Amine MARREF

Entrepreneur | Academic | Researcher | Software Engineer

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I am an academic, a researcher, a computer scientist, an entrepreneur, and an educator. I prefer the latter. I hold both an M.Eng. in Computer Systems and Software Engineering and a Ph.D. in Real-Time Systems from the prestigious University of York, UK. My expertise spans both academia and industry.

🎓 EDUCATION

10/2005-08/2009	**Ph.D.** in Computer Science, the University of York, UK. Thesis Title: *Predicated Worst-Case Execution-Time Analysis*. Supervisor: Dr. Guillem Bernat, Professor Alan Burns.
10/2001-07/2005	**M.Eng.** in Computer Systems and Software Engineering, the University of York, UK. Thesis Title: *Finding Geometric Proofs Using Logic Programming*. Supervisor:Professor Colin Runciman.

🏭 INDUSTRY EXPERIENCE

08/2023 07/2014	CEO and Founder, INFINITY COMPUTER SYSTEMS *PrediWCET*: A toolchain for performing WCET analysis using predication on measured execution times of basic blocks. The toolchain is composed of the following tools.

> *PrediFlow* performs a dynamic flow analysis of the program based on timing traces to determine its control-flow graph, which is later augmented with the results obtained from PrediMeasure.

> *PrediMeasure* captures actual execution times of your program using proprietary coverage techniques. It ensures that program parts manifest a variety of execution times that increase confidence in the estimation.

> *PrediCalculate* computes an estimation for the WCET using a complex calculation technique that takes into account the execution history of the program parts to yield tight WCET estimations.

AmiMaths: A set of e-learning apps to support maths learning in the most challenging technical areas.

> *AmiGeo* is a problem solver for Euclidean (plane) geometry. It produces human-like proofs that can help in the learning process of Euclidean geometry.

> *AmiCal* is an intelligent tutor in calculus. Using accurate learning techniques, it will help students grasp the concepts of calculus and hone their problem-solving skills in a record time thanks to accurate automatic identification of their weaknesses on a subject basis.

Real-time systems   E-Learning

💼 ACADEMIC EXPERIENCE

Present 09/2023	Assistant Professor, SAIDA UNIVERSITY, Saida, Algeria

> Teaching and coordinating the undergraduate courses "Office and Web Tools" and "Theory of Computation", teaching the undergraduate courses "Graph Theory", "Compilation", and "Operating Systems"; in addition to the supervision of capstone projects.

Office and Web   Graph Theory   Compiler Design   Theory of Computation   Operating Systems

06/2014 09/2010	Assistant Professor, UMM AL-QURA UNIVERSITY, Makkah, Saudi Arabia

> Research in real-time systems, and particularly in worst-case execution-time analysis.

> Teaching and coordinating the undergraduate course "Data Structures and Algorithms" and the master course "Software Testing"; in addition to the supervision of capstone projects.

> Main administrative duty is departmental e-learning director, as well as serving as a member of various departmental committees.

Real-time systems   WCET Analysis   Data Structures   Algorithms   Software Testing   E-Learning   Outreach

09/2010 10/2009	Postdoctoral Research Fellow, MALÅRDALEN UNIVERSITY, Västerås, Sweden

> Research in worst-case execution-time analysis techniques for software components at their early and final development phases, applying black-box measurement-based timing analysis, and code-positioning algorithms for reduced execution times.

Real-time systems   MB-WCET Analysis   Early-Time Analysis   Code Positioning

05/2009 10/2005	Graduate Teaching Assistant, THE UNIVERSITY OF YORK, UK

> During my Ph.D. years, I was a GTA for a number of courses offered to undergraduate and postgraduate students.

Digital Design   Analog Design   Data Structures   Algorithms   Maths

⚙ Research Experience

06/2014
10/2005
	Real-Time Systems
	The focus of my research is the timing analysis of Real-Time Systems (RTS) and my niche is worst-case execution-time (WCET) analysis. The following topics constitute my active line of research.
	  › Hardware modeling of embedded RTS architectures.
	  › Program-execution comprehension.
	  › Flow analysis of real-time programs.
	  › Automatic derivation of flow information based on model-checking and machine learning.
	  › Non-functional testing based on the notion of WCET coverage.
	  › Constraint and linear programming for calculating upper bounds on the WCET.
	  › Early timing analysis of RTSs.
	  › Timing model identification for WCET analysis based on statistics and evolutionary techniques.
	  › Composability of WCET estimates in component-based RTSs.
	  › WCET optimisation through code positioning.
	  › WCET-analysis methods for parallel real-time systems.
	  › Parametric WCET analysis using genetic programming.
	
