

The Software Engineering Department
Achi Racov Engineering School - Kinneret Academic College

The 7th Kinneret Conference on Software Engineering Education

- Presentation Abstracts -

February 12th, 2019



Welcome to the 7th Kinneret Conference on Software Engineering and IT Education!

We are glad to welcome you at our college, for the seventh time, for the annual Kinneret Conference on Software Engineering Education. The conference seems to attract dozens of people who believe, as we do, that the issue of proper academic education for software professionals should always be on the table and should be improved continuously. This cannot be accomplished without close cooperation between academia and industry, in order to ascertain that academic education should prepare the students to become the best software engineers for the Israeli industry. This is not an easy task – many companies still prefer to outsource their software development endeavors to foreign countries, mainly in the far east or in eastern Europe. Although this is mainly done due to financial considerations, there are sometimes claims that academic education in this field is not good enough. Therefore, our ultimate purpose is to make sure that our graduates are of the highest quality possible – which, at the end of the day, delivers high values.

We have recently recognized that there is an important link missing between the professional unions and academia. Organizations all over the world, such as IEEE, ACM, INCOSE, etc., play significant roles in the planning of academic curricula such that it would impact both the student's professional body of knowledge and industrial needs. With this approach in mind we have offered the Israeli Chamber of Information Technology partnership in this conference, and we appreciate their willingness to step forward and join our efforts.

We wish you an enjoyable and fruitful conference, and we look forward to seeing you again in the following conferences.



Prof. Amir Tomer,
Head,
Software Engineering Department



Prof. Avraham Shitzer
Dean,
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Morning Keynote Lecture

Search-Based Software Testing

Lionel Briand, University of Luxembourg

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Testing is the main mechanism used in industry to assess and improve the dependability of software systems. To be scalable to the increasingly complex systems that are being developed in many application domains, testing must be automated. However, in many contexts, such automation is challenging and various techniques from Artificial Intelligence, such as evolutionary computing and machine learning, have come to the rescue and have shown to alleviate problems that had been thought to be intractable. This technical field is referred to as search-based software testing since it reformulates testing challenges as search or optimization problems. This talk will cover recent examples of research projects, done in collaboration with industry, and targeting two distinct domains: (1) the security testing of Web applications and (2) the testing of cyber-physical systems. Lessons learned and future research directions will then be discussed.

Lionel Briand *Lionel C. Briand is professor in software verification and validation at the SnT centre for Security, Reliability, and Trust, University of Luxembourg, where he is also the vice-director of the centre. He is currently running multiple collaborative research projects with companies in the automotive, satellite, financial, and legal domains. Lionel was elevated to the grade of IEEE Fellow in 2010 and was granted the IEEE Computer Society Harlan Mills award in 2012.*

Morning Session 1

Career-oriented Education

Chair: Prof. Opher Etzion, Yezreel Valley Academic College

Gaps in the Academic Qualification in IT Infrastructures and their Impact on Distortions in this Domain's Employment-market

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The world of IT infrastructures is a technologically-complex world, which undergoes rapid and reality-changing upgrades. Infrastructure management requires a challenging integration of vast technological knowledge, in various domains, with high managerial capabilities and deep understanding of work processes. There is no academic program in Israel today, which qualify IT infrastructure people, and students who are interested in this domain have to study towards an academic degree, which is irrelevant to their career. On the other hand, those who managed to develop a career in this domain, but lack academic degree, are left with no solution. Moreover, and even worse than in the software field, The IDF, in its computer and communication units, provide a springboard to the infrastructure people who developed their profession during their military service. The result is, that those trying to get to this field, without having this military background, confront an unequal and unfair competition.

The talk will present the necessary background needed for IT infrastructure managers and the relevant courses. Various solutions will be proposed, such as dedicated tracks as part of the degree in IT or SE, dedicated diploma studies, and more.

***David Ben-Tolila** is the Vice-Chair of the Israel Chamber of Information Technology and the manager of the IT infrastructure excellence center. He holds a BA degree, with honors, in management and political science from the Open University, MA degrees (both magna cum laude) in diplomacy and security for senior officials and in political and public leadership for senior officials from Tel-Aviv University and is currently studying toward another MA in information systems management. David is the Chairman of the consulting company Energy Team, he is a MAMRAM (the IDF's software unit) veteran, Major (reserved), and he has 23 years of experience in IT infrastructures in large organizations – military, government, finance, industry, communication and healthcare.*

Industry partnership within an academic curriculum

Opher Etzion, Yezreel Valley Academic College

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The Information Systems B.Sc. program in the Yezreel Valley Academic College is aimed at increasing and accelerating the participation of population from the Israeli periphery within the Israeli high-tech industry. One of the means of achieving it is multi-dimensional partnership with people and organizations within the industry. The partnership is manifested in multiple ways:

