

LIAMA Shanghai Open Day & “Model and Verification Driven Engineering” SEI-Summer School 2014

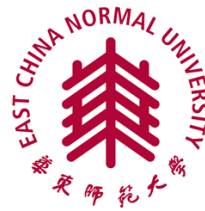
LIAMA 开放日暨“模型与验证驱动工程”暑期学校 2014





中欧信息、自动化与应用数学联合实验室上海中心开放日

LIAMA Shanghai Open Day



地址： 数学馆 113 室（华东师范大学中山北路校区）（华东师范大学中山北路校区）

Location: Room 113, Mathematics Building (In the North Zhongshan campus of East China Normal University)

时间： 2014 年 7 月 7 日 8:30-17:30

Date: 8:30-17:30 July 7, 2014

注册时间： 8:30-8:55

Registration Time: 8:30-8:55

注册地点： 数学馆 113 室（华东师范大学中山北路校区）

Registration Location: Room 113, Mathematics Building (In the North Zhongshan campus of East China Normal University)



LIAMA Events

- 8:55–9:00 王长波教授主持（华东师范大学软件学院副院长）
Prof. Changbo Wang (Vice–Dean of Software Engineering Institute, ECNU)
- 9:00–9:10 任友群副校长致欢迎辞（华东师范大学副校长）
Prof. Youqun Ren (Vice President of East China Normal University)
- 9:10–9:20 Frédéric BRETAR 博士（法国驻上海领事馆科技领事）
Dr. Frédéric BRETAR (Attaché Scientifique, Consulat Général de France à Shanghai)
- 9:20–9:30 何积丰院士（华东师范大学软件学院院长）
Prof. Jifeng He (Academician of Chinese Academy of Sciences, Dean of Software Engineering Institute, ECNU)
- 9:30–9:45 Vania Joloboff 教授致辞（华东师范大学软件学院教授）
Prof. Vania Joloboff (Professor of Software Engineering Institute, ECNU)
- 9:45–10:00 集体合影（ Group Photo ） & 茶歇（ Coffee Break ）

Technical Reports

每个报告包含 5-10 分钟的讨论。

(5-10 minutes for discussion are included in the presentations.)

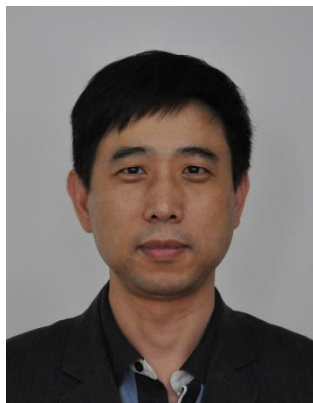
Session One (主持人： 陈仪香教授)

(Session Chair: Prof. Yixiang Chen)

10:00-10:40 特邀报告： 王晓阳教授 (复旦大学计算机学院院长)

Invited Speaker: Prof. Xiaoyang Wang (Dean of Computer Science Institute, Fudan University)

报告人简历 (Biography) :



X. Sean Wang is Professor and Dean at the School of Computer Science, Fudan University, Shanghai, China. He received his PhD degree in Computer Science from the University of Southern California, Los Angeles, California, USA, in 1992. Before joining Fudan University in 2011, he was the Dorothean Chair Professor in Computer Science at the University of Vermont, Burlington, Vermont, USA, and between 2009-2011, he served as a Program Director at the National Science Foundation, USA, in the Division of Information and Intelligent Systems. He has published widely in the general area of databases and information security, and was a recipient of the

US National Science Foundation Research Initiation and CAREER awards. His research interests include database systems, information security, data mining, and sensor data processing. In the research community, he served as the general chair of ICDE 2011 held in Washington DC, and in other roles at international conferences and journals, including PC co-chair of MDM 2013, WISE 2012, PC member of past SIGMOD, CIKM, ICDE and many other conferences, current associate editor of Geoinformatica and WWW journal, and past associate editor of TKDE and KAIS.

报告题目 (Title): "Looking for the Right Models for Data Analytics in the Cloud"

报告摘要 (Abstract) : Data analytics refers to the science and technology of data analysis to understand the processes that underly the data and to help plan for actions. The available amount of data in this "big data era" calls for massive parallelization (using cloud computing) of data analytics tasks, which are not easily done. The right model for data analytics tasks is of essential importance. This talk will introduce some data and process models that have been used and analyze their pros and cons. The goal of is to raise the awareness of the models and point to potential research directions.

