as a Service) and how they can be modeled and formalized using DSLs (Domain Specific Languages).
Link to papers	<ol style="list-style-type: none"> 1. http://www.sei.cmu.edu/reports/08tn021.pdf 2. http://clip.dia.fi.upm.es/Projects/S-CUBE/papers/keller03:wsla_framework.pdf
Bachelor/Master	Masters
Supported Language	English
Required knowledge	Knowledge on Software Architecture and Requirements Engineering would be beneficial.

Topic	Concurrency in Industry
Mentor	Alexander Klaus
E-Mail	Alexander.Klaus@iese.fraunhofer.de
Short description	Concurrency problems are connected to non-determinism and thus can be hard to detect and correct in industry. Find surveys or reports that describe the situation in industry. What do industrial practitioners think about such types of problems? Are there reports on examples of such problems?
Link to papers	P. Godefroid, N. Nagappan: Concurrency at Microsoft – An Exploratory Survey. http://research.microsoft.com/en-us/um/people/pg/public_psfiles/ec2.pdf
Bachelor/Master	Master
Supported Language	English
Required knowledge	Knowledge about software engineering and at least basic knowledge about quality assurance

Topic	Concurrency Testing
Mentor	Alexander Klaus
E-Mail	Alexander.Klaus@iese.fraunhofer.de
Short description	For concurrency testing, several methods can be used, and are of different value, e.g., load testing and testing with code instrumentation. Find different methods that are used for testing and if possible examine how successful they are.
Link to papers	G. Jin, A. Thakur, B. Liblit, S. Lu: Instrumentation and Sampling Strategies for Cooperative Concurrency Bug Isolation. https://people.cs.uchicago.edu/~shanlu/paper/res0000084-jin.pdf D. Abdelqawy, A. Kamel, F. Omara: A SURVEY ON TESTING CONCURRENT AND MULTI-THREADED APPLICATIONS TOOLS AND METHODOLOGIES. http://www.researchgate.net/profile/Fatma_Omara/publication/230771471_A_SURVEY_ON_TESTING_CONCURRENT_AND_MULTI-THREADED_APPLICATIONS_TOOLS_AND_METHODOLOGIES/links/02e7e52968bda02f9e000000.pdf (copy link into browser)
Bachelor/Master	Master
Supported Language	English
Required knowledge	Knowledge about software engineering and at least basic knowledge about quality assurance

Topic	Domain Modelling
Mentor	Manuel Rudolph Denis Feth
E-Mail	manuel.rudolph@iese.fraunhofer.de denis.feth@iese.fraunhofer.de
Short description	Domain Models are used to specify and understand problems in a specific application domain. For example, domain models can be used to describe usability problems in specific settings. The objective of this seminar is to analyze and summarize existing domain (meta-) models and modelling techniques.
Link to papers	http://www.aptprocess.com/whitepapers/DomainModelling.pdf http://link.springer.com/article/10.1007/s00766-004-0208-2 http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=324835 http://en.wikipedia.org/wiki/Domain_model
Bachelor/Master	Both
Supported Language	German/English
Required knowledge	-

Topic	Recommendation Systems
Mentor	Denis Feth
E-Mail	denis.feth@iese.fraunhofer.de
Short description	Recommendation systems are widely used to predict user ratings, preferences and interests in, for example, online shops or social media. The objective of this seminar is to create a state-of-the-art report about recommendation system concepts and technologies.
Link to papers	http://link.springer.com/chapter/10.1007%2F978-0-387-85820-3_8 http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5235134 http://link.springer.com/chapter/10.1007%2F978-3-540-72079-9_10 http://en.wikipedia.org/wiki/Recommender_system
Bachelor/Master	Both
Supported Language	German/English
Required knowledge	-