1. Senior projects: Many of the projects are done in industry, in partnership with the organization itself. In some cases, the students got a job within the organization, or the organization took over the project.
2. Senior projects – entrepreneurial projects. Projects have been adopted by enterprises.
3. Senior projects – external referees. Each project is reviewed by a person from industry, and then the presentation is reviewed and graded by a panel. This leads to visibility and in some case to active involvement of the referees in students' assignments and continuation of projects.
4. Internship program – Students can participate in an internship program in various enterprises. Many of the internships continue to job offers.
5. Industrial people teach courses within the curriculum.
6. Advisory committee that advises the department about the curriculum, especially about soft skills that are required.

The talk will touch briefly all these topics and report on current initiative to establish educational software house.

Opher Etzion serves as Professor of IS, and Head of the Information Systems Department in Yezreel Valley Academic College. During the years 1997-2014 he served in various roles in IBM, most recent Senior Technical Staff Member and Chief Scientist of Event Processing. Prior to joining IBM in 1997, he has been a faculty member and Founding Head of the Information Systems Engineering program at the Technion, and held professional and managerial positions in Sapiens and in the Israel Air-Force.

Expanding software developers' knowledge and new technologies' learning possibilities using innovative On the Job Training

Shelly Nezri and Irit Pernat, Elbit Systems

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Software world is changing rapidly. Technologies are updating now and again, and software developers in organizations are finding it difficult to keep up to date and are barely exposed to new software trends. In the long run, this can affect the company's ability to grow and penetrate new markets and technologies. On the other hand, it affects developers' satisfaction and their perception of the company's technologically. Moreover, it affects the organization's ability to attract young and talented software developers, as the company is perceived as technologically outdated. In large organizations with silos, this problem became very common since the developers have no time or motivation to look for new technologies that are not part of their daily work, although they are probably used by other groups in the organization.

One of the tactics addressing this problem is by adopting Inner Source (the act of leveraging Open Source Software development practices within the confines of a corporate environment). Therefore, last year Elbit Systems launched an Inner Source program which is relied on three pillars: code sharing, learning paths and the Software Guild (an innovative gamification approach to increase engagement and encourage collaboration in the organization).

One of the mechanisms we use in our Inner Source program to encourage code sharing and learning new technologies is called Skill-POOL. This mechanism encourages developers to experiment with new technologies by real and meaningful on the job training, which is also valuable to the organization.

The lecture offers an overview of Elbit Systems' Inner Source program and the solutions for knowledge management and learning.

***Shelly Nezri** is a software engineer at Elbit Systems and the company's InnerSource community manager, where she promotes fun and gamification. Previously, Shelly was a software developer, architect, and manager. She holds a BSc in computer engineering from the Technion – Israel Institute of Technology. In her free time, she likes hanging out with friends, jogging, and raising three little tearaways*

***Irit Pernat** is a manager of Development Processes & Methodologies Group. Previously, Irit was a software developer, development processes and tools specialist and SEPG manager. She holds a BSc in chemical engineering from the BGU and software engineering certification from the Technion. At 2015 Irit started MA studies in the department of Information and Knowledge Management in University of Haifa and writes her thesis on “adopting an inner-source in an organization using gamification”.*

Applying Software Development Methodology Paradigms to an Analysis of the Engineering Job Market

Einat Hazbani, Deganit Armon, Afeka College of Engineering

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The Engineering Career Center at Afeka was established in 2003 with the goal of providing the students and graduates of Afeka with tools for managing their job search and career prospects. The center is responsible for career-management related course development, provides individual and group training for students and graduates, and is a point of reference and expertise in recruitment and hiring issues – from information sources and job description analysis, through hiring and follow-up with students and graduates. Students are exposed to the Engineering Career Center from their first year and use it as a resource throughout their studies and after graduation.

In order to continuously adjust the center to the needs of the college and the changing market, a graduate employment survey was undertaken in 2015. 1810 of around 3600 Afeka graduates were reached by email or phone over a four month period and answered a survey about their employment status and position.

When creating the questionnaire, one of the difficulties was defining the job categories. The Israeli Central Bureau of Statistic uses broad categories that were not sufficiently specific for our survey. Companies such as LinkedIn, a business and employment-oriented networking service, and job search sites such as AllJobs and Indeed.com have developed their own categories based on the realities of the market. However, the definitions are fluid, with new categories emerging as the market evolves. Specifically regarding engineers, the lines between companies that develop a product and companies that provide software services are blurry, and similar job categories encompass different roles.

