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MIHAIL CUTITARU

EDUCATION

May 2014 **PhD, Electrical and Computer Engineering**, *Old Dominion University*, Norfolk, VA.

- Dissertation Title: IDPAL – A Partially-Adiabatic and Energy-Efficient Logic Family: Theory and Applications to Secure Computing
- Advisor: Lee A. Belfore, II

May 2010 **BS, Computer Engineering**, *Old Dominion University*, Norfolk, VA.

- Honors College – Summa Cum Laude

WORK EXPERIENCE

Jan. 2017 - Present **Teaching Assistant Professor**, *UNC Charlotte (UNCC)*, Charlotte, NC.

- Teaching courses in the areas of **Digital Logic, Computer Programming (C++), Embedded Systems, Computer Organization, Data Communications and Networking**, and **Senior Design I and II.**
- Leading recitation sessions for classes taught.
- Serving as Advisor for the IEEE Student Branch.
- **Mentoring 3 Senior Design teams every semester.**
- **Member of Senior Design Committee serving 90+ projects.**
- Advising around 30 undergraduate students in Computer Engineering.

August 2014 - January 2017 **Assistant Teaching Professor**, *Missouri University of Science and Technology*, Rolla, MO.

- Taught courses in the areas of **Computer Architecture, Embedded Systems, Microcontrollers, Networking, Digital Logic Design, Digital System Modeling**, and **Senior Design**.
- Supervised 5 undergraduate students in undergraduate research.
- Served as Advisor for the **Missouri S&T Robotics Competition Team** and IEEE Student Branch Robotics Team.
- Managed Learning Center student forums for classes taught.

June 2011 - August 2014 **Research Assistant**, *Old Dominion University*, Norfolk, VA.

- Developed IDPAL – a new **energy-efficient** dual-phase partially-adiabatic logic family.
- Simulated large combinational and sequential circuits at the transistor level using LTspice.
- Simulated a **32-bit microprocessor** that uses the DLX instruction set using LTspice and VHDL in IDPAL.
- Designed and verified a proof-of-concept microprocessor prototype to test energy characteristics of a new quasi-adiabatic logic family.
- Evaluated the resistance of the microprocessor prototype against **power analysis attacks** on the **AES encryption** algorithm.

GRANTS AND AWARDS

- *Bringing Entrepreneurial Thinking and Innovation to a Senior Design Course*, Missouri S&T, *Awarded*, $4,250, June - August 2016 – (**PI**).
- *A Partially-Adiabatic Digital Logic Circuit Technology for Ultra Low Power Operation*, Virginia Innovation Partnership and US Department of Commerce, *Awarded*, $40,000, January - December 2014 – (**Co-PI**).
- Dean's Doctoral Fellowship, College of Engineering, Old Dominion University, *Awarded*, $40,000, August 2011 - August 2013.
- Summer Research Award, Department of Electrical and Computer Engineering, Old Dominion University, *Awarded*, $3,000, Summer 2011.
- *Tutorials for Computer Aided Design Methodologies in Computer Engineering*, Center for Learning Technologies, Old Dominion University, *Awarded*, $2,600, Summer 2011 – (Consultant).

INVENTIONS

- **Mihail Cutitaru**, Lee A. Belfore, II, "Power Analysis Attack Countermeasure", Old Dominion University invention disclosure, November 1, 2013.
- **Mihail Cutitaru**, Lee A. Belfore, II, "A New Dual-Phase Adiabatic Logic Family", Old Dominion University invention disclosure, July 13, 2012.