	Real-time systems WCET Analysis Non-Functional Testing Parametric WCET Analysis Composability

09/2012 09/2010	**Field-Programmable Gate Arrays** I was involved in researching power-aware designs of field programmable gate-arrays (FPGAs) by reducing size through the merging of look-up tables using NPN equivalence-class partitioning and minimizing associated circuit delays. FPGAs NPN Class Partitioning
12/2013 01/2013	**GeoInformatic Systems** I have been a member of the GeoInformatic Systems Technology Innovation Center (GIS TIC) in Umm Al-Qura University. My work consists of researching commercialisable innovative GIS solutions for the Hajj crowding problem, as well as the integration of the Center's activity in the computer-science curriculum at Umm Al-Qura University. Crowd Control Hajj Event

🔟 Research Grants

01/2016 01/2014	**Understanding the Timing Behaviour of Real-Time Systems through Automatic Dynamic Analysis of Multidimensional Execution Traces (PI)** The project aims at devising dynamic program-analysis methods based on multidimensional execution traces in order to explain the reasons for observing timing delays and to generate automatic guidance on ways to reduce these delays. The project has a budget of 2,000,000 SAR (approximately US$540k) and lasting 24 months. This project is sponsored by the National Science, Technology, and Innovation Program (NSTIP), King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. Real-time systems WCET Analysis Parallel Programs Program Comprehension
09/2015 09/2013	**Timing Analysis of Parallel Real-Time Applications Running on Multicore Hardware Architectures (PI)** The project investigates the use of static and measurement-based analysis methods by which the timing properties of concurrently-executing code are captured, and defines suitable calculation techniques for the worst-case execution time of parallel real-time applications. The project has a budget of 1,192,600 SAR (approximately US$320k) and lasting 24 months. This project is sponsored by the National Science, Technology, and Innovation Program (NSTIP), King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. Real-time systems WCET Analysis Parallel Programs Measurement-Based Analysis
09/2015 09/2013	**Simplifying the Development of High Performance Applications on Multi-core Systems (CoI)** The project investigates the problem of auto-tuning transactional memory for parallel computing systems by deriving techniques and software design methodologies for it, that assist the programmer in building high-performance parallel applications easily. The project has a budget of 2,000,000 SAR (approximately US$540k) and lasting 24 months. This project is sponsored by the National Science, Technology, and Innovation Program (NSTIP), King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. Parallel Programs Transactional Memory

09/2015 09/2013	**Logic-Intensive Reconfigurable Architectures and Supporting CAD Tools (CoI)** The project investigates the reduction in power in FPGAs by decreasing the number of SRAM cells via sharing look-up tables between multiple NPN equivalent Boolean functions. As a co-investigator, my role constitutes of developing the Boolean algebra that enables the partitioning of the function space into equivalence classes, and the analysis of the critical-path timing delays resulting from the sharing of look-up tables. The project has a budget of 2,000,000 SAR (approximately US$540k) and lasting 24 months. This project is sponsored by the National Science, Technology, and Innovation Program (NSTIP), King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. `FPGAs` `Boolean Algebra` `Timing Analysis`
07/2013 09/2012	**Artificial Neural Networks for Modelling Corrosion in SABIC Industrial Sites (PI)** The project investigates the use of artificial neural networks to model corrosion at SABIC industrial sites to allow better understanding of the phenomenon in terms of cause and effects. The main objective of the research is to use model-identification techniques to devise mapping between environmental factors and corrosion rate in order to identify the factors that contribute more to corrosion so that necessary action such as prevention measures can be carried out. The project has a budget of 88,600 SAR (approximately US$23k) and lasting 10 months. This project is sponsored by the Saudi Basic Industries Corporation (SABIC), Saudi Arabia. `Artificial Neural Networks`
07/2013 09/2012	**Early Timing Analysis via Instruction Type-Aware Model Identification (PI)** The project investigates analysis techniques that will enable the developer to derive early timing estimates of real-time software analysis and be constantly aware about the timing requirements of the real-time software throughout the development cycle. In particular the project investigates the use of evolutionary techniques in model identification to obtain an instruction to execution-time mapping to be fed back to the source code to be used in early timing analysis. The project has a budget of 38,000 SAR (approximately US$10k) and lasting 10 months. This project is sponsored by the Institute of Scientific Research (ISR), Umm Al-Qura University, Saudi Arabia. `Real-Time Systems` `WCET Analysis` `Early Analysis`
07/2013 09/2012	**Fully-Automatic Derivation of Exact Program-Flow Constraints for a Tighter Worst-Case Execution-Time Analysisn (PI)** The project aims at implementing a completely automatic analysis that dynamically derives program-flow information to use in WCET analysis. Flow information is derived by a combination of test-data generation and parsing of program-execution traces to obtain flow-fact hypotheses which are then fed to a model checker to establish their correctness. The project has a budget of 38,000 SAR (approximately US$10k) and lasting 10 months. This project is sponsored by the Institute of Scientific Research (ISR), Umm Al-Qura University, Saudi Arabia. `Real-Time Systems` `WCET Analysis` `Flow Analysis` `Non-Functional Testing`

