

Topic	Run-Time Adaptation Architectures and Platforms
Mentor	Vasil Tenev
E-Mail	vasil.tenev@iese.fraunhofer.de
Short description	Variability of a system is traditionally managed during the development or the configuration time by following a standard PL approach. Modern self-adaptive systems require variation management at run-time. These systems are self-configurable product lines, where binding of components is driven by the environment and not the engineers. This seminar topic presents state-of-research patterns, approaches, and aspects of SPL – e.g. Dynamic Software Product Lines – in the context of self-adaptive (software) systems.
Link to papers	<ul style="list-style-type: none"> • N. Abbas, J. Andersson, M. U. Iftikhar and D. Weyns, "Rigorous Architectural Reasoning for Self-Adaptive Software Systems," 2016 Qualitative Reasoning about Software Architectures (QRASA), Venice, 2016, pp. 11-18. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7484101&isnumber=7484093 • Fatih Gey, Dimitri Van Landuyt, Stefan Walraven, Wouter Joosen: Feature Models at Run Time: Feature Middleware for Multi-tenant SaaS applications. MoDELS@Run.time 2014: 21-30 http://ceur-ws.org/Vol-1270/mrt14_submission_4.pdf • Aitor Murguzur, Rafael Capilla, Salvador Trujillo, Óscar Ortiz, and Roberto E. Lopez-Herrejon. 2014. Context variability modeling for runtime configuration of service-based dynamic software product lines. In Proceedings of the 18th International Software Product Line Conference: Companion Volume for Workshops, Demonstrations and Tools - Volume 2 (SPLC '14), Stefania Gnesi, Alessandro Fantechi, Maurice H. ter Beek, Goetz Botterweck, and Martin Becker (Eds.), Vol. 2. ACM, New York, NY, USA, 2-9. http://dx.doi.org/10.1145/2647908.2655957
Bachelor/Master	Master
Supported Language	German and English
Required knowledge	Master Course on Product Line Engineering
Required student	Nicolas Fußberger

Topic	Self-Adaptive Systems: Where, Why, How
Mentor	Vasil Tenev
E-Mail	vasil.tenev@iese.fraunhofer.de
Short description	Traditional mechanisms for error detection and recovery are typically wired into applications at the level of code, where they are hard to change, reuse, or analyze. An alternative approach is to use externalized adaptation. This work gives an overview on state of the art and the practice on self-adaptive systems. Motivation for self-adaptation and existing principles are explained based on examples.
Link to papers	<ul style="list-style-type: none"> • Stepan Shevtsov, M. Usman Iftikhar, and Danny Weyns. 2015. SimCA vs ActivFORMS: comparing control- and architecture-based adaptation on the TAS exemplar. In Proceedings of the 1st International Workshop on Control Theory for Software Engineering (CTSE 2015). ACM, New York, NY, USA, 1-8. http://dx.doi.org/10.1145/2804337.2804338 • Sebastian Wätzoldt and Holger Giese. 2015. Modeling Collaborations in Adaptive Systems of Systems. In Proceedings of the 2015 European Conference on Software Architecture Workshops (ECSAW '15). ACM, New York, NY, USA, , Article 3 , 8 pages. http://dx.doi.org/10.1145/2797433.2797436
Bachelor/Master	Both
Supported Language	German and English
Required knowledge	Grundlagen des Software Engineering; Formale Grundlagen der Programmierung
Required student	Patrick Pschorn

Topic	The role and use of documents in software projects
Mentor	Anne Hess
E-Mail	Anne.Hess@iese.fraunhofer.de
Short description	The topic investigates the usage and relevance of documentation during software development projects.
Link to papers	<p>Andrew Forward , Timothy C. Lethbridge, The relevance of software documentation, tools and technologies: a survey, Proceedings of the 2002 ACM symposium on Document engineering, November 08-09, 2002, McLean, Virginia, USA [doi>10.1145/585058.585065]</p> <p>Timothy C. Lethbridge, Janice Singer, and Andrew Forward. 2003. How Software Engineers Use Documentation: The State of the Practice. <i>IEEE Softw.</i> 20, 6 (November 2003), 35-39. DOI=http://dx.doi.org/10.1109/MS.2003.1241364</p>
Bachelor/Master	both
Supported Language	German, English
Required knowledge	Software Engineering (master or bachelor)

