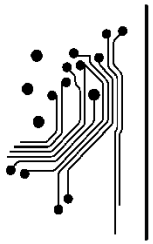

Computer & Informatics Engineering Department

Technological Educational Institute of Western Greece

MSc Program: "Technologies and Infrastructures for Broadband Applications and Services"

MSc Thesis (4th Cycle – D' Semester - Academic year 2016 - 2017)

Title	Supervisor
1. Evaluation of DVFS governors in Android Smartphones	N. Voros, G. Keramidas
2. Accelerating Graphical User Interfaces using Hardware Level Techniques	N. Voros, G. Keramidas
3. Evaluation of Cache level Techniques for Worst-Case Execution Time (WCET) Analysis	N. Voros, G. Keramidas
4. Hardware Implementation of Bluetooth Security	P. Kitsos
5. Efficient modulation and multiplexing techniques, signal coding and interference cancellation in 5G cellular networks	M. Paraskevas
6. Usability evaluation of different designs in Facebook Page Engagement	S. Sirmakessis
7. Distributed algorithms for overlay formation in p2p live video streaming systems	V. Tampakas, M. Efthymiopoulou
8. Mathematical Modelling and Analysis of Computer Networking with Applications in Wireless Communications	J. Kougias, L.Seremeti
9. Performance analysis of JQuery/Javascript code in Smartphones	S. Christodoulou
10. Comparative study of planning and scheduling algorithms for cloud computing infrastructures with stochastic performance characteristics	P. Alefragkis
11. Αυτοματοποιημένη επιλογή παραμέτρων και αλγορίθμων επίλυσης προβλημάτων βελτιστοποίησης με τεχνικές μηχανικής μάθησης	P. Alefragkis

Title: Evaluation of DVFS governors in Android Smartphones

Supervisors:	N. Voros G. Keramidas	**e-mail:** gkeramidas@teiwest.gr voros@teiwest.gr

Domain: Embedded Systems

Educational Targets:

- To study and analyze the architecture of the latest ARM processors (processors in current smartphones).
- To study and understand the basics features that shape the performance and power consumption of ARM processors.
- To study and understand the basic concepts and functionality of an Android operating system.
- To study and understand the impact of DVFS in Android-based ARM processors.

Short Description:

Dynamic Voltage-Frequency Scaling (DVFS) is the most convenient and commonly used knob for controlling power at the processor level. Using DVFS, performance can be increased by using a higher supply voltage or frequency for hardware components (e.g. processors or memory) and power consumption can be reduced by decreasing the voltage or frequency – often at the cost of longer application runtime. The purpose of this master thesis is to evaluate and analyze different DVFS policies (called governors) in an Android based smartphone. The target smartphone contains 4-core ARM A15 processors operating in shared memory architecture. A list of the latest Android Governors can be found here:

http://forum.xda-developers.com/nexus-4/general/guide-android-governors-explained-t2017715

Note that the framework for measuring power in smartphones (as well as for controlling an Android smartphone) has been built in two other master theses that are in the final phase.

Thesis contains:

[X] System's design and development

[] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[] Theoretical study and algorithms' development or analysis

Related courses and prerequisites:

- Embedded Systems – Processor Design
- C/C++ Programming Languages

Title: Accelerating Graphical User Interfaces using Hardware Level Techniques

Supervisors: N. Voros, G. Keramidas

e-mail: gkeramidas@teiwest.gr, voros@teiwest.gr

Domain: Embedded Systems

Educational Targets:

- To study and understand hardware level acceleration mechanisms for computationally intensive applications.
- To study and understand the concepts of SoC (System-on-Chip) design using the Zynq-based FPGAs of Xilinx.
- To build a framework for accelerating GUIs for MCU based systems (systems with limited resources).

Short Description:

The purpose of this thesis is to develop a methodology for accelerating GUIs (graphical user interfaces) in Zynq-based FPGAs. The target is to build a profiling tool that will provide hints for GUIs acceleration in an energy-efficient manner. To further reduce the power Quality-of-Service (QoS) vs power consumption trade-offs will be explored. The end result will be to control the low-level operations of a SoC (System-on-Chip) consisting by an MCU and hardware accelerator using the tool in an input independent way by performing partial runs and code improvement techniques.