📖 REFEREED PUBLICATIONS

2013	**Evolutionary Computation Techniques for Predicting Atmospheric Corrosion** Amine Marref, Saleh Basalamah, Rami Al-Ghamdi. International Journal of Corrosion, Article in Press, January 2013. `Evolutionary Computation`
2012	**Evolutionary Techniques for Parametric WCET Analysis** Amine Marref. In proceedings of the 12th International Workshop on Worst-Case Execution Time (WCET) Analysis, July 2012, Pisa, Italy. `WCET Analysis` `Parametric WCET Analysis` `Evolutionary Techniques`
2011	**Fully-Automatic Derivation of Exact Program-Flow Constraints for a Tighter Worst-Case Execution-Time Analysis** Amine Marref. In Proceedings of the 11th IEEE International Conference on Embedded Computer Systems: Architectures, Modeling, and Simulation (SAMOS XI), July 2011, Greece, IEEE. `WCET Analysis` `Dynamic Flow Analysis`
2011	**WCET Analysis of Component-Based Systems using Timing Traces** Adam Betts and Amine Marref. In Proceedings of the 16th IEEE International Conference on Engineering of Complex Computer Systems (ICECCS 2011), April 2011, Las Vegas, USA, IEEE. `WCET Analysis` `MB Analysis`

2011	**Memory Positioning of Real-Time Code for Smaller Worst-Case Execution Times**
	Amine Marref and Adam Betts. In Proceedings of the 16th IEEE International Conference on Engineering of Complex Computer Systems (ICECCS 2011), April 2011, Las Vegas, USA, IEEE.
	`WCET Analysis` `WCET Optimization`

2011	**Accurate Measurement-Based WCET Analysis in the Absence of Source and Binary Code**
	Amine Marref and Adam Betts. In Proceedings of the 14th IEEE International Symposium on Object / Component / Service-Oriented Real-time Distributed Computing (ISORC 2011), March 2011, Newport Beach, CA, USA, IEEE.
	`WCET Analysis` `Timing Traces`

2011	**Hierarchical Composition of Parametric WCET in a Component Based Approach**
	Thomas Leveque, Etienne Borde, Amine Marref, and Jan Carlson. In Proceedings of the 14th IEEE International Symposium on Object / Component / Service-Oriented Real-time Distributed Computing (ISORC 2011), March 2011, Newport Beach, CA, USA, IEEE.
	`WCET Analysis` `Components`

2010	**Compositional Timing Analysis**
	Amine Marref. International Conference on Embedded Computer Systems: Architectures, Modeling, and Simulation, July 2010, Samos, Greece, IEEE.
	`WCET Analysis` `Compositional Analysis`

2009	**Predicated Worst-Case Execution-Time Analysis.**
	Amine Marref. PhD thesis, August 2009, York, United Kingdom, The University of York.
	`WCET Analysis` `Contsraint-Logic Programming` `Dynamic Execution Timing Tables`

2009	**Predicated Worst-Case Execution-Time Analysis.**
	Amine Marref and Guillem Bernat. Reliable Software Technologies – Ada-Europe 2009, Lecture Notes in Computer Science, 2009, Volume 5570/2009, 134-148, 2009, Springer-Verlag.
	`WCET Analysis` `Contsraint-Logic Programming` `Dynamic Execution Timing Tables`

2008	**Towards Predicated WCET Analysis.**
	Amine Marref and Guillem Bernat. In proceedings of the 8th International Workshop on Worst-Case Execution Time (WCET) Analysis, pages 29-28, July 2008, Prague, Czech Republic, Austrian Computer Society.
	`WCET Analysis` `Contsraint-Logic Programming` `Dynamic Execution Timing Tables`

🏛 TEACHING EXPERIENCE

Present 09/2023	**Lecturing (Saida, DZ)**
	My teaching material for the courses "Office and Web Tools", "Graph Theory", and "Compilation" at Saida University can be found at the Moodle portal of the University's website.