Topic	Validity threats in Empirical SE research
Mentor	Anne Hess
E-Mail	Anne.Hess@iese.fraunhofer.de
Short description	In judging the quality of a research study it is very important to consider threats to the validity of the study and the results. This topic investigates current views and discussions on validity threats in empirical software engineering studies
Link to papers	<p>J. Siegmund, N. Siegmund and S. Apel, "Views on Internal and External Validity in Empirical Software Engineering," 2015 IEEE/ACM 37th IEEE International Conference on Software Engineering, Florence, 2015, pp. 9-19. doi: 10.1109/ICSE.2015.24</p> <p>Amadeu Anderlin Neto and Tayana Conte. 2013. A conceptual model to address threats to validity in controlled experiments. In <i>Proceedings of the 17th International Conference on Evaluation and Assessment in Software Engineering (EASE '13)</i>. ACM, New York, NY, USA, 82-85. DOI=http://dx.doi.org/10.1145/2460999.2461011</p> <p>R. Feldt, and A. Magazinius, "Validity Threats in Empirical Software Engineering Research -- An Initial Survey", <i>Software Engineering and Knowledge Engineering</i>, pp. 374--379, 2010.</p>
Bachelor/Master	both
Supported Language	German, English
Required knowledge	Knowledge about empirical software engineering would be helpful (master or bachelor)

Topic	The impact of Smart Ecosystems on the Domain of Mobility
Mentor	Steffen Hess
E-Mail	steffen.hess@iese.fraunhofer.de
Short description	The topic addresses the impact of so called Smart Ecosystems to the domain of mobility. The impact should be shown with regard to emerging ecosystems in this domain and their corresponding software engineering challenges. Human interaction with those ecosystems should be explicitly part of this analysis as well as usability and user experience issues. It is required to show examples of Smart Mobility Ecosystems and a vision of possible future scenarios. Furthermore the impact of digitalization to the domain should be addressed.
Link to papers	http://www2.deloitte.com/content/dam/Deloitte/br/Documents/manufacturing/Future_of_mobility.pdf Holl, K., Müller, C., Liggesmeyer, P. & Ebert, A., (2016). Interaction with Mobile Systems as part of Smart Ecosystems. In: Weyers, B. & Dittmar, A. (Hrsg.), Mensch und Computer 2016 – Workshopband. Aachen: Gesellschaft für Informatik e.V.. http://www.iese.fraunhofer.de/en/innovation_trends/smart_ecosystems.html
Bachelor/Master	Both
Supported Language	German, English
Required knowledge	Software Engineering is beneficial Human-Computer Interaction is beneficial

Topic	The impact of Smart Ecosystems on the Domain of Health
Mentor	Steffen Hess
E-Mail	steffen.hess@iese.fraunhofer.de
Short description	The topic addresses the impact of so called Smart Ecosystems to the domain of health. The impact should be shown with regard to emerging ecosystems in this domain and their corresponding software engineering challenges. Human interaction with those ecosystems should be explicitly part of this analysis as well as usability and user experience issues. It is required to show examples of Smart Health Ecosystems and a vision of possible future scenarios. Furthermore the impact of digitalization to the domain should be addressed.
Link to papers	http://dl.acm.org/citation.cfm?id=2745388&CFID=844088189&CFTOKEN=80847280 http://dl.acm.org/citation.cfm?id=2555811&CFID=844088189&CFTOKEN=80847280 Holl, K., Müller, C., Liggesmeyer, P. & Ebert, A., (2016). Interaction with Mobile Systems as part of Smart Ecosystems. In: Weyers, B. & Dittmar, A. (Hrsg.), Mensch und Computer 2016 – Workshopband. Aachen: Gesellschaft für Informatik e.V.. http://www.iese.fraunhofer.de/en/innovation_trends/smart_ecosystems.html
Bachelor/Master	Both
Supported Language	German, English
Required knowledge	Software Engineering is beneficial Human-Computer Interaction is beneficial

Topic	The impact of Smart Ecosystems on the Domain of Living
Mentor	Steffen Hess
E-Mail	steffen.hess@iese.fraunhofer.de
Short description	The topic addresses the impact of so called Smart Ecosystems to the domain of living. The impact should be shown with regard to emerging ecosystems in this domain and their corresponding software engineering challenges. Human interaction with those ecosystems should be explicitly part of this analysis as well as usability and user experience issues. It is required to show examples of Smart Home Ecosystems and a vision of possible future scenarios. Furthermore the impact of digitalization to the domain should be addressed.
Link to papers	Holl, K., Müller, C., Liggesmeyer, P. & Ebert, A., (2016). Interaction with Mobile Systems as part of Smart Ecosystems. In: Weyers, B. & Dittmar, A. (Hrsg.), Mensch und Computer 2016 – Workshopband. Aachen: Gesellschaft für Informatik e.V.. http://www.iese.fraunhofer.de/en/innovation_trends/smart_ecosystems.html
Bachelor/Master	Both
Supported Language	German, English
Required knowledge	Software Engineering is beneficial Human-Computer Interaction is beneficial