It is possible to tie job categories to software development methodologies – the waterfall model and the agile development models. These models define a basis for organizational structures that tie technology, processes and people to positions and areas of responsibility. Historically, development based on the waterfall model creates clusters of positions that do not have much interaction with each other. As more companies began adopting agile methodologies, development has shifted from being product-focused to being customer-focused, and new jobs and new job categories emerged. Among other changes, some companies are eliminating middle management positions as development becomes more agile.

The job categories that were developed for our survey are based on the changing realities of job market practices. An understanding these shifting dynamics, along with other results from our graduate survey, such as which factors impact salaries, helps guide the operations of the Engineering Career Center as we accompany our students towards a career in their chosen fields.

Einat Hazbani is the founder and manager of the Afeka Engineering Career Center. She holds an MA in Labor Studies from Tel Aviv University.

Dr. Deganit Armon, Head of the School of Software Engineering at Afeka, received her PhD in Computer Science from Duke University in the area of dynamic data structures and algorithms. She has over 30 years of experience in both academia and industry, including ten years managing large software projects.

Morning Session 2

IT and SE Education Techniques

Chair: Prof. Tzvi Kuflik, Haifa University

Making Complex Software Systems Transparent: Educating Developers to Consider “Algorithmic Transparency”

Veronika Bogina, Alan Hartman, Tsvi Kuflik and Avital Shulner Tal

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The increasing complexity of computerized systems and especially the penetration of Artificial Intelligence into every aspect of information-based services, makes computerized systems less and less understandable. This opaqueness, together with the danger of inherent biases that are introduced (un) intentionally into these systems during development lead the ACM to issue the “Statement on Algorithmic Transparency and Accountability” where they note: “Computer algorithms are widely employed throughout our economy and society to make decisions that have far-reaching impacts, including their applications for education, access to credit, healthcare, and employment. The ubiquity of algorithms in our everyday lives is an important reason to focus on addressing challenges associated with the design and technical aspects of algorithms and preventing bias from the onset”. The ACM identified the following important aspects that comprise transparency and accountability:

1. **Awareness:** Owners, designers, builders, users, and other stakeholders of analytic systems should be aware of the possible biases involved in their design, implementation, and use and the potential harm that biases can cause to individuals and society.
2. **Access and redress:** Regulators should encourage the adoption of mechanisms that enable questioning and redress for individuals and groups that are adversely affected by algorithmically informed decisions.
3. **Accountability:** Institutions should be held responsible for decisions made by the algorithms that they use, even if it is not feasible to explain in detail how the algorithms produce their results.
4. **Explanation:** Systems and institutions that use algorithmic decision-making are encouraged to produce explanations regarding both the procedures followed by the algorithm and the specific decisions that are made. This is particularly important in public policy contexts.
5. **Data Provenance:** A description of the way in which the training data was collected should be maintained by the builders of the algorithms, accompanied by an exploration of the potential biases induced by the human or algorithmic data-gathering process. Public scrutiny of the data provides maximum opportunity for corrections. However, concerns over privacy, protecting trade secrets, or revelation of analytics that might allow malicious actors to game the system can justify restricting access to qualified and authorized individuals.
6. **Auditability:** Models, algorithms, data, and decisions should be recorded so that they can be audited in cases where harm is suspected.
7. **Validation and Testing:** Institutions should use rigorous methods to validate their models and document those methods and results. In particular, they should routinely perform tests to assess and determine whether the model generates discriminatory harm. Institutions are encouraged to make the results of such tests public.

While transparency is one of a long list of nonfunctional requirements to be addressed during systems development, there is little emphasis on training developers to address this aspect and it is open to interpretation. The growing complexity of systems and the integration of complex AI-based reasoning mechanisms increases the need to address transparency better. The immediate question that arises is how to train software developers, the key actors in the development of such systems. They should consider the above aspects (those that are not regulatory ones) during the software development process in order to make their systems more transparent and bias free to their end users.

At the University of Haifa, a graduate seminar about Algorithmic Transparency is integrated into the elective M.Sc. courses, aimed at increasing the awareness of experienced software developers of these aspects by combining frontal lectures (including visiting experts), presenting the state of research in this area with group learning focusing on specific areas of interest.

The proposed talk will present the course and its content and is intended to initiate brainstorming and discussion about algorithmic transparency and how it should be considered in Software Engineering education.

Veronika Bogina is a PhD student at the Information Systems Department, The University of Haifa, under the supervision of Prof. Tsvi Kuflik. Her research focuses on temporal aspects in user modeling and recommender systems. She has an industrial experience as a Software Engineer at IBM Haifa Labs.