Thesis contains:

[X] System's design and development

[] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[] Theoretical study and algorithms' development or analysis

Related courses and prerequisites:

- Embedded Systems – Hardware Design
- Verilog or VHDL, C/C++ Programming Languages

Title: Evaluation of Cache level Techniques for Worst-Case Execution Time (WCET) Analysis

Supervisors: N. Voros, G. Keramidas

e-mail: gkeramidas@teiwest.gr

voros@teiwest.gr

Domain: Embedded Systems

Educational Targets:

- To study and understand the memory architecture of the latest embedded processors.
- To study and understand the concepts of WCET analysis and real-time systems.
- To study and understand the impact of memory system in WCET.
- To perform Architectural level simulations with state-of-art multicore simulators.

Short Description:

Nowadays, the presence of cache hierarchies tends to be a common trend in processor architectures, even in hardware for real-time embedded systems. Caches are used to fill the gap between the processor and the main memory, reducing access times based on spatial and temporal locality properties of tasks. Cache hierarchies are going even further however at the price of increased complexity. The purpose of this thesis is to develop a method for analyzing the impact of cache memories in systems indented to operate in a real-time fashion. Existing techniques will be evaluated and improved (using scratchpads in addition to caches) in order to allow tighter estimates of the worst case execution time. The analysis will be performed using the gem5 architectural simulator:

http://gem5.org/Main_Page

Thesis contains:

[X] System's design and development

[] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[] Theoretical study and algorithms' development or analysis

Related courses and prerequisites:

- Embedded Systems – Processor Design
- C/C++ Programming Languages

Title: Hardware Implementation of Bluetooth Security		
Supervisor:	P. Kitsos	**e-mail: pkitsos@teimes.gr**
Domain:	Hardware – Security	**Num of students: 1**

Educational Targets:

- Deep knowledge of VHDL programming
- Deep knowledge of hardware architecture design
- Design secure FPGA ICs
- Deep experience in IC design

Short Description: The major scope of this master thesis is the hardware implementation of a major part (keys generations) for the Bluetooth v5 security. So, initially an architecture of the keys generation will be designed and then a FPGA implementation will be given. For the experiments the BASYS 3 FPGA board will be provided.

For the FPGA experiments some of the typical metrics such as clock frequency, hardware researches, power dissipation etc will be used.

Thesis contains:

[X] System's design and development

[…] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[…] Theoretical study and algorithms' development or analysis

Related courses and prerequisites: The M.Sc. courses, Principles of Security Systems, DSP and Hardware Design, Embedded System Design

Title: Efficient modulation and multiplexing techniques, signal coding and interference cancellation in 5G cellular networks

Supervisor: Michael Paraskevas **e-mail:** mparask@teiwest.gr

Domain: Digital Communications

Educational Targets:

- Theoretical study of modern digital modulation and multiplexing techniques used in 4G and 5G mobile networks
- Theoretical study of inter-symbol and inter-carrier interference cancellation techniques
- Simulation of some of above techniques, such as OFDM, SEFDM, f-OFDM, GFDM, etc.
- Comparative study between OFDM and f-OFDM
- Update Wikipedia for terms related to the subject of the thesis

Short Description:

The purpose of this thesis is the study and simulation of modern modulation and multiplexing techniques that used in modern mobile networks 5th generation (5G). Also, it will be studied modern techniques of inter-symbol and inter-channel interference cancellation. The simulations will be implemented in Matlab or AWRDE environment.

Thesis contains:

[ ] System's design and development

[X] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[X] Theoretical study and algorithms' development or analysis

Related courses and prerequisites:

- Digital Communication Systems
- Information Theory
- Digital Signal Processing

Title: Usability evaluation of different designs in Facebook Page Engangement

Supervisor: Spiros Sirmakessis | **e-mail:** syrma@teiwest.gr

Domain: User Experience, usability evaluation

Educational Targets:

- Define usability aspects in social media
- Apply design guidelines to systems
- Connect aesthetics, to usability and social engagement

Short Description:

Social networks (SN) have a mediating effect between individuals and society in the virtual world. As such, they represent a natural technological platform for marketing, providing access to a large number of users. Companies, across all industries are starting to understand the possibilities of social media (SM) marketing. They have evolved their approach to their customers, offering contact or assistance on a personal level at any time through social network sites such as Facebook, Twitter, etc.

However, how these platforms are being used, what their potentials are and how consumers interact, remains largely unknown and has yet to be addressed from different perspectives. Availability of the user generated content of SM platforms is encouraging companies to fully engage with their customers in order to enhance and enrich SM users' experiences.