10:40–11:20 特邀报告： Jane W.S. Liu 教授（台湾中央研究院资讯科学研究所）
Invited Speaker: Prof. Jane W.S. Liu (Institute of Information Science and Research
Center for Information Technology Innovations of Academia
Sinica, Taiwan.)

报告人简历 (Biography):



Jane W.S. Liu is a Distinguished Visiting Fellow of Institute of Information Science and Research Center for Information Technology Innovations of Academia Sinica, Taiwan. Before joining Academia Sinica in 2004, she was a software architect in Microsoft Corporation from 2000 to 2004 and a faculty member of Computer Science Department at the University of Illinois at Urbana-Champaign from 1972 to 2000. Her research interests are in the areas of real-time and embedded systems. In addition to journal and conference publications, she has also published two text books, one on real-time systems and the other on signals and systems. Her recent research focuses on technologies for building user-centric automation and assistive devices and services and ICT technologies for disaster preparedness and response. She received the Achievement and Leadership Award of IEEE Computer Society, Technical Committee on Real-Time Systems in 2005; Information Science Honorary Medal of Taiwan Institute of Information and Computing Machinery in 2008 and Linux Golden Penguin Award for special contributions of Taiwan Linux Consortium in 2009. She is a fellow of IEEE.

报告题目(Title): " Crowdsourcing Surveillance Data - System Supports and Theoretical Foundations"

报告摘要 (Abstract) : Today's smart mobile devices and social networking services have enabled increasingly more people to be human sensors. There are now diverse systems and applications that exploit crowdsourced human sensor data (i.e., observational data and information contributed by human sensors) for purposes ranging from generation of fine-grain maps of air quality, radiation level, traffic and road conditions, etc. to crisis and disaster management. Numerous techniques and tools based on a wide range of technologies are now available for discovering, extracting, and refining information contributed by a vast number of human sensors and verifying veracity and assessing accuracy of the information thus obtained. Experiences from past disasters have told us time and again that physical sensors deployed by disaster surveillance (and early warning) systems often cannot provide adequate coverage. When this happens, crowdsourcing human sensor data can be an effective solution. Nevertheless, disaster surveillance systems typically do not use crowdsourcing human sensor data as a means to improve their sensor coverage. Unlike typical crowdsourced sensing systems and applications mentioned above, a disaster surveillance system must be able to make critical decisions, sometimes within minutes or seconds. If the system crowdsources human sensor data, it must be able to process the data in real-time and extract from them decision support information of sufficiently good and quantifiable quality. Existing techniques and

tools for processing social reports cannot meet this requirement. Often, the system should use as few human sensors as possible, direct them to locations where physical sensor coverage is poor, and help them to stay away from dangerous locations. The system needs tools for these purposes as well. CROSS (CROWdsourcing Support system for disaster Surveillance) is a system of tools built to meet these needs. The underlying participant selection problem and tour planning problem that CROSS must solve to select participants from volunteers and plan tours for each of them in support of crowdsourcing data collection processes are similar to the well-known GAP (Generalized Assignment Problem) and mTSP (Multiple Traveling Salesman) problems, but differ from them significantly to require new formulations and solutions. The problem of fusing human sensor data and physical sensor data builds on an abstract yet realistic model that enables the symbiotic data to be processed in a coherent manner. After presenting a brief overview of CROSS, this talk will discuss these problems, available solutions and future work.

11:20–11:45 **Patrice Quinton 教授(法国高师集团 Rennes)**
Prof. Patrice Quinton (ENS Rennes)

报告人简历 (Biography):



Patrice Quinton was born in Tours, France, in 1950. He obtained a degree of Engineer in Computer Science of ENSIMAG (Grenoble, France), in 1972, and a Thèse d'État in Mathematics of the University of Rennes (France) in 1980. He was Directeur de Recherches of the CNRS, and head of the VLSI Parallel Architectures group of IRISA in Rennes between 1982 and 1997. He was professor in Computer Science of the University of Rennes 1 between 1998 and 2004, and since then, he has been heading the brittany branch of the École normale supérieure de Cachan in Rennes. He is currently the president of the École normale supérieure de Rennes, newly created in October 2013.