Alan Hartman is a senior lecturer at the University of Haifa, Department of Information Systems and an adjunct professor at the Afeka Academic College of Engineering, Department of Service Engineering. Alan has a Ph.D. in mathematics from the University of Newcastle in Australia, an M.Sc. in mathematics from the Technion – Israel Institute of Technology, and a B.Sc. in mathematics from Monash University in Australia. After a post-doctoral fellowship at the University of Waterloo in Canada, Alan joined the IBM Haifa Research Lab in 1983. Since then, his industrial research focused on storage technologies, mathematical optimization, hardware and software verification, and model-based software, systems and services engineering. He has held visiting positions in the Mathematics Department at the University of Toronto, at Telstra Research Labs and the IBM Research Lab in Bangalore. He has published over 70 research papers and holds 17 patents.

Tsvi Kuflik is a professor of information systems, the former chair of the information systems department, the co-chair of the B.Sc. program in Digital Humanities at the University of Haifa and a member of the PhD. Selection committee for Digital Humanities at the University of Torino (Tech4Culture project). His main areas of research are Ubiquitous User Modeling and Intelligent User Interfaces. For the past 15 years, Tsvi has led a research group that focused on applying novel computing and communication technology for supporting museum visitors. As part of the research, a museum within the university was set up and now used as a “living lab” – a museum and an experimental site. Prior to that, Tsvi worked as a researcher at the scientific and technological research institution in Trento Italy, working on intelligent systems in cultural heritage. In recent years, Tsvi’s research expanded to cover various aspects of digital humanities in collaboration with colleagues from the University of Haifa and abroad. He is a distinguished ACM scientist and IEEE senior member.

***Avital Shulner Tal** is a M.Sc. student at the Information Systems Department, The University of Haifa, under the supervision of Prof. Tsvi Kuflik. She has a B.Sc. in Industrial Engineering with specialization in information systems from ORT Braude College of Engineering in Israel. Her research focuses on social networks analytics, sentiment analysis and machine learning.*

Crowdsourcing and Collective Intelligence as Smart Resource Gathering Tool for SE Course

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This paper presents a new concept of Crowdsourcing and Collective Intelligence (CI) as a tool for gathering and classification of educational resources for Software Engineering (SE) course. One of the definitions of crowdsourcing is: the practice of obtaining information or input into a task or project by enlisting the services of many people, either paid or unpaid, typically via the Internet. Collective Intelligence is shared or group intelligence, that emerges from the collaboration, collective efforts, and competition of many individuals and appears in consensus decision making. Thinking about CI means thinking about the IQ that's generated when a group of people come together to think and work. This group of people does not have to meet physically with each other or to know the identity or number of other existing members. Often, collective intelligence is much higher than general individual intelligence.

We believe that there is a difference between crowd and collective. Crowd is basically a group of people without any common background. Collective can be defined as a group of people that came together to do something. This people may have some common background or some common purpose or mission. In our study it was a group of students who came to study SE course and they had, more or less, the same background in CS and SE.

The problem

First let's identify the problem that we want to solve. In modern world a lot of users create and publish different type of content online. The amount of data uploaded to the Internet daily is huge. Current output of data is roughly 2.5 quintillion bytes a day. This continuously growing amount of user generated content presents a variety of challenges, one of them being how to analyze and categorize this content. The task becomes even more complicated when the analysis of video content is required (like YouTube movies). One of the solutions can be to use crowdsourcing and collective intelligence models for gathering and classification of those resources.

Our idea was to use students and their Collective Intelligence to gather, analyze and classify the data related to the SE course on Youtube. Our previous study, "Creativity via Games in SE course", presented at the 6th Kinneret conference and enetCollect COST action meeting, showed that the major learning resource used by students was YouTube with its tutorials (40% of the students used it), and the second best was - using websites (34%). Our study also showed that it can be difficult to find a relevant content on YouTube and those resources usually require additional classification. In our current study we created a system for gathering and classification of learning materials. Our users, the students, are procumers, both:

- content producers and
- content consumers.

At this stage the system only provides classification of the existing content (not a new content). The system is an Internet based system. Students play a role of "web collaborators", perform the task of providing the content and judgements (providing metadata properties for each learning entity) and the task of checking those judgements (validation of the metadata properties supplied by other students).

Basic system description

Each student enrolled to the SE course was asked to submit 5-6 links, as an educational resource (a YouTube tutorial) to our DB in a field of “GUI in C#”. After checking that it was a new educational resource the content provider, the student, had to supply some additional metadata. Some of the classification categories were: the subject of the educational resource, the language, the length of the resource (in min), is the resource: theoretical or practical, the quality of the resource (very useful, useful, partially not useful, not useful at all) and more.