Topic	The impact of Smart Ecosystems on the Domain of Work
Mentor	Steffen Hess
E-Mail	steffen.hess@iese.fraunhofer.de
Short description	The topic addresses the impact of so called Smart Ecosystems to the domain of work. The impact should be shown with regard to emerging ecosystems in this domain and their corresponding software engineering challenges. Human interaction with those ecosystems should be explicitly part of this analysis as well as usability and user experience issues. It is required to show examples of Smart Work Ecosystems and a vision of possible future scenarios. Furthermore the impact of digitalization to the domain should be addressed.
Link to papers	Holl, K., Müller, C., Liggesmeyer, P. & Ebert, A., (2016). Interaction with Mobile Systems as part of Smart Ecosystems. In: Weyers, B. & Dittmar, A. (Hrsg.), Mensch und Computer 2016 – Workshopband. Aachen: Gesellschaft für Informatik e.V.. http://www.iese.fraunhofer.de/en/innovation_trends/smart_ecosystems.html
Bachelor/Master	Both
Supported Language	German, English
Required knowledge	Software Engineering is beneficial Human-Computer Interaction is beneficial

Topic	How does TDD impact different process characteristics?
Mentor	Philipp Diebold
E-Mail	Philipp.diebold@iese.fraunhofer.de
Short description	The idea is to use the given literature (possible add further ones if you can find them), extract the data about which (process) characteristics are impacted by test-driven development (TDD), and aggregate these findings. All these aspects should finally be documented in the seminar paper.
Link to papers	<ul style="list-style-type: none"> • The Impact of Test-Driven Development on Software Development Productivity — An Empirical Study (Lech Madeyski, Lukas Szala) • Driving Software Quality: How Test-Driven Development Impacts Software Quality (Lisa Crispin) • Assessing test-driven development at IBM (E.M. Maximilien, L. Williams) • How Effective is Test-Driven Development? (Burak Turhan, Lucas Layman, Madeline Diep, Hakan Erdogmus, Forrest Shull)
Bachelor/Master	Both
Supported Language	At least English for reading the papers; best German for the communication with the mentor.
Required knowledge	None; Knowing of how to perform a systematic literature review or mapping study might be helpful.

Topic	How does Continuous Deployment impact different process characteristics?
Mentor	Philipp Diebold
E-Mail	Philipp.diebold@iese.fraunhofer.de
Short description	The idea is to use the given literature (possible add further ones if you can find them), extract the data about which (process) characteristics are impacted by test-driven development (TDD), and aggregate these findings. All these aspects should finally be documented in the seminar paper.
Link to papers	<ul style="list-style-type: none"> • Continuous deployment of software intensive products and services: A systematic mapping study (Rodrígueza, Haghghatkaha, Lwakatara, Teppolab, Suomalainenb, Eskelib, Karvonena, Kuvajaa, Vernerc, Oivoa) • Customer Involvement in Continuous Deployment: A Systematic Literature Review (Yaman, Sauvola, Riungu-Kalliosaari, Hokkanen, Kuvaja, Oivo, Männistö)
Bachelor/Master	Both
Supported Language	At least English for reading the papers; best German for the communication with the mentor.
Required knowledge	None; Knowing of how to perform a systematic literature review or mapping study might be helpful.

Topic	How does collective ownership impact different process characteristics?
Mentor	Anna Schmitt
E-Mail	Anna.Schmitt@iese.fraunhofer.de
Short description	The idea is to use the given literature (possible add further ones if you can find them), extract the data about which (process) characteristics are impacted by test-driven development (TDD), and aggregate these findings. All these aspects should finally be documented in the seminar paper.
Link to papers	<ul style="list-style-type: none"> • Role of collective ownership and coding standards in coordinating expertise in software project teams (Maruping, Zhang, Venkatesh) • Successful extreme programming: Fidelity to the methodology or good teamworking? (Wood, Michaelides, Thomson) • An Empirical Study Examining the Usage and Perceived Importance of XP Practices (Fruhling, Zhang) • Managing Code Ownership (Nordberg III)
Bachelor/Master	Both
Supported Language	At least English for reading the papers; best German for the communication with the mentor.
Required knowledge	None; Knowing of how to perform a systematic literature review or mapping study might be helpful.

Topic	How does an on-site customer impact different process characteristics?
Mentor	Anna Schmitt
E-Mail	Anna.Schmitt@iese.fraunhofer.de
Short description	The idea is to use the given literature (possible add further ones if you can find them), extract the data about which (process) characteristics are impacted by test-driven development (TDD), and aggregate these findings. All these aspects should finally be documented in the seminar paper.
Link to papers	<ul style="list-style-type: none"> • On-Site Customer in an XP Project: Empirical Results from a Case Study (Koskela, Abrahamsson) • The Effects of Individual XP Practices on Software Development Effort (Kuppuswami, Vivekanandan, Ramaswamy, Rodrigues) • Customer Involvement in Continuous Deployment: A Systematic Literature Review (Yaman, Sauvola, Riungu-Kalliosaari, Hokkanen, Kuvaja, Oivo, Männistö)
Bachelor/Master	Both
Supported Language	At least English for reading the papers; best German for the communication with the mentor.
Required knowledge	None; Knowing of how to perform a systematic literature review or mapping study might be helpful.