Topic	Domain Specific Languages
Mentor	Manuel Rudolph
E-Mail	manuel.rudolph@iese.fraunhofer.de
Short description	The basic idea of a domain specific language (DSL) is a computer language that's targeted to a particular kind of problem, rather than a general purpose language that's aimed at any kind of software problem. The objective of this seminar is to summarize the key concepts of DSL, give examples of DSL usage as well as analyze and summarize DSL creation techniques.
Link to papers	https://sisis.rz.htw-berlin.de/inh2009/12371395.pdf http://www.sciencedirect.com/science/article/pii/S0950584907000419# http://www.researchgate.net/profile/Paul_Klint/publication/220178552_Domain-Specific_Languages_An_Annotated_Bibliography/links/02bfe50ca498359028000000.pdf (copy into browser) http://dsal.dcc.uchile.cl/2008/Media/dinkelaker.pdf
Bachelor/Master	Both
Supported Language	German/English
Required knowledge	-

Topic	State of the Practice “Mobile App Testing”
Mentor	Konstantin Holl
E-Mail	Konstantin.holl@iese.fraunhofer.de
Short description	<p>Identification and formulation of:</p> <ul style="list-style-type: none"> - actual industrial approaches for testing mobile applications (summary and references of frequent used approaches) - existing challenges of these approaches - proposed solutions to address these challenges
Link to papers	<p>Cappgemini, “Testing and SMAC Technologies: Ensuring a Seamless and Secure Customer Experience,” World Quality Report. 6th ed., pp.25–31, 2014.</p> <p>H. Muccini, A. Di Francesco, P. Esposito, “Software Testing of Mobile Applications: Challenges and Future Research Directions,” 7th International Workshop on Automation of Software Test (AST), 2-3 June 2012, pp.29–35.</p>
Bachelor/Master	This topic fits to master students
Supported Language	German and English
Required knowledge	Basics about software testing resp. quality assurance

Topic	The release phase in secure software development models
Mentor	Kai Simon
E-Mail	Kai.simon@iese.fraunhofer.de
Short description	What are the topics in the release phase of different classical development models (see for example Microsoft SDL)? Describe the connections to previous and following phases? Research and analyze the additional or changed security (not safety) tasks that are necessary to develop secure software.
Link to papers	<ul style="list-style-type: none"> • Michael Howard and Steve Lipner, The Security Development Lifecycle, 2006, ISBN-13: 978-0-7356-2214-2 • https://msdn.microsoft.com/en-us/library/windows/desktop/84aed186-1d75-4366-8e61-8d258746bopq.aspx
Bachelor/Master	Master
Supported Language	German (preferred) or English.
Required knowledge	Basics of Software Engineering Security skills

Topic	Real-time fault tree for environment hazards
Mentor	Sebastian Müller
E-Mail	sebastian.mueller@cs.uni-kl.de
Short description	For an autonomous vehicle it is important to describe the environment hazards in an adequate way. Obstacles around the vehicle should be integrated to fault tree analysis at runtime to evaluate a hazard potential. Therefore a research for existing methods and a transmission to this specific application is needed.
Link to papers	-
Bachelor/Master	both
Supported Language	German or English
Required knowledge	Lecture "Safety and Reliability of Embedded System"

Topic	Time-dependent certificates
Mentor	Sebastian Müller
E-Mail	sebastian.mueller@cs.uni-kl.de
Short description	So called "ConSerts" (Conditional Safety Certificates) allow to analyze the influence of changes in system components on the whole system safety at runtime. Therefore a logic is needed to display additional time dependencies.
Link to papers	http://dl.acm.org/citation.cfm?id=2491467
Bachelor/Master	both
Supported Language	German or English
Required knowledge	Lecture "Safety and Reliability of Embedded System"

Topic	Multi-core systems in safety-critical applications
Mentor	Markus Damm
E-Mail	damm@cs.uni-kl.de
Short description	While multi-core processors are common in consumer electronics for several years now, they are not used in safety critical applications. One reason is the focus on average-case optimization, while for safety a good handle on the worst-case behavior is needed. This topic explores some of the issues, especially worst case execution time.
Link to papers	http://dx.doi.org/10.1109/EDCC.2012.27 http://dx.doi.org/10.1109/ECRTS.2014.20
Bachelor/Master	Both: Bachelor and Master
Supported Language	German and English
Required knowledge	nothing required