Later each student changed its role to content consumer and was asked to validate 6 resources from our DB. Each student was given:

- 2 random items with their classification and he had to agree/disagree with the given classification
- 2 items of user’s choice selected from DB by consumer itself with their classification and he had to agree/disagree with the given classification
- 2 items without classification (hidden classification) and he had to re-classify the items by himself (according to the mentioned above list of categories). One item was a Random selection of the system and one item was user’s choice.

After getting at least 3 consumer opinions for each educational resource the system decided which resources were correctly classified according to some measuring algorithm and which were misclassified. Correctly identified resources became available for students of the SE course as a learning material created by the students. Misclassified items were taken aside for future investigation (not a topic of our current study).

Results

The results show that students dedicated a lot of time to this project. Students reported higher engagement in SE course and enjoyed this difficult project. Student also understood the importance of providing the correct data and metadata. Most of the items submitted to the system were classified correctly (80%). We managed to gather and classify more than 400 items (from 112 students participating in this study).

Dr. Rina Zviel-Girshin is the Head of Knowledge Engineering and Robotics Lab, Ruppin Academic Center. Fields of interest are AI applications and Smart Systems, Educational Software, Robotics, Internet of Things, STEM and CS education.

Full Stack Web Development: A Project-Based Learning Course Prepares Students for Industry 4.0

Hanan Kohen, Natali Levi and Dov Dori

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In 2016, we launched a graduate-undergraduate course titled *Full Stack Web Development* at in the Enterprise Systems Modeling Laboratory (ESML), Faculty of Industrial Engineering and Management, Technion, Israel Institute of Technology. The course aims to teach basics of Model-Based Systems Engineering (MBSE), system modeling, and developing complex Web applications to support requirements of the emerging Industry 4.0 wave. Initiated in Germany, Industry 4.0, the fourth industrial revolution, is closely related to the Internet of Things (IoT), Cyber Physical Systems (CPSs), information and communications technology (ICT), Enterprise Architecture (EA), and Enterprise Integration (EI) (Lu, Y. 2017). In Industry 4.0, enterprises and companies of all sizes are expected to work collaboratively using common standards to develop, produce and evolve ever more sophisticated products, services, and systems. These combine hardware and software that are increasingly intertwined and versatile, making the systems complex, in turn mandating that they be modeled and simulated in detail before they are built and fielded.

We review the various pedagogical aspects of the course and how the combination of novel pedagogical elements prepares students for the new era of Industry 4.0, the dawn of which we are now witnessing.

The course is taught in a Project-Based Learning (PBL) approach in a real-world-like agile software development environment, characteristic of a high-tech startup companies. PBL organizes learning around projects, fostering active, social, and self-learning techniques alongside design and creation of teamwork artifacts. Through active learning, teams work towards solving real-world problems (Dori & Silva, 2010). Skills emphasized by PBL include project management, systems thinking, effective communication, and collaborative work. These skills are sought after by prospective Industry 4.0 employers, so they are critical to students' success in the modern workforce and in studies for graduate degrees. Projects performed in PBL courses should be based on challenging research questions, so students can gain full experience of design, investigative activities, and decision making. They should give students the opportunity to work relatively autonomously over extended periods of time, culminating in realistic products or presentations (Jones, Rasmussen, & Moffitt, 1997; Thomas, 1999). Useful students' projects connect activities with underlying conceptual knowledge that the student is expected to gain (Barron, Schwartz, Vye, Moore, Petrosino, Zech, Bransford, & The Cognition and Technology Group at Vanderbilt, 1998, p. 274). While designing the *Full Stack Web Development* course, we wanted to integrate meaningful, complex, real-world problems into the PBL basis of the course. To this end, we selected as project topics real features from *OPCloud*, a Web-based framework we are developing, which implements Object-Process Methodology, OPM (Dori, 1995; 2016), ISO 19450:2015 International Standard. OPCloud is designed to model and simulate Industry 4.0 systems, so the projects assigned to the students relate to domains that include IoT, CPS, and ICT. For example, a team of students designed and implemented an interface between OPCloud and MATLAB to enhance OPM conceptual modeling

with computational capabilities. Another team developed an option for collaborative modeling in OPCLoud, a feature that one of the ESML industrial partners specifically asked to be developed.

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Hanan Kohen is a researcher and OPCLoud project manager at the Enterprise Systems modeling Laboratory at the Faculty of Industrial Engineering and Management, Technion, Israel Institute of Technology. He is also a history lecturer at Shaanan College of Education. Hanan has over 15 years' experience in the high-tech industry, and served as Scrum Master, Senior Expert and head development team at Amdocs Israel in various projects.

