
European PhD Program in Computational Logic

EPCL Basic Training Camp 2013 13-19 November 2013, TU Dresden

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The annual EPCL Basic Training Camp provides a set of research talks and courses in specialized topics within Computational Logic, addressed to young researchers.

In 2013, the EPCL Basic Training camp takes place at TU Dresden. The lecturers will be

- Pietro Baroni, Università degli Studi di Brescia, Italy
- Anton Belov, University College Dublin, Ireland
- Sarah Alice Gaggl, TU Dresden
- João Leite, Universidade Nove de Lisboa, Portugal
- Nicolas Maudet, Université Pierre et Marie Curie, France
- Jussi Rintanen, Aalto University, Finland
- Alexandra Varga, Justus-Liebig-Universität Gießen, Germany

Up-to-date information about EPCL is provided at <http://www.epcl-study.eu/>.

Location

The Basic Training Camp takes place in

Room 2026

of the building of the *Fakultät Informatik* of TU Dresden, Nöthnitzer Straße 46, 01187 Dresden.

The site is close to the tramway stop *Münchner Platz* (Tramway 3) and bus stop *Helmholtzstraße* (Bus 85). Its Google Maps link is: <http://goo.gl/maps/YBnzT>

Research Talks

Exploiting Semantics Properties for Efficient Computation in Abstract Argumentation

Pietro Baroni

Università degli Studi di Brescia, Italy

<http://www.ing.unibs.it/~baroni/>

Abstract: Devising efficient algorithms for abstract argumentation is a hot and largely open research topic. In particular, several computational problems in abstract argumentation lend themselves to some form of local/incremental computation. After providing a basic overview on this matter, the talk will discuss how some general properties (either well-established or being currently investigated) of argumentation semantics can play a crucial role in the development of efficient incremental computation techniques.

SAT Preprocessing for MUS Extraction and MaxSAT

Anton Belov

University College Dublin, Ireland

<http://anton.belov-mcdowell.com/>

Abstract: State-of-the-art algorithms for industrial instances of MUS extraction problem and MaxSAT rely on iterative calls to a SAT solver. Preprocessing is crucial for the acceleration of SAT solving, and the key preprocessing techniques rely on the application of resolution and subsumption elimination. Additionally, satisfiability-preserving clause elimination procedures are often used. Since the computation typically involves a large number of SAT calls, an interesting question is whether an input instance to a problem can be preprocessed up-front, i.e. prior to running an MUS extractor or a MaxSAT solver, rather than (or, in addition to) during each iterative SAT solver call. The key requirement in this setting is that the preprocessing has to be sound, i.e. so that the solution to the original problem can be reconstructed correctly and efficiently after the execution of an algorithm on the preprocessed instance. In this talk we will examine some of the obstacles to such up-front preprocessing, and will discuss a solution that involves re-casting the MUS and MaxSAT computation problems in a so-called labelled-CNF framework.

Computational Aspects of the stage2 Argumentation Semantics

Sarah Alice Gaggl

TU Dresden

http://www.inf.tu-dresden.de/?node_id=3382

Abstract: Abstract argumentation frameworks (AFs) are typically represented as directed graphs. In this formalism cycles and in particular odd-length cycles can have a strong and sometimes undesired influence on the rest of the framework. Several semantics have been proposed to resolve this problems, out of them cf2 and stage semantics attracted specific attention. By distancing from the notion of defense, they are capable to select arguments out of odd-length cycles. In case of cf2 semantics, the SCC-recursive schema guarantees that important evaluation criteria for argumentation semantics are fulfilled. Beside several desirable properties, both stage and cf2 semantics still have some drawbacks. The stage semantics does not satisfy very basic evaluation criteria, whereas cf2 semantics produces some questionable results on frameworks with cycles of length ≥ 6 . Therefore, we suggest to combine stage semantics with the SCC-recursive schema of cf2 semantics. The resulting stage2 semantics overcomes the problems regarding cf2 and stage semantics. In this talk we study the relation of stage2 to existing semantics, strong equivalence w.r.t. stage2 and we give complexity results of the standard reasoning problems and tractable fragments for stage2. Furthermore, we present the system ASPARTIX which is capable to compute all prominent argumentation semantics.