PUBLICATIONS AND PRESENTATIONS

PUBLICATIONS

- Lee A. Belfore, II, **Mihail Cutitaru**, *"VHDL Models for Adiabatic Logic Circuits,"* Journal of Circuits, Systems, and Computers, 2015.
- **Mihail Cutitaru**, Lee A. Belfore, II, *"A Partially-Adiabatic Energy-Efficient Logic Family as a Power Analysis Attack Countermeasure,"* in Proc. of the Asilomar Conference on Signals, Systems, and Computers (ACSSC), 2013.
- **Mihail Cutitaru**, Lee A. Belfore, II, *"An Energy-Efficient 32-bit Kogge-Stone Adder Using a Dual-Phase Partially-Adiabatic Logic Family,"* in Proc. of the Intl Conf. on Computer Applications in Industry and Engineering (CAINE), 2013.
- **Mihail Cutitaru**, Lee A. Belfore, II, *"Arithmetic Circuits Using New Single-Phase Partially-Adiabatic Logic Family,"* in Proc. of the IEEE Midwest Symposium on Circuits and Systems (MWSCAS), 2013.
- **Mihail Cutitaru**, Lee A. Belfore, II, *"New Single-Phase Adiabatic Logic Family,"* in Proc. of the Intl Conf. on Computer Design (CDES), pp. 5-9, 2012.
- **Mihail Cutitaru**, Lee A. Belfore, II, *"Improved Cost Reversible Multiplier Design,"* in Proc. of the Intl Conf. on Computer Design (CDES), pp. 35-38, 2011.

PRESENTATIONS

- Presented paper *"A New Single-Phase Adiabatic Logic Family for CMOS Circuits,"* at the Graduate Research Achievement Day, Old Dominion University, Norfolk, VA, April 11, 2013.
- Presented paper *"Improved Cost Reversible Multiplier,"* at the Graduate Student Seminar, Electrical and Computer Engineering Department, Old Dominion University, Norfolk, VA, January 20, 2012.

SERVICE

- **Member, Senior Design Committee**, UNCC, 2017-Present.
- **Advisor, IEEE Student Branch**, UNCC, 2017-Present.
- **Member, ECE Automatic Course Scheduling Commitee**, UNCC, 2019-Present.
- **Reviewer, Elsevier Measurement Journal**, 2017-Present.
- **Member, Senior Design Course Committee**, Electrical and Computer Engineering Department, Missouri S&T, 2015-2017.
- **Member, Commitee for Effective Teaching**, Missouri S&T, 2015-2017.
- **Advisor, Missouri S&T Robotics Competition Team**, Missouri S&T, 2015-2017.
- **Advisor, Undergraduate Research Experience Program**, Missouri S&T, 2015-2017.
- **Advisor, Senior Design – 5 teams**, Missouri S&T, 2015-2017.
- **Advisor, IEEE Student Branch Robotics Team**, Missouri S&T, 2015-2017.
- Judge, Undergraduate Research Conference, Missouri S&T, 2015.
- Reviewer, Chancellor's Scholarship, Missouri S&T, 2014-2015.

HONORS

2015-2016 **University of Missouri Faculty Scholar.**

Honor Societies Membership.

- Tau Beta Pi (Virginia Gamma Vice-President, 2009)

PROFESSIONAL MEMBERSHIP

- Member, IEEE; Societies: Computer. (Petitioned for Senior Member)

Teaching Statement

My objectives as a teacher focus around being able to get the students excited about the topics I teach by integrating theory and practice, teaching students essential engineering skills, and helping students become lifelong learners. I believe that students need to be interested in a topic in order to understand it, but we need to show them how the theory learned in class applies to practical applications in real life to keep them interested. I think the ultimate goal of teaching is to educate the students in their chosen field, but also help them become independent learners.

One of the first steps that need to be taken in connecting theory and practice is to understand the fundamentals of a subject. In my teaching, I have always given students a big picture description of a course or topic at different levels of abstraction and then proceeded with a bottom-up description from small, simple parts to more complex components and to the system as a whole. This approach was particularly useful in teaching my ECGR 2181 Logic I at the University of North Carolina at Charlotte (UNCC) where we had a complex final project, but I started with the basics and built on them so that students would be able to manage the complexity in the end from the highest level of abstraction to the smallest details.

I believe some of the most important skills for an engineer are problem solving and critical thinking skills. When a student is given a particular problem, he/she must study and understand the problem carefully and find a solution for it and critical thinking is of utmost importance in achieving this goal. However, critical thinking is an acquired skill and can be perfected only with practice as a student moves from the lower-division courses up through the engineering curriculum. A project is a perfect example of critical thinking being applied in a course. When I assign a project for a course, I always break it up into more manageable milestones (weekly or bi-weekly) in order for the students to see that what seemed like an impossible problem can be solved.