Patrice Quinton is member of the Cairn research group at IRISA -- INRIA, Rennes. His scientific interests include parallel architectures, VLSI, systolic arrays, computer aided design and sensor networks. He is co-author of one book, and author and co-author of more than one hundred journal papers, international conference communications or book chapters.

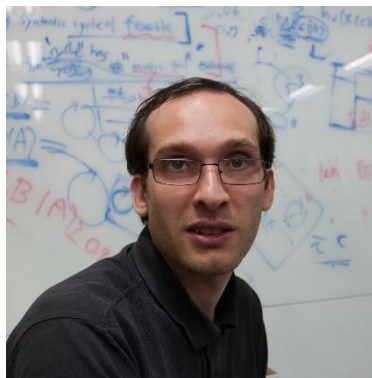
报告题目 (Title): "Cairn : Energy-Efficient Reconfigurable System-on-Chips"

报告摘要 (Abstract): This presentation will be a short survey of the activities of the Cairn INRIA project-team in Rennes. Cairn researches new architectures, algorithms and design methods for flexible and energy efficiency domain-specific system-on-chip (SoC). As performance and energy-efficiency requirements of SoCs are continuously increasing, they become difficult to fulfil using only programmable processors solutions. To address this issue, we promote/advocate the use of reconfigurable hardware, i.e. hardware structures whose organization may change before or even during execution. Such reconfigurable SoCs offer high performance at a low energy cost, while preserving a high level of flexibility.

The group studies these SoCs from three angles: (i) The invention and design of new reconfigurable platforms with an emphasis on flexible arithmetic operator design, dynamic reconfiguration management and low- power consumption. (ii) The development of their corresponding design flows (compilation and synthesis tools) to enable their automatic design from high-level specifications. (iii) The interaction between algorithms and architectures especially for our main application domains (wireless communications, wireless sensor networks and digital security).”

11:45–12:10 **Xavier Rival (法国国家信息自动化研究所)**
Xavier Rival (INRIA)

报告人简历 (Biography):



Xavier Rival is Research Scientist at INRIA Paris-Rocquencourt. His research interest focus on abstract interpretation and software verification by static analysis. He is mainly working on symbolic abstractions (trace partitionng abstraction, shape analysis, separation logic and memory abstract domains). He has been involved in the design, implementation and transfer of the Astrée analyzer, a static analyzer able to verify safety properties on industrial size safety critical softwares. He is currently the PI of the MemCAD ERC Starting Grant, aiming at the

design of a library of abstract domains to describe memory states containing a wide range of complex data structures. He is also the Head of the ANTIQUE INRIA group, located at ENS Paris.

报告题目 (Title): “Modular Construction of Shape-Numeric Analyzers”

报告摘要 (Abstract) :The aim of static analysis is to infer invariants about programs that are precise enough to prove semantic properties, such as the absence of run-time errors. Broadly speaking, there are two major branches of static analysis for imperative programs. Pointer and shape analyses focus on inferring properties of pointers, dynamically allocated memory, and recursive data structures, while numeric analyses seek to derive invariants on numeric values. Although simultaneous inference of shape-numeric invariants is often needed, this case is especially challenging and is not particularly well explored. Notably, simultaneous shape-numeric inference raises complex issues in the design of the static analyzer itself.

In this talk, we will study the construction of such shape-numeric, static analyzers. We set up an abstract interpretation framework that allows us to reason about simultaneous shape-numeric properties by combining shape and numeric abstractions into a modular, expressive abstract domain. Such a modular structure is highly desirable to make its formalization and implementation easier to do and get correct. To achieve this, we choose a concrete semantics that can be abstracted step-by-step, while preserving a high level of expressiveness. The structure of abstract operations (i.e., transfer, join, and comparison) follows the structure of this semantics. The advantage of this construction is to divide the

analyzer in modules and functors that implement abstractions of distinct features.

12:10–12:35 刘静教授 (华东师范大学软件学院)
Prof. Jing Liu (Professor of Software Engineering Institute, ECNU)

报告人简历 (Biography)



Jing Liu is a professor in the Software Engineering Institute of East China Normal University, Shanghai. Her research work focuses on UML/MARTE models, model consistency, model refinement. She is a vice director of the Theoretic Computing Institute of East China Normal University. Previously, she was a leader of some projects about model based design, namely Model Driven Development Technology of High Dependable Software (863 program), A Strategy for Model Construction and Integration (National Scientific Foundation of China) etc.