Evolving Logic Programs

João Leite
Universidade Nove de Lisboa, Portugal
<http://centria.di.fct.unl.pt/~jleite/>

Playing with Argumentation

Nicolas Maudet
Université Pierre et Marie Curie, France
<http://www-poleia.lip6.fr/~maudetn/index.html>

Solving AI Planning Problems with SAT

Jussi Rintanen
Aalto University, Finland
<http://users.ics.aalto.fi/rintanen/>

Abstract: In the last 10 years, SAT, the best-known NP-complete problem, has become an important framework for combinatorial search in various areas of computer science, including computer-aided verification and artificial intelligence. In this talk we explain the main ingredients of efficient SAT-based planners, including encoding of partially-ordered plans, scheduling of SAT solvers, automatic synthesis of invariants, as well as specialized SAT-solving for planning.

Closed-World Practical Reasoning for Knowing what to do, when, what for

Alexandra Varga
Justus-Liebig-Universität Gießen, Germany

Abstract: Practical reasoning is displayed in the instrumental actions of human agents, as well as in the comprehension of other agents' actions. It serves two main purposes: appropriate action and action explanation. Its main features are the concern with efficiency with respect to goals, context-relativity and context-normativity, non-monotonicity, and tremendous computational complexity. The conclusions of practical reasoning are action rules, which connect a goal state to a sequence of actions in a given context. I introduce the distinction between achievement (concrete) and maintenance (more abstract, higher order) goals. These different goal representations lead to a multi-level, wide-scope view of practical rationality. One benefit is that the goals of practical reasoning mentioned above (i.e., action, and action explanation) may be included in an object-level model of teleological practical reasoning.

Closed-world reasoning is a strategy that allows to show how real agents may overcome computational complexity. It can be formalized in Logic Programming, and thus it serves to model certain types of practical reasoning, such as planning or teleological explanation.

I substantiate the last claim by presenting an experiment in developmental psychology (Gergely 2002). Preverbal children's acquisition of skills and functional knowledge can well be understood in this framework of practical rationality, and modeled in LP with the event calculus.

Lectures

An Introduction to Abstract Argumentation

Pietro Baroni

Università degli Studi di Brescia, Italy

<http://www.ing.unibs.it/~baroni/>

Abstract: This cycle of lectures aims at presenting the basics of abstract argumentation and at introducing some advanced topics and open issues in this field. Building on the formalism of abstract argumentation frameworks introduced by Dung, the following main topics will be covered: argumentation semantics and their basic properties, the role of strongly connected components in argumentation semantics, agreement among different semantics, comparisons between argumentation frameworks, alternative notions of skepticism and argument justification status, extensions and variations of Dung's framework.

Algorithms for Analysis and Repair of Inconsistent Boolean Formulas

Anton Belov

University College Dublin, Ireland

<http://anton.belov-mcdowell.com/>

Abstract: In some practical applications of SAT – for example, in hardware and software design and verification, product configuration and product line engineering – establishing the inconsistency of a Boolean formula alone is not sufficient. Minimal Unsatisfiable Subformulas (MUSes) provide a way to pin-point the sources of inconsistency of a formula. Dually, Minimal Correction Subsets (MCSes) represent possible ways to repair the formula, i.e. to restore its consistency. This course serves as a brief introduction to the topic of minimal unsatisfiability, and related concepts, in classical propositional logic. The main focus of the course is the discussion of a number of effective algorithms and optimization techniques for the computation of MUSes and MCSes on practical application instances. The course assumes familiarity with classical propositional logic, propositional satisfiability (SAT) and the basics of SAT solving.

Communication Issues in Collective Decision-Making

Nicolas Maudet

Université Pierre et Marie Curie, France <http://www-poleia.lip6.fr/~maudetn/index.html>

Presentations by Doctoral Candidates

A Computational Logic Approach to The Belief-Bias Effect

Emmanuelle-Anna Dietz

<http://www.wv.inf.tu-dresden.de/People/Dietz.html>

Abstract: The tendency to accept or reject arguments based on own beliefs or prior knowledge rather than on the reasoning process is called the belief-bias effect. In 1983, Evans et al demonstrated these two, possibly conflicting, processes in a psychological study. Participants were presented four different types of syllogisms where two types conflicted on the psychological level and two types conflicted on the logical level. In my presentation I will discuss these syllogisms, their differences and the participants' responses. I will propose a computational logic approach for these cases by applying abnormalities and abduction. The formalization reveals new open questions about possible variations of abnormalities.