Topic	Mixed-criticality multicore systems and virtualization
Mentor	Markus Damm
E-Mail	damm@cs.uni-kl.de
Short description	An important motivation for using multi-core processors in embedded systems is consolidation of different applications on one processor. Some of these applications might be safety-critical to various degrees. This topic explores how this situation can be handled using virtualization.
Link to papers	http://dx.doi.org/10.1109/RTAS.2014.6925987 http://dx.doi.org/10.1109/ETFA.2014.7005238
Bachelor/Master	Both: Bachelor and Master
Supported Language	German and English
Required knowledge	nothing required

Topic	Application of Category theory in software engineering
Mentor	Markus Damm
E-Mail	damm@cs.uni-kl.de
Short description	Category theory is a general theory of mathematical structures, which also saw some applications in computer science like programming language semantics. This topic explores some applications of category theory to software engineering.
Link to papers	http://dx.doi.org/10.1109/SAMI.2011.5738874 http://dx.doi.org/10.1109/SAMI.2014.6822376
Bachelor/Master	Master
Supported Language	German and English
Required knowledge	nothing required, but some knowledge of basic mathematical concepts (like vector spaces or groups) would be helpful

Topic	Category theory and model-driven engineering
Mentor	Markus Damm
E-Mail	damm@cs.uni-kl.de
Short description	Category theory is a general theory of mathematical structures, which also saw some applications in computer science like programming language semantics. This topic explores its application to model-driven engineering.
Link to papers	http://dx.doi.org/10.4204/EPTCS.93.1
Bachelor/Master	Master
Supported Language	German and English
Required knowledge	This topic requires good knowledge of category theory

Topic	Dynamic and Static Analysis of (Cross-compiled) Binaries
Mentor	Christian Wolschke
E-Mail	wolschke@cs.uni-kl.de
Short description	In order to validate and verify the behavior of cross-compiled programs it is necessary to analyze the binaries directly to get the exact behavior and to avoid the effects of testing platforms with different operation systems, system libraries and different host compilers. This seminar topics deals the possibilities of performing dynamic and static analyze techniques at binary level to guarantee reliability and correctness.
Link to papers	<ol style="list-style-type: none"> 1. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6045462&isnumber=6045429 2. http://doi.acm.org/10.1145/2465351.2465380 3. http://doi.acm.org/10.1145/1961295.1950396
Bachelor/Master	Both
Supported Language	German/English
Required knowledge	Knowledge about software engineering and at least basic knowledge about software quality assurance.

Topic	Use of Emulation and Virtual Machines for Integration Testing
Mentor	Christian Wolschke
E-Mail	wolschke@cs.uni-kl.de
Short description	It is state of the practice to use Hardware-in-the-Loop (HIL) tests to validate the system behavior. Since HIL test stands are expensive and give no insight to the system state, it is wanted to overcome these disadvantages with emulation of the hardware; which would allow connecting several emulators for integration testing. The seminar work should deliver the state of the art in this topic.
Link to papers	<ol style="list-style-type: none"> 1. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5635141&isnumber=5635036 2. http://doi.acm.org/10.1145/2601381.2601384
Bachelor/Master	Both
Supported Language	German/English
Required knowledge	Knowledge about software engineering and at least basic knowledge about software quality assurance.

Topic	An Overview of Context Modeling Approaches
Mentor	Christian Jung
E-Mail	Christian.jung@iese.fraunhofer.de
Short description	Context information is the basis for realizing adequate context-aware applications. There are several definitions of context and there are several approaches to model context information. The work should provide an overview of existing modeling approaches and evaluate them with respect to different criteria.
Link to papers	http://www.cs.umd.edu/class/spring2013/cmsc818b/files/context_modeling.pdf https://www.cs.umd.edu/class/spring2014/cmsc818g/files/dataorientedsurvey.pdf http://espace.library.uq.edu.au/view/UQ:10713/Pervasive2002_fi.pdf http://pace.itee.uq.edu.au/cw2004/Paper15.pdf
Bachelor/Master	Master (Bachelor could also be possible)
Supported Language	German or English.
Required knowledge	-