报告题目 (Title): “Formal Design and Verification of Zone Controller”

报告摘要 (Abstract) : iCMTC is an advanced Communication Based Train Control system developed by CASCO Signal Ltd. for China's mass transit transportation. Some subsystems of iCMTC has been applied in Shang-hai Metro Line 10. Zone Controller (ZC) is one of the subsystems of iCMTC. Modeling and verifying ZC is challenging due to the complexity of the block system and the behavior itself. We propose a formal approach to gradually specify the block system and lower complexity of the verification of ZC behavior. In recent years, there are many researches on railway systems. However, these studies use simple track networks, which makes them inadequate in industrial practice. To address this problem, we define specific block layouts (i.e., double slip connection) as relations on sets. We also define mathematical properties of the relations so that the block system can be precisely described. For the purpose of reducing the complexity of verification, we propose an improved refinement mechanism based on the Event-B notation. We apply this mechanism in modeling the ZC behavior, and achieve good results in automated proof. The model is verified with three safety properties to ensure the safety and correctness of ZC.

12:30–14:00 午餐 (逸夫楼)
Lunch (Yifu Building)

Session Two (主持人: Patrice Quinton 教授)

(Session Chair: Prof. Patrice Quinton)

14:00–14:25 Marc Pouzet 教授 (法国巴黎高师)
Prof. Marc Pouzet (ENS Paris)

报告人简历 (Biography)



Marc Pouzet is professor in computer science at Ecole normale superieure in Paris and leader of the INRIA Team PARKAS. His research concerns the design, semantics and implementation of programming languages for real-time systems. He has been the main architect of several synchronous languages including Lucid Synchronne, an extension of the synchronous language Lustre. Several features (programming constructs, compilation and compile-time static analysis) are integrated to the SCADE 6 tool developed at Esterel-Technologies and used for programming safety critical control software like fly-by-wire commands. Currently, he is interested in the semantics and implementation of hybrid modelers (e.g., Simulink, Modelica), the design and implementation of a synchronous language with mixed (discrete/continuous) signals, and the formal certification of a Lustre compiler.

报告题目(Title):”Zelus, a synchronous language with Ordinary Differential Equations”

报告摘要 (Abstract) :”Zelus is a new programming language for modeling systems that mix control reactive software and a physical environment. From a user's perspective, its main originality is to extend an existing Lustre-like synchronous language with Ordinary Differential Equations (ODEs). The extension is conservative: any synchronous program expressed as data-flow equations and hierarchical automata can be composed arbitrarily with ODEs in the same source code. A dedicated type system and causality analysis ensure that all discrete changes are aligned with zero-crossing events so that no side effects nor discontinuities occur during integration. Programs are statically scheduled and translated into sequential code by a sequence of source-to-source transformations and the final code is paired with an off-the-shelf numeric solver. During the talk, I will focus on a recent work showing some causality issues in Simulink and Modelica and present a Lustre inspired type-based causality analysis to detect instantaneous loops.

This is joint work with Albert Benveniste, Benoit Caillaud, Timothy Bourke and Bruno Pagano.”

14:25–14:50 朱惠彪教授 (上海市高可信计算重点实验室常务副主任)

Prof. Huibiao Zhu (Vice Director of Shanghai Key Laboratory of Trustworthy Computing)

报告人简历 (Biography)



Huibiao Zhu is a Professor of Computer Science at Software Engineering Institute, East China Normal University, also the Executive Deputy Director of Shanghai Key Laboratory of Trustworthy Computing. He earned his PhD in Formal Methods from London South Bank University in 2005. During these years he has studied various semantics and their linking theories for Verilog, SystemC, web services and probability system. Currently he is the Chinese PI of the Sino-Danish Basic Research Center IDEA4CPS.