Social Abstract Argumentation

Sinan Egilmez

Abstract: Despite the overall growing number of users of the Web 2.0, there are also many who abandon it, often unsatisfied with the quality of their experience. One of the reasons pointed out is the unstructured, often chaotic, kind of interactions that characterise most of the available Social Networks. In our study, we take a step towards using Argumentation in Social Networks and introduce Social Abstract Argumentation Frameworks, an extension of Dung's Abstract Argumentation Frameworks that incorporates social voting. We propose a class of semantics for these new Social Abstract Argumentation Frameworks and prove some important non-trivial properties which are crucial for their applicability in Social Networks.

SAT Solving – Beyond Resolution

Norbert Manthey

<http://www.ki.inf.tu-dresden.de/~norbert/html/home.php>

Abstract: Modern CDCL SAT Solvers are based on an extension of the DPLL procedure: the naive backtracking scheme is replaced by clause learning and back jumping. The learned clauses are generated via resolution. Thus, from a proof theory point of view, CDCL solvers are more powerful than DPLL solvers, because the former have been shown to be as strong as general resolution, and the latter are only as strong as tree-like resolution. However, in the hierarchy of proof systems there exists more, for example the cutting planes algorithm, or extended resolution. Furthermore, the resolution proof of Gaussian elimination is large. In this talk, proof systems and their dependencies are presented. More importantly, the current approaches of how techniques from these systems have been integrated into CDCL SAT solvers are discussed, and preliminary empirical results are given.

Exact Query Reformulation with First-Order Ontologies and Databases

Thi Phuong Nhung Ngo

Abstract: We study a general framework for query rewriting in the presence of an arbitrary first-order logic ontology over a database signature. The framework supports deciding the existence of a safe-range first-order equivalent reformulation of a query in terms of the database signature, and if so, it provides an effective approach to construct the reformulation based on interpolation using standard theorem proving techniques (e.g., tableau). Since the reformulation is a safe-range formula, it is effectively executable as an SQL query.

Application of Hierarchical Hybrid Encodings to Efficient Translation of CSPs to SAT

Hau Nguyen Van

<http://www.wv.inf.tu-dresden.de/People/Van.html>

Abstract: Solving Constraint Satisfaction Problems (CSPs) through Boolean Satisfiability (SAT) requires suitable encodings for translating CSPs to equivalent SAT instances that can not only be efficiently generated, but also efficiently solved by SAT solvers. In this paper we investigate hierarchical and hybrid encodings, as proposed by Velev, namely a previously studied log-direct encoding, and a new combination, the log-order encoding. Experiments on different domain problems with these hierarchical encodings demonstrate their significant promise in practice. Our experiments show that the log-direct encoding significantly outperforms the direct encoding (typically by one or two orders of magnitude) taking advantage not only of the more concise representation, but also of the better capability of the log-direct encoding to represent interval variables. We also show that the log-order encoding is competitive with the order encoding, although more studies are required to understand the tradeoff between the fewer variables and longer clauses in the former, when expressing complex CSP constraints.

Verification of Semantically-Enhanced Artifact Systems

Ario Santoso

<https://sites.google.com/site/santosoario/>

Abstract: Artifact-Centric systems have emerged in the last years as a suitable framework to model business-relevant entities, by combining their static and dynamic aspects. In particular, the Guard-Stage-Milestone (GSM) approach has been recently proposed to model artifacts and their lifecycle in a declarative way. In this paper, we enhance GSM with a Semantic Layer, constituted by a full-fledged OWL 2 QL ontology linked to the artifact information models through mapping specifications. The ontology provides a conceptual view of the domain under study, and allows one to understand the evolution of the artifact system at a higher level of abstraction. In this setting, we present a technique to specify temporal properties expressed over the Semantic Layer, and verify them according to the evolution in the underlying GSM model. This technique has been implemented in a tool that exploits state-of-the-art ontology-based data access technologies to manipulate the temporal properties according to the ontology and the mappings, and that relies on the GSMC model checker for verification.