Topic	Activity Recognition with Cell Phones
Mentor	Christian Jung
E-Mail	Christian.jung@iese.fraunhofer.de
Short description	The research field of activity recognition is used to detect user activities and behavior by interpreting sensor data using different sensors. The work should elaborate on different possibilities of activity recognition and describe their characteristics as well as their limitations.
Link to papers	http://www.cis.fordham.edu/wisdm/includes/files/sensorKDD-2010.pdf http://sclab.yonsei.ac.kr/publications/Papers/IC/2011_IC05.pdf https://www.teco.kit.edu/~michael/publication/2011_COSDEO.pdf http://www.teco.edu/~michael/publication/Pervasive10Workshop.pdf
Bachelor/Master	Master (Bachelor could also be possible)
Supported Language	German or English.
Required knowledge	-

Hint	Topic is not available anymore
Topic	How does Agile Software Development fit to Best-Practice-Assessment models? Current State of the Art
Mentor	Philippe Diebold
E-Mail	Philipp.Diebold@iese.fraunhofer.de
Short description	Within this seminar, the existing literature regarding the combination of agile software development with different common best-practice-assessment models like CMMI, ISO15504-5 (SPICE), or adaptations of these models should be collected, aggregated and summarized. The initial references provided for this seminar already shows that such kind of mappings are on different levels of abstraction and the combination of such results is more than just a summarizing task. For this reason some knowledge in the area of software processes, especially with agile development as well as the different models, is necessary.
Link to papers	<ul style="list-style-type: none"> • R. Turner, A. Jain: Agile Meets CMMI: Culture Clash or Common Cause?; XP2002; pp 153-165 • M. Fritsche, P. Keil: Agile Methods and CMMI: Compatibility or Conflict?; e-Informatica SE Journal; 2007 • A. Marcal, B. de Freitas, F. Soares, A. Belchior: Mapping CMMI Project Management Process Areas to Scrum Practices; SEW2007; pp 13-22 • C. Bianco: Agile and SPICE Capability Levels; SPICE2011; pp 181-185 • T. Schweigert, D. Vohwinkel: TestSPICE and Agile Testing — Synergy or Confusion; SPICE2013; pp 154-164
Bachelor/Master	Both
Supported Language	German/English
Required knowledge	--

Topic	Safety in the context of Open Adaptive Systems
Mentor	Patrik Feth
E-Mail	patrik.feth@iese.fraunhofer.de
Short description	Open Adaptive Systems (OAS) change during their lifetime. Not all changes are foreseeable at development time. In the context of safety-critical systems the adaptations must not happen in an uncontrolled manner. The topic aims at analyzing state-of-the-art approaches to control the changes and guarantee safety in the context of OAS.
Link to papers	<ul style="list-style-type: none"> • J. Rushby: Runtime Certification • D. Schneider: Conditional Safety Certification for Open Adaptive Systems
Bachelor/Master	Master
Supported Language	German and English
Required knowledge	Preferred but not mandatory: <ul style="list-style-type: none"> • Foundations of embedded systems • Verification of reactive systems • Safety and reliability of embedded systems

Topic	Car-to-X Communication
Mentor	Felix Möhrle
E-Mail	moehrle@cs.uni-kl.de
Short description	Modern approaches for vehicular communication systems aim at sharing traffic information and safety warnings between cars (Car-to-Car) and between cars and infrastructure (Car-to-I). The current state of research, challenges and techniques are to be investigated.
Link to papers	Possible but not limited-to References: (*) Bilstrup, Katrin. "A survey regarding wireless communication standards intended for a high-speed vehicle environment." (2007): 45. http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A239214&dswid=-8588 (*) CAR 2 CAR Communication Consortium Manifesto https://www.car-2-car.org/index.php?id=31
Bachelor/Master	Both: Bachelor and Master
Supported Language	German and English
Required knowledge	-