

Ph.D. Position

Reuse: Mining and Evolving Variability in Software-Intensive Systems

[Institute of Software Systems Engineering](#)
[Johannes Kepler University, Linz, Austria](#)

The big picture:

With the advent of technologies, such as the internet of things, component-based development, or mobile computing, it is no longer economically feasible to develop software products as one-of-a-kind standalone systems. Instead, modern software must be designed to execute in multiple environments (hardware and software platforms) and different contexts (e.g., desktop or mobile), interact with other software products and can even be part of larger software ecosystems. These and other technological and economic trends are changing the way software is developed from a product-centric perspective to product portfolios of similar software products that are tailored to varying, customer-specific requirements. However, efficiently developing software product portfolios is not an easy endeavor. The most common scenario is when portfolios are reverse-engineered from a diverse pool of existing variants of software products that were created with ad hoc techniques. These techniques are collectively called Clone and Own (C&O), and commonly rely on manual, undisciplined, and generally undocumented development practices. Not surprisingly, even when dealing with a small number of variants, C&O approaches lead to maintenance problems like inefficient bug fixing, wrong feature updates, duplicated functionality, and redundant and inadequate testing. All these factors inevitably result in low-quality software with performance and functionality faults and limitations, and render software companies unable to cope with fast-evolving functionality requirements or technological advances.

The goal:

The main goal of this Ph.D. position is to develop an integrated framework capable of providing scalable, robust, flexible, extensible, and automated support for the effective management of software products portfolios. The work aims to provide a more formal and methodological footing to C&O practices such that their shortcomings are properly addressed. The proposed approach is supposed to be incremental and should have no hefty upfront investment in the production of the first consolidated portfolio compared to traditional product lines. This fact enables adopters to reap benefits early on and continuously. The framework envisioned will orchestrate and extend works from several important research areas in software engineering, e.g., automated software repair and search based software engineering that rely on novel algorithms inspired by nature to solve complex engineering problems. The proposed Ph.D. will also develop software tools, techniques, and work on case studies from academia and the local industry.

Required expertise:

- A Master's degree in computer science or a closely related discipline
- Strong programming skills (for example in Java, C++, or C#)
- Ability to work on own initiative and also as a part of a team
- English language proficiency, written and spoken

Application Instructions:

Applications should include a cover letter, CV, preferably also letters of reference, and a brief statement

describing the applicant's research motivation in relationship to this topic. Electronic submissions are required. Review of applications will begin immediately and continue until suitable candidates are appointed.

Contact:

- Prof. Dr. Alexander Egyed (alexander.egyed@jku.at)



About the Institution:

The JKU Institute for Software Systems Engineering is a 30+ people strong research institute that is ranked among the best in the world (e.g., recently Microsoft ranked JKU 16th in the world in software engineering). Research at the institute covers a wide area of software engineering from requirements to capture software, systems architecture, design and testing, to maintenance. Engineering is an inherently creative process that requires rigorous attention to details. However, engineering is also a collaborative, human centric process with adhoc activities. Engineering automations are few and rare – not just during programming but also during modeling, testing or maintenance.

About the Advisor:

Prof. Dr. Egyed received his Doctorate from the University of Southern California, USA and previously worked at Teknowledge Corporation, USA and the University College London, UK. He is most recognized for his work on software and systems design – particularly on variability, consistency, and traceability. Dr. Egyed has published over 200 refereed scientific books, journals, and conferences with over 6000 citations to date. He was recognized a Top 1% scholar in software engineering in Communications of the ACM, Springer Scientometrics, and Microsoft Academic Search. He was also named an IBM Research Faculty Fellow in recognition to his contributions to consistency checking.

Location: Linz, Austria

Website: <http://isse.jku.at/>