However, the usage of the SM platforms differs from the more traditional forms of companies' web presence resulting in challenges of applying the traditional usability guidelines and methods to this new communication channel. Classic usability testing methods, involving few participants using a prototype, are limited when applied to SM. To contribute in this direction we will try to answer the question: How to perform usability testing on a Facebook brand page?

Thesis contains:

[ ] System's design and development

[X] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[ ] Theoretical study and algorithms' development or analysis

Related courses and prerequisites:

- Technological Entrepreneurship

Title: Distributed algorithms for overlay formation in p2p live video streaming systems

Supervisor: V. Tampakas, M. Efthymiopoulou

e-mail: tampakas@teiwest.gr, mefthymiop@ece.upatras.gr

Domain: Distributed Systems

Educational Targets:

- Deep knowledge of theoretical distributed algorithms background focusing on distributed information dissemination, distributed routing and distributed graph algorithms
- Deep experience in design and implementation of innovative distributed algorithms for distributed video streaming systems

Short Description: In this master thesis will be studied distributed algorithms that could be exploited in the p2p overlay formation of a p2p live video streaming system. In p2p live video streaming applications, in order to allow users to exchange video blocks, each user maintains network connections with a small subset of other participating users. The sets of these connections change dynamically and form a dynamic graph called the P2P overlay. The major objective towards the p2p overlay formation is the full exploitation of participating users bandwidth resources despite users' and network's dynamic behavior. This should be achieved in a scalable and dynamic fashion in order the system to be able to ensure the on time video delivery to every participating user. Towards this scope, distributed algorithms seem a promising solution.

Thesis contains:

[X] System's design and development

[X] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[X] Theoretical study and algorithms' development or analysis

Related courses and prerequisite

Distributed Software Technologies

Title: "Mathematical Modelling and Analysis of Computer Networking with Applications in Wireless Communications"

Supervisor:	I. Kougias, L. Seremeti	**e-mail: kougias@teimes.gr**
Domain:	Computer Networks	

Educational Targets:

- Deep knowledge of modelling and designing computer networks
- Survey on the mathematical background, theory and analysis
- Record and explore the latest developments on the subject
- Design and/or explore related systems and networks

Short Description: Networking systems, with the Internet being the best-known and mostly used today, are becoming versatile and multifunctional, as well as complex and indispensable, not only for scientist but for everyone and, thus, the mathematical techniques of analyzing, modelling and designing broad, complex computer networks and protocols are of great importance.

The study and resolution of networking problems arising in this field is done by proposing their mathematical models, with the objective being that of examining the correspondence between these concepts. In designing a new computer architecture and network protocol, it is crucial to be able to quantify the performance impacts of the various choices of the design and also be aware of the analytic performance modelling and the appropriate mathematical tools.

The main purpose of this dissertation is, firstly, to explore the fundamentals and advances of modelling computer networks, their design and multiple uses today, with emphasis on applications in wireless communications. Moreover, an in depth research will be conducted on the latest developments of the subject, aiming at new and original results.

Thesis contains:

[X] System's design and development

[X] Comparative survey or study, and evaluation framework

[X] Models' analysis and design

[X] Theoretical study and algorithms' development or analysis

Related courses and prerequisites: The M.Sc. courses:

1. Advanced Mathematics
2. Advanced Multimedia Systems
3. Broadband Network Technologies
4. Advanced Wireless Network Technologies
5. Embedded System Design

Title: Performance analysis of JQuery/Javascript code in Smartphones

Supervisor: Sotiris P. Christodoulou | **e-mail: sxristod@teiwest.gr**

Domain: Web Engineering and Technologies

Educational Targets:

Εξοικείωση με μεθόδους μέτρησης της απόδοσης λογισμικού γενικά και πιο συγκεκριμένα σε smartphones. Μελέτη και καταγραφή μεθόδων και εργαλείων. Μέτρηση της απόδοσης εντολών και ολόκληρων προγραμμάτων JQuery/Javascript σε smartphones.

Short Description:

- Εξοικείωση και μελέτη σε βάθος της Javascript βιβλιοθήκης JQuery.
- Μελέτη και καταγραφή των μεθόδων μέτρησης της απόδοσης λογισμικού σε smartphones.
- Μελέτη και καταγραφή των εργαλείων που είναι διαθέσιμα για τη μέτρηση της απόδοσης εφαρμογών webmobile που βασίζονται σε JQuery/Javascript.
- Μέτρηση της απόδοσης κάθε συνάρτησης JQuery στους πιο διαδεδομένους browsers σε μια μεγάλη γκάμα συσκευών smartphones και λειτουργικών συστημάτων.
- Μέτρηση της απόδοσης εφαρμογών γραμμένων σε JQuery.