> 2023-2024	Spring	Operating Systems 1.	(B.Sc.)
> 2023-2024	Spring	Theory of Computation.	(B.Sc.)
> 2023-2024	Spring	Theory of Computation.	(B.Eng.)
> 2023-2024	Fall	Graph Theory.	(B.Sc.)
> 2023-2024	Fall	Compilation.	(B.Sc.)
> 2023-2024	Fall	Office and Web Tools.	(B.Eng.)

Present 09/2023	**Bachelor Thesis Supervision (Saida, DZ)**
	> 2023-2024 *A Web Application for Requesting Manual Workers.*
	> 2023-2024 *A Web Application for Price Tracking.*

06/2014 09/2010	**Accreditation (UQU, SA)**
	As a faculty member teaching one of the core courses in the undergraduate program in the Department of Computer Science at Umm Al-Qura University, I have significantly contributed for four years to the ABET accreditation through timely, detailed, and insightful end-of-semester reports, managing the continuous development of the teaching/learning experience at the level of the course, and at the level of its pre-requisite and post-requisite courses, and contributing to improving course, student, and program learning outcomes.

| 06/2014 | Lecturing (UQU, SA) | | | |
| 09/2010 | My teaching material for the course "Data Structures and Algorithms" at Umm-Al-Qura University can be found at the following URL: marref.org/uqu-cs-dsa. | | | |

> 2013-2014   Spring   Software Testing.   (M.Sc.)
> 2012-2013   Spring   Data Structures and Algorithms.   (B.Sc.)
> 2012-2013   Fall   Data Structures and Algorithms.   (B.Sc.)
> 2011-2012   Spring   Data Structures and Algorithms.   (B.Sc.)
> 2011-2012   Fall   Data Structures and Algorithms.   (B.Sc.)
> 2010-2011   Spring   Data Structures and Algorithms.   (B.Sc.)
> 2010-2011   Fall   Data Structures and Algorithms.   (B.Sc.)

06/2014 — 09/2011 — Bachelor Thesis Supervision (UQU, SA)

> 2013-2014   *A Smartphone App for Minimizing Waiting Times in Health-Care Institutions.*
> 2013-2014   *A Virtual World for Education.*
> 2013-2014   *The Slacker Terminator.*
> 2013-2014   *Software Teaching Aid for the Course Data Structures and Algorithms.*
> 2012-2013   *Helping Autistic Children using an Android Application.*
> 2012-2013   *Java-Based Educational Visual Programming Language.*
> 2012-2013   *Euclidean-Geometry Proofs using Logic Programming.*
> 2012-2013   *Maximum Comfort: Hotel Management Software.*
> 2011-2012   *Deterministic Testing Methods for WCET Estimation.*
> 2011-2012   *Source-Level WCET Estimation for Early Timing Analysis.*

06/2014 — 09/2011 — Bachelor Thesis Examination (UQU, SA)

> 2013-2014   *Navigation System For Makkah.*
> 2013-2014   *Saudi Caller Info.*
> 2013-2014   *Hajj Explorer.*
> 2012-2013   *Quick Response Code Application for Traffic Violations.*
> 2012-2013   *Web-based Graduation Project System.*
> 2012-2013   *E-councils.*
> 2012-2013   *Automatic Timetabling System.*
> 2011-2012   *Automated Metadata Extraction from Multimedia.*
> 2011-2012   *Adding Emotional Tag to Augment Context Awareness in Social Network Services.*
> 2011-2012   *Detailed Analysis of Steal-on-Abort in Software Transactional Memory.*
> 2011-2012   *Hajj Guider: iPhone Application.*
> 2011-2012   *Face Recognition.*
> 2011-2012   *Multi-Level Spam Filtering System.*
> 2011-2012   *Online Signature Identification and Verification System.*

06/2009 — 10/2005 — Lab Assistance/Demonstration (York, UK)

> 2008-2009   Spring   Digital and Analog Design.   (B.Eng.)
> 2008-2009   Fall   Introduction to Digital Design.   (B.Eng.)
> 2007-2008   Spring   Digital and Analog Design.   (B.Eng.)
> 2007-2008   Fall   Introduction to Digital Design.   (B.Eng.)
> 2006-2007   Spring   Digital and Analog Design.   (B.Eng.)
> 2006-2007   Fall   Introduction to Digital Design.   (B.Eng.)
> 2005-2006   Summer   Unifying Theories of Programming.   (M.Eng.)
> 2005-2006   Spring   Algorithms and Data Structures.   (B.Eng.)
> 2005-2006   Fall   Chips to Systems.   (B.Eng.)