Natali Levi is a PhD candidate, advised by Prof. Dov Dori, at the Enterprise Systems modeling Laboratory at the Faculty of Industrial Engineering and Management, Technion, Israel Institute of Technology. She is Teaching Assistant of the graduate course "Full Stack Web Development". Natali worked as software engineer at Intel, and previously she served in the Israeli Airforce for 6 years as system and software engineer.

Dov Dori is Harry Lebensfeld Chair in Industrial Engineering and Head of the Enterprise System Modeling Laboratory at the Faculty of Industrial Engineering and Management, Technion. He is Fellow of IEEE – Institute of Electrical and Electronics Engineers, Fellow of INCOSE – International Council on Systems Engineering, and Fellow of IAPR – International Association for Pattern Recognition.

From Higher Education to Hire Education – The Challenges and Opportunities of Educating Gen-Z

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For most universities and colleges student recruitment is a major issue. In conjunction with the percentage of graduate completion and entrance into the workforce rates these issues are playing a key role in the development and teaching of an undergraduate degree program in SE. More and more prospective students are making decisions on where to study based on graduation rates and employability. The cohorts now entering our institutes are Gen-Z and with them comes the additional challenges of engaging students who are highly global, visual, technology and socially orientated. In this talk we will try to identify the key challenges that SE education is currently facing as well as the ones in the future with the advent of the Gen-Z student entering the gates of higher education. These encounters also offer various opportunities which can be exploited for the benefit of all the different stakeholders (students, parents, institutions, government and industry). Specifically, we will examine the key areas of knowledge in SE using SWEBOK V3¹ and more importantly the set of soft skills both technical and non-technical which will be needed.

***Meir Komar**, has been actively involved in Computer Science Education for close to 40 years at both secondary and tertiary levels. He is a senior lecturer at JCT - the Jerusalem College of Technology (Lev Academic Center) in the Computer Department. Amongst his previous positions; Chairman of the Science and Technology Teaching Department; Founder and Head of the Academic Quality Unit at the College. His current fields of interest are gender issues in engineering education and methodologies for improving academic instruction.*

¹ P. Bourque and R.E. Fairley, eds., GUIDE TO THE SOFTWARE ENGINEERING BODY OF KNOWLEDGE, VERSION 3.0, IEEE Computer Society, 2014; www.swebok.org.

Afternoon Keynote Lecture

Big Data Analytics Starts with a Research Question

Moti Sadovsky, Informatica and the Israeli Chamber of Information Technology

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Analytics is an essential component in an organization's capability to produce business values and to base its business decisions on good quality data in the Digital Transformation era. Analytics is the answer to the "organization's research question", such as forecasting, optimization, identifying links, text analysis, finding “Outliers” (exceptions), etc. Big data is the ability to collect huge amounts of data from various resources and of various types and formats, to manage this data's integrity, quality and integrative, and to enable to produce insights from it, sometimes in "near real-time".

The lecture will explain connection to other IT areas, such as IoT, Artificial Intelligence, and more.

A lot of examples will be given to the ability to produce analytic insights in various domains. The lecturer will share his experience about the main challenges in the IT projects he managed and will advise how to manage successful project in this domain.

***Motti Sadovsky** is a Data Expert who started his technical career at Mamram (IDF) as a programmer and then a system analyst. Afterwards he was employed in several IT companies like IAI, Digital Equipment, Sun Microsystems, Symantec and SAS Israel. where he worked in different roles such as Project Manager, Business Consulting and sales & Marketing manager. Currently, Motti manages the Informatica business in Israel and the Balkan countries. Motti's expertise is in data, and how to create business value from organizational data. He has a lot of experience in Bigdata analytical projects, and how to create changes in the Digital Transformation Era.*

Afternoon Session

Agile and other Soft Skills in IT and SE Education

Chair: Dr. Deganit Armon, Afeka College of Engineering

Two weeks in Five Minutes

Stand-up Meeting Based Evaluation of Student Teams

Eyal Eisenstein, Keren Kalif, Deganit Armon, Afeka College of Engineering

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The field of software engineering deals with complex systems that are created by large teams over an extended period of time. Meaningful, large scale software projects that involve a variety of technologies and development methodologies are difficult to fit into a single semester time frame. In order for software engineering students to be able to both adapt and learn software integration concepts idioms and techniques, Afeka offers a mandatory “Integrative Software Engineering” course in a Project Based Learning (PBL) format. This course is intended as the culmination and integration of four years of software engineering studies. The course evolved from an elective advanced programming class to an integrative course with a large team project. The course incorporates a variety of issues such as multiprocessing, utilizing reactive programming methodologies and techniques, software monitoring and control, applying architectural patterns, unit-testing, mocking and integration testing, integration with relational and NoSQL databases, web services, code refactoring, code review and integrating horizontal software aspects using AOP. Students who study this course learn advanced methodologies and techniques for integrative development of software systems relying on multiple components with varying levels of complexity.