I believe projects also foster creative thinking as some parts of the project can be left open-ended, leaving it up to the students to figure out how to implement them and what the final product would look like. I believe allowing students a good amount of creative thinking helps them become better engineers and they can come up with better solutions to a given problem than if they were more restricted. Allowing for a healthy amount of creative independence in a project helps keep the students interested in a particular field and also encourages them to stay in the engineering program, thus maintaining or increasing the retention rates. An example of this is the project for my ECGR 3183 Computer Organization course, where the students are asked to design a floating point processor using a given instruction set, but are also asked to add a few additional instructions of their choice to be incorporated in the final design. Being a former international student myself, I have always tried to come up projects that would be easy to understand for a person of any background and have given extensive directions in the description of the projects. I speak 4 languages fluently, which has been very useful in cases where the students had questions about a project and my explanations in English were not enough. A professor has to take into consideration the diversity of the student body when designing course materials as the diversity of the student population on university campuses increases every year.

I follow several principles in my teaching of course material. I think one of the important things, which is sometimes overlooked, is to give students a clear sense of direction for the course. In my teaching, I start each class with a brief review of the previous class, an outline for the current class, and plan for the future. When looking at an engineering curriculum as a whole, sometimes the pathway to

graduation can seem like a collection of many different and unrelated courses to a student. In my past experience, I have encountered some students who do not completely understand why a lower-division course was needed in order for them to graduate, so I try to correct that in my teaching. As a former laboratory instructor/supervisor of a lower-division course, I try to show the big picture to my students when talking about a project, how it integrates in the big picture, and how the topics learned in that class will be further expanded on in other classes that will follow. I believe it is important to show how a small laboratory project will be part of a bigger system in later classes.

I measure student success using multiple types of assignments. I use homework and quizzes for easy and immediate assessments of what the student learned and prompt feedback on what a student needs to work on more in order to master a topic. Tests can be used to show whether a particular student has learned from the feedback in the homework assignments and is able to solve problems in a given time frame. Projects and presentations can be used to connect multiple topics together, including theory and practice, especially in upper-level courses, and I think they are an essential tool in teacher's toolkit. I also believe projects are a very good way of preparing future engineers for a real-life work environment as most engineers work on teams with other engineers. Projects also prepare students for their future Junior Design and Senior Design courses, where they will work on a real industry-sponsored project. I encourage students to tinker with a project, laboratory, or code once they have it working properly to gain a better understanding of it. I believe this is an important exercise for the students to be able to write better and more efficient code or add new functionality to a product without significantly changing the original scope of the project.

Course Development and Future Teaching Plan

In Summer 2015 and 2016, I was able to offer my Networking course online via synchronous and asynchronous online delivery. I enjoyed this offering and I believe it was a success based on student feedback. I believe the future of teaching entails some kind of online offering, either a synchronous class or simply a recording of the class that will be available for student review as they learn the topics. I have received a teaching grant to develop recorded course material over Summer 2017 in order to help my students in mastering the basic topics of the courses I taught. This has proven to be very useful as a study tool for my students in subsequent semesters. At UNCC, I have recorded all of my classes and made them available to the students for later review, which has been received positively by the students.

The recent trend toward Massive Open Online Courses (MOOCs) has made instructional material more easily accessible than ever before for students of all ages, backgrounds, and locations throughout the world. In order for a university to be able to compete with these free courses, we have to offer a more personalized and high-quality experience. In order to achieve this, I think we have to offer interesting and meaningful projects and other assignments, have engaging lectures, and give prompt and personalized feedback, something that MOOCs normally cannot provide. That being said, I am open to collaborating with colleagues on development of MOOCs and other innovative educational tools in order to provide a better education for our students to increase retention rates and try to attract new students into the program.

My future teaching plans include development of undergraduate and graduate courses and course materials in the areas of Computer Architecture and Security. These two fields are of particular interest to the research community and I believe they would be of interest to a large number of students in the

Computer Engineering and Computer Science programs. I will focus these courses on design, modeling, and simulation of secure computer architectures using industry standards like VHDL, Cadence, and PSPICE so that students get exposed to the complete design of a product and are ready for the workforce. Additionally, I plan on extending my use of FPGA boards to synthesize student designs and for them to be able to see the results of their work from theory and concept to final hardware product, even at the lowest level, such as my ECGR 2181 Logic course.