📅 University Administration Experience

06/2014 09/2010	Department (UQU, SA)	
	› 12/2013 – 06/2014	Departmental e-learning director.
	› 09/2013 – 06/2014	Departmental curriculum-committee member.
	› 01/2012 – 06/2014	Departmental research-committee member.
	› 09/2011 – 06/2012	Departmental recruitment-committee member.
	› 09/2011 – 06/2012	Departmental student-supervisory committee member.
	› 09/2011 – 06/2014	Departmental student-advising committee member.
	› 03/2011 – 06/2014	Departmental system committee member.
	› 03/2011 – 06/2014	Departmental programming committee member.
	› 03/2011 – 06/2014	Departmental policies manager.
	› 03/2011 – 09/2011	Departmental career-advising committee member.
06/2012 09/2011	College (UQU, SA)	
	› 01/2011 – 06/2012	College outreach-program coordinator.

👥 Professional Service

2013 2008	Technical Program Committees
	› A member of the International Board of Reviewers for the 2013 Informing Science + IT Education Conference (InSITE'2013), Porto, Portugal, 2013.
	› A member of the technical program committee of the 5th International Conference on Communications, Computers and Applications (MIC-CCA2012), Istanbul, Turkey, October 2012.
	› A member of the technical program committee in the 3rd International Conference on Systems, Modeling and Design (MIC-SMD2013), Kenitra, Morocco, February 2013.
	› A member of the technical program committee in the 2nd International Conference on Computing and Artificial Intelligence (MIC-CAI2012), Palma de Mallorca, Spain, June 2012.
	› A member of the technical program committee in the Worst-Case Execution-Time Analysis Workshop, Brussels, Belgium, 2010.
	› A referee in the Journal of Architecture, Special Issue on Worst-Case Execution Time, 2010.
	› A member of the technical program committee in the Real-Time Systems Symposium, Barcelona, Spain, 2008.

🏆 Awards and Honours

2013	Highly-Recommended Project Award from Umm Al-Qura University, Saudi Arabia (November 2013). An award for attracting funds for the project "Understanding the Timing Behaviour of Real-Time Systems through Automatic Dynamic Analysis of Multidimensional Execution Traces" with the highest-possible rating.
2013	Best Reviewer Award for service to the Informing Science Institute and the InSITE 2013 Conference in Porto, Portugal (April 2013).
2013	GIS-Center Winning Team at Umm Al-Qura University, Saudi Arabia (January 2013). An award for the team of researchers who wrote and won the proposal for the 50-Million SAR GIS Center.
2011	Highly-Recommended Project Award from Umm Al-Qura University, Saudi Arabia (November 2011). An award for attracting funds for the project "Timing Analysis of Parallel Real-Time Systems" with the highest-possible rating.
2009	Research Fellowship from Swedish Foundation for Strategic Research to work at Mälardalen University (Sweden), 2009-2010.
2005	Teaching Assistantship from the University of York (UK), 2005-2009.
2000	University Scholarship from the Algerian Government to study at the University of York (UK), 2000-2008.

☰ Skills

Development	C, Java, Android, C#, Javascript, CSS, PHP, Python, SQL, Prolog, ECL^{i}pS^e-CLP, Matlab, Maple
Development Tools	Visual Studio (Code), Eclipse, Android Studio, Unity, Gradle, SVN, git
Graphics Design	Blender, Adobe Fuse, Autodesk MotionBuilder, CLO Marvelous Designer
Authoring and Teaching	Moodle, Latex, Beamer, LibreOffice, MS Office
Operating Systems	Linux, Mac OS, Windows

🌐 LANGUAGES

Arabic ● ● ● ● ●
English ● ● ● ● ●
French ● ● ● ● ●

✚ STRENGTHS

› Autonomous
› Pragmatic
› Tenacious