报告题目 (Title): “Denotational Semantics and Its Algebraic Derivation for an Event-driven System level Language”

报告摘要 (Abstract) : As a system-level modelling language, SystemC possesses several novel features such as de- layed notifications, notification cancelling, notification overriding and delta-cycle. It also has real-time and shared-variable features. Previously we have studied an operational semantics for SystemC [PZHJ06] and bisimulation has been introduced based on some aspects of reasonable abstractions. The denotational method is another approach to studying the semantics of a programming language. It provides the mathematical meaning to programs and can predict the behaviour of programs. Due to the novel features of SystemC, it is challenging to study the denotational semantics for SystemC. In this paper, we apply Unifying Theories of Programming (abbreviated as UTP) [HH98] in exploring the denotational semantics. Two trace variables are introduced, one to record the state behaviours and another to record the event behaviours. The timed model is formalized in a three-dimensional structure. A set of algebraic laws is explored, which can be proved via the presented denotational semantics. In this paper, we also consider the linking between denotational semantics and algebraic semantics. The linking is obtained by deriving the denotational semantics from algebraic semantics for SystemC. A complete set of parallel expansion laws is explored, where the location status of an instantaneous action is studied. The location status indicates an instantaneous action is due to which exact parallel component. We introduce the concept of head normal form for each program and every program is expressed in the form of guarded choice with location status. Based on this, the derivation strategy for deriving denotational semantics from algebraic semantics is provided.

14:50–15:15 陈铭松副教授（华东师范大学软件学院）
Associate Prof. Mingsong Chen (Software Engineering Institute, ECNU)

报告人简历 (Biography)



Mingsong Chen is an Associate Professor in the Software Engineering Institute (SEI) at the East China Normal University (ECNU) . His research interests include design automation and verification of cyber physical systems, cloud/embedded/parallel computing, and computer architecture. He received his B.S. and M. Eng. from Nanjing University in 2003 and 2006 respectively, and Ph.D. from the University of Florida, in 2010.

报告题目(Title): "Towards Assertion-Based Functional Equivalence between TLM and RTL Models "

报告摘要 (Abstract) : Transaction Level Modeling (TLM) is promising for validation of System-on-Chip (SoC) designs at an early stage. However, raising the abstraction level brings a major challenge: How to guarantee the functional equivalence between TLM specifications and Register Transfer Level (RTL) implementations? In this talk, we will present a methodology that uses the assertion observability for functional equivalence checking between TLM and RTL models. The initial results using several industrial designs demonstrate that our method can automatically translate assertions as well as partially check the functional equivalence between different abstraction levels.

15:15–15:30 茶歇 (Coffee Break)

Session Three (主持人： 刘静教授)

(Session Chair: Prof. Jing Liu)

15:30–15:55 Eric Madelaine 教授(法国国家信息自动化研究所索菲亚分院)
Prof. Eric Madelaine (INRIA-Sophia Antipolis)

报告人简历 (Biography)



Eric Madelaine is a senior researcher at INRIA in Sophia-Antipolis, France. He has a diploma from Ecole Polytechnique, Paris, a PhD Thesis from Univ. of Paris 7, and an Habilitation from Univ. of Nice. His research interests range from semantics of programming languages, distributed and cloud computing, component-based software, formal methods, methods and tools for specification and verification of complex programs. He has served in many international conferences committees, including Euromicro, FESCA, SEAA, FMCO, and FACS. He is the french leader of the INRIA - ECNU associated team DAESD on "Distributed Asynchronous, Embedded Synchronounous

System Development".

报告题目(Title): " Title: pNets: an Expressive Model for Parameterised Networks of Processes "

报告摘要 (Abstract) :INRIA team SCALE and ECNU's SEI are working on formalisms and semantic models for expressing the behavior of very large scale heterogeneous systems, including both synchronous and asynchronous communication.

We study Parameterised Networks of Synchronized Automata (pNets) from a theoretical perspective. In this presentation, I will illustrate the expressiveness of pNets by showing how to express a wide range of classical constructs of (value-passing) process calculi, but also how we can easily express complex interaction patterns used in modern distributed systems. Our framework can model full systems, using (closed) hierarchies of pNets; we can also build (open) pNet systems expressing composition operators. Concerning more fundamental aspects, we define a strong bisimulation theory specifically for the pNet model, prove its properties, and illustrate it on some examples. One of the original aspects of the approach is to relate the compositional nature of pNets with the notion of bisimulation; this is exemplified by studying the properties of a flattening operator for pNets. We shall present the first results of this research, and sketch the ongoing work, and the long term goals we pursue in terms of methodology for reasoning on large scale and complex heterogeneous applications.