Thesis contains:

[x] System's design and development

[ ] Comparative survey or study, and evaluation framework

[ ] Models' analysis and design

[ ] Theoretical study and algorithms' development or analysis

Related courses and prerequisites:

The M.Sc. course "Advanced Multimedia Systems".

Subject: **Comparative study of planning and scheduling algorithms for cloud computing infrastructures with stochastic performance characteristics**	
Supervisor: Panayiotis Alefragis, Dept. of	**Contact details:** Phone: 6945809991, Email: alefrag@teiwest.gr

Goal

The master thesis goal is to study the performance of task planning and scheduling algorithms on cloud infrastrucutres that exhibit unreliable performance characteristics in the available resources.

Study

The study will perform a thorough survey of the recent bibliography on stochastic and exact methods for planning and scheduling independent tasks on cloud infrastructures, will implement or use various planning and scheduling algorithms on published workloads from the literature and will make a comparative study of the performance of planning algorithms to the scheduling algorithms used by cloud brokers. The study will compare the degradation of performance of planning algorithms in cloud infrastructures that excibit not predictable behavior in core performance introducing failures in task execution or delays in the execution time. The study will try to determine the levels and distribution of unpredictable behavior that leads scheduling algorithms to perform better than planning algorithms. The study will use the cloudsim cloud simulator (http://www.cloudbus.org/cloudsim/) and derived project to perform algorithm comparison and a set of novel readily available algorithms from the literature and the supervisor.

The study includes

X Design and developement

X Comparative study or evaluation framework

☐ Model analysis and design

X Theoretical study, algorithmic development or analysis

Relative Courses Distributed Systems

Required infrastructure

What	**Where**
Java Development Environment	To be installed in students computer

Θέμα: **Αυτοματοποιημένη επιλογή παραμέτρων και αλγορίθμων επίλυσης προβλημάτων βελτιστοποίησης με τεχνικές μηχανικής μάθησης**

Επιβλέπων: Παναγιώτης Σπ. Αλεφραγκής, Καθηγητής Εφαρμογών Τμήματος Μηχανικών Πληροφορικής ΤΕ, ΤΕΙ Δυτικής Ελλάδας	**Στοιχεία επικοινωνίας:** Τηλέφωνο: 6945809991 Email: alefrag@teiwest.gr

Στόχοι

Η πτυχιακή εργασία αφορά την ανάπτυξη πλατφόρμας ανοικτού λογισμικού για την αυτοματοποιημένη επιλογή, με χρήση τεχνικών μηχανικής μάθησης, αλγορίθμων και παραμέτρων για την επίλυση προβλημάτων βελτιστοποίησης.

Αντικείμενο

Συνήθως η υλοποίηση ενός ευρετικού αλγορίθμου βελτιστοποίησης για την επίλυση ενός είδους προβλήματος διαθέτει ένα σύνολο από παραμέτρους που επηρεάζουν την συμπεριφορά τους αλγορίθμου και οδηγούν να εμφανίζονται πλεονεκτήματα και αδυναμίες ανά στιγμιότυπο του προβλήματος. Το πρόβλημα γίνεται πολυπλοκότερο αν διαθέτουμε πολλαπλούς αλγορίθμους ή πολλαπλούς συνδυασμούς αλγορίθμων που μπορούν να εφαρμοστούν. Είναι αρκετά συνηθισμένο κατά την εφαρμογή ευρεστικών, μεταευρεστικών και στοχαστικών αλγορίθμων βελτιστοποίησης για την επίλυση ενός συγκεκριμένου στιγμιότυπου ενός προβλήματος να παρουσιάζεται διαφορετική συμπεριφορά ως προς την ποιότητα της τελική λύσης και την ταχύτητα σύγκλισης ανάλογα με τις παραμέτρους που θα επιλεγούν. Ο συνδυασμός ενός συνόλου παραμέτρων και ο αλγόριθμος μπορεί λοιπόν να χαρακτηριστεί ως καταλληλότερος σε σχέση με κάποιον άλλον συνδυασμό παραμέτρων και αλγορίθμου για ένα στιγμιότυπο ενός συγκεκριμένου προβλήματος. Το πρόβλημα γίνεται πολυπλοκότερο γιατί δεν μπορεί να υπάρχει a priori γνώση της συμπεριφοράς της συγκεκριμένης διαμόρφωσης επίλυσης (παράμετροι και αλγόριθμος) πριν την εκτέλεση του.