Teaching can sometimes be a challenging endeavor, but one at least as equally rewarding. As the goal of any teacher is for the students to truly understand the concepts of a given topic, seeing students understand topics is one of the most exciting parts of teaching for me. In my teaching, I try to motivate my students to accomplish greater things than I did so that they can be better engineers and design products that will improve the world we live in. I believe my experience in teaching and mentoring students at different stages in their programs illustrate my ability to be an effective teacher.

Diversity Statement

I was born in a small village in the Republic of Moldova in Eastern Europe and I have lived a sheltered life, without a lot of interactions with what is considered minorities in the US. I have always believed that education is important and planned on getting a Bachelor's degree after being inspired by my mother getting her Master's degree. I am the first person in my family (and all of my extended family) and my village to get a PhD. I decided to get my college education in the US, against all odds of this happening due to the high cost of attending college here.

As an international student, both undergraduate and graduate, I was one of the over 1000 international students handled by the VISA office at ODU. Being an international student allowed me to not only see how American students study for their courses and also how education in this country differs from other countries. As an international student, I have met many other international students and was able to exchange ideas and approaches to learning that would not have been otherwise possible. This international perspective has greatly helped me in shaping my own ways of teaching once I graduated. When teaching certain subjects in my career, and where appropriate, I have always tried to add a "but in Eastern Europe, this is how we do this" moment or joke so that students are exposed to other ways of thinking. One example from my Logic course is when I explain the Finite State Machine for a traffic light controller. In the US, the adopted sequence for a traffic light is Red, then Green, then Yellow, in a repeated cycle. In Eastern Europe (and some other parts of the world), the usual sequence is Red, then Yellow, then Green, in a repeated cycle. This usually gets a laugh with the students and exposes them to new ideas that they may not otherwise learn about.

In my 5.5 years of teaching engineering, I have had many diverse experiences with students, ranging from having a significant number of female students in my classes, to having gay and transgender students, to having a large number of international students, to having first-generation college students. Each one of these experiences was unique and has shaped the way I teach my courses. A large number of female students in my class has changed how I greet my students at the beginning of every class. In the past, I used to start every class with "Hi guys, welcome to another class", whereas nowadays I use "Hi everyone, welcome to another class". Having gay and/or transgender students in my class (after being told about it privately) has made me encourage students to form study groups and project groups with these students regardless of how they feel about the identity of any given person. Having a large number of international students has allowed me to interact with them privately during my office hours in order to explain things in a way that made sense to them and for them to feel more comfortable asking questions, which allowed me to gain an insight into how students from certain parts of the world understand certain subjects and adjust my teaching accordingly. One clear example of this is when I described a Finite State Machine for a vending machine example, where the inputs could be nickels and dimes and the international students did not have an understanding of what these coins meant. Another memorable example of this is a student from Nigeria who attended every one of my office hours to get clarifications on some topics covered in the course. Finally, having had many first-generation students in my classes has allowed me to consider the wording and background information I write in my presentations so that first-generation students are not lost in the jargon of the field.

As part of my teaching, I have also had experiences with students with disabilities, anything from physical disability, such as those using a wheelchair, to many other disabilities, including students battling cancer. I adjusted the way that I teach the course depending on the student population as

every offering of a course is unique. Not long ago, one of my former students who was battling cancer when taking my CpE 3150 Microcontrollers course at Missouri S&T in Fall 2015 reached out to me to thank me again for being accommodating of his condition.

I have always believed having a large diversity of students in a classroom is beneficial for the entire class, as well as the instructor. Diversity allows for a large number of views on a given topic, differences in opinion (that can be expressed in a civil manner), and it can be a learning experience for the rest of the class. To aid with this effort, I always encourage students to speak up in class or office hours about their background and their experiences so that the rest of the class can learn about them.

In the future, I plan on continuing my current approaches of encouraging diversity in the classroom. I believe being accommodating of many backgrounds helps make the class a better learning experience and ultimately increases retention rates.