15:55–16:20 Frederic Mallet 教授 (尼斯大学)
Prof. Frederic Mallet (University of Nice)

报告人简历 (Biography)



Frédéric Mallet is currently a professor at Univ. Nice Sophia Antipolis. He holds a Phd and an habilitation in Computer Sciences. He is a permanent member of Aoste Team-project, a joint team between INRIA Sophia Antipolis and I3S Laboratory. His work focuses on the design and analysis of real-time and embedded systems. He is one of the designers of the Time and Allocation subprofiles of the MARTE OMG Specification and a key contributor to the definition of its companion language, the Clock Constraint Specification Language (CCSL).

报告题目(Title): " Combining CCSL logical clocks and UPPAAL clocks: application to transportation systems "

报告摘要 (Abstract) : Logical clocks can be used to capture causal relationships, synchronization constraints, relative activation rates of both application and execution platform models. Real-valued clocks are used to capture real-time properties of systems. We consider here a framework where logical clocks and real-time clocks are combined and jointly used in the context of verification for transportation systems. The clock constraint specification language (CCSL) is used as a concrete syntax to capture relationships on logical clocks. Timed Automata clocks serve to capture the physical time constraints. Both are combined in a verification framework based on UPPAAL.

16:20–16:45 Julien Deantoni (法国国家信息自动化研究所索菲亚分院)
Dr. Julien De Antoni (INRIA–Sophia Antipolis)

报告人简历 (Biography)



Julien Deantoni is currently an associate professor in computer sciences at the University of Nice Sophia-Antipolis. After studies in electronics and micro informatics, he obtained a PhD focused on the modeling and analysis of control systems, and had a post doc position at INRIA. He is currently a member of the INRIA-I3S AOSTE team. His research focuses on the join use of Model Driven Engineering and Formal Methods.

报告题目(Title): " Reifying Concurrency for Executable Metamodeling

报告摘要 (Abstract) : Current metamodeling techniques can be used to specify the syntax and semantics of domain specific modeling languages (DSMLs). However, there is currently very little support for explicitly specifying concurrency semantics using

metamodels. Often, such semantics are provided through implicit concurrency models embedded in the underlying execution environment supported by the language workbench used to implement the DSMLs. The lack of an explicit concurrency model has several drawbacks: it not only prevents from developing a complete understanding of the behavioral semantics, it also prevents development of effective concurrency-aware analysis techniques, and effective techniques for producing semantic variants in the cases where the semantic base has variation points. This work reifies concurrency as a metamodeling facility, leveraging formalization work from the concurrency theory and models of computation (MoC) community. In this context, the talk proposes the introduction to a language workbench for binding domain-specific concepts and models of computation through an explicit event structure at the metamodel level.

Session Conclusion (主持人： 陈仪香教授)

(Session Chair: Prof. Yixiang Chen)

16:45–16:55 总结发言 (Conclusion) (Prof. Vania Joloboff)

16:55–17:30 自由讨论发言 (Free Talk)

=====THE END=====

“Model and Verification Driven Engineering”

MVDE@SEI Summer School Program

		Monday 7, July	Tuesday 8, July	Wednesday 9, July	Thursday 10, July	Friday 11, July
Morning	8:30-9:00	Welcome Ceremony				
	9:00-10:20	LIAMA Open Day & Workshop (See Program of LIAMA Open Day & Workshop)	Patrice Quinton	Eric Madelaine	Frederic Mallet & Julien Deantoni	Xavier Rival
	10:20-10:40		Break	Break	Break	Break
	10:40-12:00		Patrice Quinton	Eric Madelaine	Frederic Mallet & Julien Deantoni	Xavier Rival
12:00-14:00	Lunch		Lunch	Lunch	Lunch	
Noon	14:00-15:20	LIAMA Open Day & Workshop)	Marc Pouzet	Eric Madelaine	Frederic Mallet & Julien Deantoni	Xavier Rival
	15:20-15:40		Break	Break	Break	Break
	15:40-17:00		Marc Pouzet	Eric Madelaine	Frederic Mallet & Julien Deantoni	Xavier Rival
	17:00-17:30					Closing Ceremony
Evening		Dinner	Dinner	Dinner	Dinner	

"The polyhedral model and its use to generate parallel programs and hardware accelerators"	Prof. Patrice Quinton
"synchronous model of time"	Prof. Marc Pouzet
"Designing, programming, and verifying distributed systems"	Prof. Eric Madelaine
"The Clock Constraint Specification Language"	Prof. Frederic Mallet & Dr. Julien Deantoni
"Static analysis by abstract interpretation"	Prof. Xavier Rival