

Report from Slovak University of Technology in Bratislava

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In the year 2011, Slovak University of Technology in Bratislava awarded 159 Master's degrees in fields within Information Sciences and Technologies, studying at its Faculty of Informatics and Information Technologies. The Faculty offers 3 study programmes. In Computer and Communication Systems and Networks, there were 52 graduates, in Information Systems 43 graduates, and in Software Engineering 64 graduates.

The Faculty evaluates the cohort of its graduates each year, taking into account their study results but most importantly the quality of their theses. According to their overall study results, the top 1-2% receives Summa Cum Laude, the next 3% receives Magna Cum Laude and the next 6% receives Cum Laude (limits are approximate). Based on their thesis reviews, presentation and defence, approximately 5% receives Award for Excellent Thesis. The Faculty aims at distinguishing itself by a strong research dimension. This is reflected also in Master's theses, which are expected to make contributions to some research problem related to the field of study of the particular student.

In 2011, 5 graduates received Magna Cum Laude and 4 graduates received Cum Laude. In the following there are listed abstracts of theses that were evaluated as the 7 top ones (roughly 5%) from all the theses (159) submitted in 2011. Also, there are listed titles of other 12 theses that received Honourable Mention.

Dean's Award for Excellent Master Thesis

Student: Martin Labaj

Degree program: Software Engineering

Thesis title: Recommendation and Collaboration Based on Implicit Feedback

Supervisor: prof. Mária Bieliková

Annotation: In the field of e-learning considering the open web, the identification of difficult and/or interesting parts of learning text can be useful feature for tasks like rewriting, showing where to focus or providing help to students adaptively. Methods which extract this information by directly interacting with a user for example by asking him to rate document fragments can lead to distraction while reading (specifically in learning domain) and require that users answer truthfully. In this work, we focus on implicit interest indicators, most importantly document scrolling and user's gaze. With these, we proposed a method for identification of interesting fragments of document and tracking fragments of the content presented by a web application. We proposed several scenarios for use our method and evaluated some of them in the experiment which involved 34 bachelor students of our faculty. Main contribution of this work is in the utilization of users' gaze in the web environment, in common settings and with only commodity hardware.

Student: Andrej Hopko

Degree program: Information Systems

Thesis title: Classification of DNA Functional Regions Using Binary Tensor Decomposition

Supervisor: Jakub Mažgut

Annotation: Knowledge discovery is favorite and trendy approach for valuable knowledge retrieval, useful in science and commerce as well. Understanding of gene location in the genome and functional region construction of a gene represents such desired knowledge. Mining in DNA sequence data is one among many approaches to pursue these objectives. Goal of this project is an analysis of decomposition techniques for binary tensors with consideration of DNA region classification domain. We proposed an innovative decomposition technique using an idea of approach considering both content and discrimination characteristics of binary tensors. We offer detailed design, derivation and implementation of such decomposition technique with algorithms supporting its experimental evaluation. We have experimentally verified data reduction properties of proposed decomposition technique on the generated data and real DNA data as well. Our knowledge discovery model thus showed its capabilities of supervised dimensionality reduction. We demonstrated an improvement towards the model we had started from. We think, that in age of demand for more and more multilinear data processing this model has much to offer.

Student: Dominik Macko

Degree program: Computer and Communication Systems and Networks

Thesis title: VHDL Digital Systems Model Visualization

Supervisor: Katarína Jelemenská, PhD.

Annotation: This project is focused on the problem of visualization of digital systems VHDL models and the display possibilities, which existing design systems and visualizers can offer. We analyze existing visualizers, among them the visualizers developed in previous diploma projects at the Faculty. The project deals with the problem of VHDL model simulation and visualization of this simulation. The simulation visualization possibilities of the existing digital systems VHDL models simulators are analyzed. From the analysis of visualization problem, we show different possibilities of visualization environment design procedure. In the design, it is necessary to choose properly a VHDL description parser, a transient representation and a way of the simulation visualization of digital system VHDL model. The design and implementation of the extension to existing application VHDL Visualizer v5.0 is proposed. This extension is about the simulation and the visualization of this simulation. Our visualization environment is also able to use some free external tools for functionality addition. Because of that this visualizer also becomes the strong verification tool.

Slovak Academy of Sciences Award for Excellent Master Thesis

Student: Karol Rástočný

Degree program: Software Engineering

Thesis title: Semantic Web Navigation Based on Adaptive Views

Supervisor: Michal Tvarožek, PhD.