Project implementation during the course could rely on several approaches. This year, we conducted this course using a top-down development approach through a bi-weekly development cycles of Scrum sprints.

By applying Test Driven Development (TDD) and Behavior Driven Development (BDD) methodologies to the course, the students were able to refine their project requirements and have each cycle focused on specific issues from by the course syllabus. Thus, using this inherent validation process, the students were able to better comprehend the academic and technological issues and apply them to their projects efficiently.

This methodology was intended to provide close monitoring of team progress, whereby at the end of each cycle the students reported their progress by applying industry standard agile stand-up meetings. The intent was to evaluate the progress of the teams throughout the semester. As anticipated, this enhanced the progress of the teams and enabled the students to fit the work to the designated time frame. As the semester progressed, it became apparent that the bi-weekly Scrums had other benefits. The team reports exposed significant issues of team dynamics, increased motivation across the teams, and provided an excellent platform for knowledge transfer among the all students in the class.

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Keren Kalif holds an MSc in Computer Science and an MA in Computer Science Education from the Technion. She is a senior teacher at the School of Software Engineering at Afeka has extensive teaching and industry experience.

Dr. Deganit Armon, Head of the School of Software Engineering at Afeka, received her PhD in Computer Science from Duke University in the area of dynamic data structures and algorithms. She has over 30 years of experience in both academia and industry, including ten years managing large software projects.

Social Hackathon as a High-Impact Educational Practice

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High-Impact practice (HIP) in the field of education is defined by five major characteristics: investing time and effort, initiating learning outside the classroom, deep interaction with other students and faculty staff, working with varied others and receiving and significant feedback (Kuh, 2008).

In the 2018 Spring Semester, a course named "Selected Problems in CS – Soft skills" was offered to undergraduate Computer Science (CS) and Software Engineering students studying at the Technion's Department of CS. The course was based largely on applied exercises and active learning. Students were asked to practice a set of soft skills introduced in class. In the first part of the course (Lessons 1-3), focus was placed on common soft skills such as teamwork, presentations, and giving and getting feedback. Then, an educational HIP took place in the form of a 9-hours social hackathon. In general, a hackathon is an event where computer programmers and others are involved in software development, collaborating intensively over a short and limited time to produce a working prototype of software projects (Briscoe, 2014). A soft-skills oriented social hackathon was designed by the course staff, in which the students were required to develop innovative technological products for people with disabilities, while practicing working with both Technion researchers and real customers from the third sector. At the end of the hackathon, the teams presented their final products, which were then ranked by nine external judges. This experience has enabled the students to practice a highly engaging simulation of real projects in the industry, leading to authentic emotional dynamics throughout the process, while practicing innovation, creativity and teamwork processes, in addition to many other soft skills. The last part of the course (Lessons 10-13) has wrapped-up the course by addressing several additional soft skills, continuously relating them to the hackathon experience. Academic training is well-established with respect to "Hard Skills". The course was developed in response to a call by the Israeli hi-tech industry to equip Technion CS graduates with soft skills, based on studies pointing out that employers rank soft skills as critical for productive performance in nowadays workplaces (Robles, 2012), and with findings indicating soft skills as important cognitive capabilities (John, 2009). In this talk we will share our experience of running a Social Hackathon as the course staff, and suggest it as HIP which accelerates the acquisition of a variety of fundamental soft skills.

Avivit Dolev is a licensed Educational psychology expert. She is a counselor at the Technion's Beatrice Weston Unit for the Advancement of students. Her military profession (1993-2000) is a Computer Analyst and a programmer. She was the first woman from the computer array who was awarded the 'Excellent Officer' prize granted by the Commander in Chief of the Israel Defense

Forces (IDF). Currently, Avivit is a graduate student at the Technion's Faculty of Education in Science and Technology. Her research interests are in higher education environments.

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Briscoe, G. (2014). Digital innovation: The hackathon phenomenon.

John, J. (2009). Study on the nature of impact of soft skills training programmer on the soft skills development of management students. Pacific Business Review, October/December, 19-27.

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Teaching Agile the Agile Way

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Agile Software Development is an approach to software development based on the values and principles expressed in the Agile Manifesto. For the past few years, we have offered an elective course in agile software development methodologies to third and fourth year students at Afeka. The course was usually taught by an adjunct instructor working in industry and experienced in agile development. Typically, the course involved guest lectures offering other perspectives on the methodologies, and a team project.