Topic	DevOps – What does the research community say?
Mentor	Frank Elberzhager, Taslim Arif
E-Mail	frank.elberzhager@iese.fraunhofer.de ; taslim.arif@iese.fraunhofer.de
Short description	Since 2009, DevOps becomes more and more important. However, the number of scientific publications is rather low compared to the interest in industry. The student should provide an overview of relevant papers based on an existing literature review, and provide a short gap analysis to today's body of existing papers.
Link to papers	F. Erich, C. Amrit, M. Daneva, Cooperation between software development and operations: A literature review, ESEM, 2014
Bachelor/Master	Both
Supported Language	German / English
Required knowledge	SE overview

Topic	What are the difference between code coverage of sequential software and concurrent software?
Mentor	Jasmin Jahić
E-Mail	jasmin.jahic@iese.fraunhofer.de
Short description	Manifestation of a bug in sequential software depends on the input data set. A bug in concurrent software is a result of an input data and specific interleavings between concurrent threads. Code coverage techniques used for sequential software must be adjusted to concurrent software. This seminar aims to answer two questions: <ul style="list-style-type: none"> - What are the difference between code coverage of sequential software and concurrent software? - Which challenges remain unsolved when it comes to the code coverage of concurrent software?
Link to papers	http://onlinelibrary.wiley.com/doi/10.1002/stvr.1539/full http://dl.acm.org/citation.cfm?id=2002964
Bachelor/Master	Master students.
Supported Language	English
Required knowledge	Knowledge of software testing and code coverage. Software development process.

Topic	Debugging concurrent and multicore software: state of the practice
Mentor	Jasmin Jahić
E-Mail	jasmin.jahic@iese.fraunhofer.de
Short description	<p>We are in the era of multicore processors and concurrent software. Debugging of concurrent software is a challenging task. Although the research community is very active in this field, integration of the scientific solutions into software development process is not straightforward. This survey aims at answering the questions:</p> <ul style="list-style-type: none"> - Why is the embedded, concurrent software debugging in practice a challenging task? - Which tools are commonly used in embedded, concurrent software development, and their comparison. - What are the main challenges in the integration of the concurrent software debugging into software development cycle?
Link to papers	http://link.springer.com/article/10.1007/s11219-015-9301-7 http://ieeexplore.ieee.org/document/6909202/
Bachelor/Master	Master students.
Supported Language	English
Required knowledge	Knowledge of C/C++. Software development process. Experience with Eclipse/Qt is helpful, but not necessary.

Topic	Data structures for non-locking synchronization of concurrent software
Mentor	Jasmin Jahić
E-Mail	jasmin.jahic@iese.fraunhofer.de
Short description	<p>Locks are predominant technique for synchronization of concurrent software. With the increase of the number of cores, developers are struggling with the proper use of locks. Improper use of locks often results in bugs such as deadlocks. Alternative to locks are non-locking, mainly data structure based, synchronization mechanisms. The aim of this seminar is to review available non-locking mechanisms and evaluate how suitable they are for the safety critical systems.</p>
Link to papers	http://dl.acm.org/citation.cfm?id=2483866 http://www.sciencedirect.com/science/article/pii/S0167739X15000977
Bachelor/Master	Master students.
Supported Language	English
Required knowledge	Operating systems, C/C++, multithreading.

Topic	How is model based testing for safety critical systems applied?
Mentor	Christian Wolschke
E-Mail	wolschke@cs.uni-kl.de
Short description	Model based testing is key for generating test cases automatically. Especially in the context of Cypher Physical Systems, it is needed to test the system of system so that guarantees like safety are still given. The student should investigate which kinds of testing approaches exist in this scenario.
Link to papers	http://ieeexplore.ieee.org/document/5954386/ http://ieeexplore.ieee.org/document/6405444/
Bachelor/Master	Bachelor and Master students
Supported Language	German, English
Required knowledge	Foundations of Software Engineering

Topic	Testing of self-adaptive software
Mentor	Christian Wolschke
E-Mail	wolschke@cs.uni-kl.de
Short description	Software that runs in different contexts should be able to adapt automatically in order to give the user the best possible result. Nevertheless, if the adaption is made in safety critical domain, it must be guaranteed, that the new system is safe again. The task of the student would be to give an overview of the existing testing approaches in the domain as well as the discussion of the advantages and disadvantages of the system.
Link to papers	http://ieeexplore.ieee.org/document/7306570/ http://ieeexplore.ieee.org/document/7306567/
Bachelor/Master	Bachelor and Master students
Supported Language	German, English
Required knowledge	Foundations of Software Engineering