Annotation: The difficulty of finding relevant information in the Web is increasing as web repositories grow in size. We proposed a novel approach for navigation in the Semantic Web, which helps users find relevant information and enables them to browse similar and/or related resources. We achieve this via view-based search within the Semantic Web using navigation in a two-dimensional graph, which has the advantage of visualizing dependencies between results. Typical tools for Semantic Web browsing that employ graph-based approaches has problems with readability and understandability. We address these problems via adaptive views, result clustering, facet marking, next action recommendation and zoom-based navigation. We realized a prototype of the proposed navigation approach in the Semantic Web by implementing it as a plug-in for the faceted browser Factic. We next evaluated our approach via several experiments with real-world users.

Student: Marián Hönsch

Degree program: Software Engineering

Thesis title: Virtual Community Detection in Vast Information Spaces

Supervisor: Michal Barla, PhD.

Annotation: This thesis describes our work on identifying communities of individuals based on their interests while browsing the web. A user can belong to several communities at a time, where each community represents parts of his interests. We assume that recommendations coming from such communities are more accurate than from communities based on a whole user profile. We describe how to record and identify particular interests for each user. Interests evolve from analysis of the resources that the user has viewed in the past and are defined as cluster of keywords. To evaluate our approach we built articles recommender for a news portal. As recommender systems are tailored to the specific domain, we also adapted our approach slightly to better fit the news portal domain, which is highly dynamic and with frequent changes.

Student: Peter Havrila

Degree program: Computer and Communication Systems and Networks

Thesis title: Management Tools of MPLS Networks

Supervisor: Margaréta Kotočová, Associate Professor

Annotation: This work deals with management of networks based on TCP/IP protocol stack in service provider environment. Systematic approaches aimed to network management on FCAPS model are presented with focus on change management in TCP/IP networks. This work presents a conception of network management systems and usage of network management protocols with focus on SNMP protocol. We describe service provider technologies with emphasis on BGP protocol, Multiprotocol Label Switching (MPLS), MPLS Virtual Private Services (VPN) and MPLS Traffic Engineering (MPLS TE). We focus on Quality of Service principles and Traffic Engineering principles and needs for a typical service provider. We specify the requirements for SNMP based visualization tool HelloRouteSP that has an ambition to provide value added information regarding MPLS network. Based on provided specification a proof of concept application called HelloRouteSP was implemented that allowed access to logical topology visualization of TCP/IP networks and as an addition also visualize routing paths along MPLS core technology spectrum.

Student: Matej Krchniak

Degree program: Software Engineering

Thesis title: Genetic Programming on Graphics Processing Unit

Supervisor: Peter Trebatický, PhD.

Annotation: Performance of central processing units is constantly increasing, but in the field of artificial intelligence it is not enough. In the effort of increasing effectiveness of calculation we may consider moving part of the computation on the graphics processing units, which now may have more than hundreds of processors. This work describes the basics of parallel computation on graphics processing units. Terminology described in this work form the basis of parallel computation on graphics processing units in CUDA and OpenCL. We use genetic algorithm to solve specific problem on central processing unit and graphics processing units. We evaluate effectiveness of executing on graphics processing units instead of central processing units. These evaluations provide information about which representation of genetic program is better suited for execution on graphics processing units.

Dean's Honourable Mention for Master Thesis

Burda, Filip: *Optimisation of IP/MPLS Network*. Supervisor: M. Kotočová

Fogelton, Andrej: *Hand Tracking*. Supervisor: M. Makula

Chalupa, David: *An Evolutionary Algorithm for Class Optimization*. Supervisor: J. Pospíchal

Jačala, Martin: *Relationship Discovery in Unstructured Text Using Semantic Analysis*. Supervisor: J. Tvarožek

Kuric, Eduard: *Automatic Photo Annotation Based on Visual Content Analysis*. Supervisor: M. Bieliková

Malečka, Peter: *Linux Based Communication Server on TI DaVinci Platform*. Supervisor: B. Dado

Murányi, Ján: *Interconnecting of IP Multimedia subsystem (IMS) domains*. Supervisor: T. Kováčik

Nemeček, Juraj: *SIP Single Port*. Supervisor: I. Kotuliak

Paulovič, Andrej: *Social Behaviour of Honey Bees as Inspiration for Data Mining*. Supervisor: P. Návrat

Siebert, Miroslav: *Editor, Animator and Verifier of Petri Nets*. Supervisor: M. Kolesár

Švoňava, Daniel: *Efficient Representation of Graphs*. Supervisor: P. Trebatický

Ukrop, Jakub: *Presentation of Embedded Graph Data*. Supervisor: P. Kapec