Last year, due to a scheduling conflict, the course was left without an instructor two weeks before the start of the semester. Rather than canceling the course, the two authors agreed to co-teach the class. In developing the class, we used agile methodologies and tools, essentially applying the course material to the class preparation process. We created user stories (e.g. “As a team of lecturers, we would like deliver a lecture each week of the semester and cover all the topics in the planned schedule”) and acceptance criteria (“All lectures prepared and delivered”), created a backlog of tasks (list of lectures) and tracked task status (reality check: 11/12 topics covered). Other stories involved creating course assignments and grading criteria. We met weekly for short planning meetings. Having two instructors with no differentiated tasks allowed us to split the work between us and devote more time to student feedback as they worked on their agile projects. At the end of the course each team, including the team of instructors, presented a project retrospective and lessons learned.

The course was successful and is currently offered again in the same format. We present our insights from the process and its outcomes.

***Dr. Leah Goldin** is a senior lecturer at the School of Software Engineering at Afeka. She received her PhD in Computer Science from the Technion in the area of Requirements Engineering. Dr. Goldin divides her time between teaching in academia and consulting high-tech companies, specializing in requirements engineering, system engineering, software engineering, development process improvement and quality.*

***Dr. Deganit Armon**, Head of the School of Software Engineering at Afeka, received her PhD in Computer Science from Duke University in the area of dynamic data structures and algorithms. She has over 30 years of experience in both academia and industry, including ten years managing large software projects.*

The 7th Kinneret Conference on Software Engineering Education

Conference Program

09:00 - 09:30

Registration

09:30 - 09:45

Opening and Greetings - room 812

Prof. Amir Tomer, Head of SE Department

Conference Organizer

Prof. Shimon Gepstein, President, Kinneret Academic College

Eli Frank, CEO FrankIt, Business and IT Strategy

Chairperson, The Israeli Chamber of IT

Prof. Avraham Shitzer, Dean, School of Engineering

09:45 - 10:45

Morning Guest Keynote

Search-based Software Testing

Prof. Lionel Briand, University of Luxembourg

10:45 - 11:00

Coffee

Morning Session 1: Career-oriented

Education - room 812

Chair: Opher Etzion, Yezreel Valley Academic College

Morning Session 2: IT and SE Education

Techniques - room 811

Chair: Tzvi Kuflik, Haifa University

11:00 - 11:30

Gaps in the Academic Qualification in IT Infrastructures and their Impact on Distortions in this Domain's Employment-market

David Ben-Tolila, Energy Team

Making Complex Software Systems Transparent: Educating Developers to Consider Algorithmic "Transparency"

Veronika Bogina, University of Haifa

11:30 - 12:00

Industry partnership within an academic curriculum

Opher Etzion, Yezreel Valley Academic College

Crowdsourcing and Collective Intelligence as Smart Resource Gathering Tool for SE Course

Zviel-Girshin, Rina, Ruppim Academic Center

12:00 - 12:30

Expanding software developers' knowledge and new technologies' learning possibilities using innovative On the Job Training

Shelly Nezri and Irit Pernat, Elbit Systems

Full Stack Web Development: A Project-Based Learning Course Prepares Students for Industry 4.0

Hanan Kohen, Natali Levi and Dov Dori, Technion

12:30 - 13:00

Applying Software Development Methodology Paradigms to an Analysis of the Engineering Job Market

Einat Hazbani and Deganit Armon, Afeka College of Engineering

From Higher Education to Hire Education - The Challenges and Opportunities of Educating Gen-Z

Meir Komar, Lev Academic Centre

13:00 - 13:45

Lunch

13:45 - 14:45

Afternoon Guest Keynote - room 812

Big Data Analytics Starts with a Research Question

Moti Sadovsky, The Israeli Chamber of IT

14:45 - 15:00

Coffee

Afternoon Session: Agile and other Soft Skills in IT and SE Education - room 812

Chair: Deganit Armon, Afeka College of Engineering

15:00 - 15:30

Two weeks in Five Minutes - Stand-up Meeting Based Evaluation of Student Teams

Eyal Eisenstein, Keren Kalif and Deganit Armon, Afeka College of Engineering

15:30 - 16:00

Social Hackathon as a High-Impact Educational Practice

Avivit Dolev, Orit Hazzan, Rotem Bennet, Gadi Har-shai and Ruti Donag, Technion

16:00 - 16:30

Teaching Agile the Agile Way

Leah Goldin and Deganit Armon, Afeka College of Engineering

16:30

Closing