Για κάθε καινούριο στιγμιότυπο του προβλήματος που προκύπτει θα πρέπει να επιλύεται από όλους τους αλγορίθμους και για πολλούς συνδυασμούς από πιθανές παραμέτρους ώστε να μπορέσουμε να προσδιορίσουμε ποιος αλγόριθμος είναι καλύτερος. Έχοντας στη διάθεσή μας όμως συνήθως περιορισμένους πόρους και περιορισμένο χρόνο που ζητάμε την λύση αυτό δεν είναι συνήθως εφικτό. Το πρόβλημα της επιλογής διαμόρφωσης επίλυσης είναι και αυτό συνδυαστικό. Στα πλαίσια της πτυχιακής εργασίας θα χρησιμοποιηθούν τεχνικές μηχανικής μάθησης για την δημιουργία ενός αρθρώματος λογισμικού που βάση χαρακτηριστικών του προβλήματος προς επίλυση και των διαθέσιμων αλγορίθμων, θα επιλέγει διαμορφώσεις που εκτιμά ότι θα παράγουν «καλές» λύσεις.

Ως πρώτο βήμα, θα πραγματοποιηθεί μελέτη της βιβλιογραφίας για τεχνικές μηχανικής μάθησης (πχ Τεχνητά νευρωνικά δίκτυα, Βαθιά Μάθηση κλπ) και τεχνικών αυτοματοποίησης παραμέτρων βελτιστοποίησης (Mathheuristics, Hyperheuristics κλπ) και θα επιλεγούν δύο κατηγορίες προβλημάτων που θα εφαρμοστούν οι τεχνικές. Ως δεύτερο βήμα θα πραγματοποιηθεί υλοποίηση μια τεχνική μηχανικής μάθησης σε ένα είδος προβλήματος και θα γίνει εξαντλητική επίλυση ενός συνόλου στιγμιότυπων με όλες τις πιθανές διαμορφώσεις παραμέτρων και αλγορίθμων για την δημιουργία δεδομένων εκμάθησης. Ως τρίτο βήμα θα αξιολογηθεί η συμπεριφορά του αρθρώματος στην επιλογή διαμορφώσεων για κάποια νέα στιγμιότυπα και θα υλοποιηθεί μία επιπλέον τεχνική μηχανικής μάθησης. Ως τέταρτο βήμα θα γίνει σύγκριση των δύο τεχνικών μηχανικής μάθησης και θα εφαρμοστεί το άρθρωμα σε ένα δεύτερο είδος προβλήματος και θα εκτιμηθεί η συμπεριφορά του.

Η εργασία περιλαμβάνει

X Σχεδιασμό και ανάπτυξη συστήματος

X Συγκριτική επισκόπηση ή μελέτη, και πλαίσιο αξιολόγησης

☐ Ανάλυση και σχεδιασμό μοντέλων

X Θεωρητική μελέτη, ανάπτυξη ή ανάλυση αλγορίθμων

Απαιτούμενος εξοπλισμός

ΤΙ	**ΠΟΥ**
Περιβάλλον προγραμματισμού Python	θα εγκατασταθεί στον υπολογιστή του φοιτητή
Περιβάλλον προγραμματισμού Java	θα εγκατασταθεί στον υπολογιστή του φοιτητή

Περιβάλλον προγραμματισμού Cuda	θα εγκατασταθεί στον υπολογιστή του φοιτητή

Απαιτήσεις παρουσίας Ο φοιτητής γενικά θα εργαστεί στο χώρο του. Η επικοινωνία με τον επιβλέποντα θα γίνεται κυρίως ηλεκτρονικά. Επιπλέον, θα υπάρξουν και συναντήσεις για συζήτηση τυχόν δυσκολιών που θα προκύπτουν κατά την εκπόνηση της εργασίας. Οι συναντήσεις θα γίνουν στο Τμήμα ή στην Πάτρα μετά από συνεννόηση μεταξύ φοιτητή και επιβλέποντα.

Άλλες προϋποθέσεις

ΤΙ	**ΕΠΙΠΕΔΟ**	**ΣΗΜΑΣΙΑ**
γνώση Αγγλικών	Πολύ καλή	Απαραίτητη
γνώση Python	Καλή	Προαιρετική
γνώση Java	Πολύ καλή	Απαραίτητη
γνώση C++	Καλή	Προαιρετική