Encoding Pseudo-Boolean Constraints into CNF

Peter Steinke

<http://www.wv.inf.tu-dresden.de/People/Steinke.html>

Abstract: Many different encodings for pseudo-Boolean (PB) constraints into CNF have been proposed in the past. The PBLib project starts to collect and implement these encodings to be able to encode PB constraints in a very simple, but effective way. The talk gives an overview on the different encodings and discuss empirical results.

Social Events

Friday 15 November, 14:25, Gläserne Manufaktur, Historic City Center

With a guided tour, we visit the *Gläserne Manufaktur* Volkswagen car factory, located in the city center. We meet at 14:35 at the entrance of *Gläserne Manufaktur*. Afterwards we will walk through the historic city center and go to a café.

- <http://www.glaesernemanufaktur.de/en/>
- Google Maps link: <http://goo.gl/maps/KtmJt>
- Tramway stop *Straßburger Platz (Gläserne Manufaktur)*
Line 2, about 20 min from *Münchner Straße* (change at *Pirnaischer Platz*).

Monday 18 November, 20:00 Joint Dinner at Bautzner Tor

Bautzner Tor

<http://www.bautznertor.de/>

<http://goo.gl/maps/y57fz>

Tramway stop *Bautzner Straße / Rothenburger Straße*, Lines 6,11,13

Wednesday, 13 November

9.45 – 10.00	WELCOME
10.00 – 11.00	PRESENTATION: Norbert Manthey <i>SAT Solving – Beyond Resolution</i>
11.00 – 11.30	COFFEE BREAK
11.30 – 12.30	PRESENTATION: Hau Nguyen Van <i>Application of Hierarchical Hybrid Encodings to Efficient Translation of CSPs to SAT</i>
12.30 – 14.00	LUNCH BREAK
14.00 – 15.00	RESEARCH TALK: Sarah Alice Gaggl <i>Computational Aspects of the stage2 Argumentation Semantics</i>
15.00 – 15.30	COFFEE BREAK
15.30 – 16.30	PRESENTATION: Thi Phuong Nhung Ngo <i>Exact Query Reformulation with First-Order Ontologies and Databases</i>

Thursday, 14 November

9.00 – 10.00	PRESENTATION: Sinan Egilmez <i>Social Abstract Argumentation</i>
10.00 – 10.20	COFFEE BREAK
10.20 – 11.20	PRESENTATION: Emmanuelle-Anna Dietz <i>A Computational Logic Approach to The Belief-Bias Effect</i>
11.20 – 11.40	COFFEE BREAK
11.40 – 12.40	RESEARCH TALK: Alexandra Varga <i>Closed-World Practical Reasoning for Knowing what to do, when, what for</i>
12.40 – 14.00	LUNCH BREAK
14.00 – 15.30	LECTURE: Pietro Baroni <i>An Introduction to Abstract Argumentation – Part I</i>
15.30 – 16.00	COFFEE BREAK
16.00 – 17.30	LECTURE: Pietro Baroni <i>An Introduction to Abstract Argumentation – Part II</i>

Friday, 15 November

9.00 – 10.00	LECTURE: Pietro Baroni <i>An Introduction to Abstract Argumentation – Part III</i>
10.00 – 10.20	COFFEE BREAK
10.20 – 11.20	RESEARCH TALK: Pietro Baroni <i>Exploiting Semantics Properties for Efficient Computation in Abstract Argumentation</i>
11.20 – 11.40	COFFEE BREAK
11.40 – 12.40	RESEARCH TALK: João Leite <i>Evolving Logic Programs</i>
Afternoon 14:25	SOCIAL EVENT: Guided tour in the <i>Gläserne Manufaktur</i> Meeting at the entrance of <i>Gläserne Manufaktur</i> Afterwards: Walk through the historic city center with stop at a café

Monday, 18 November

9.00 – 10.30	LECTURE: Nicolas Maudet <i>Communication Issues in Collective Decision-Making – Part I</i>
10.30 – 11.00	COFFEE BREAK
11.00 – 12.30	LECTURE: Nicolas Maudet <i>Communication Issues in Collective Decision-Making – Part II</i>
12.30 – 14.00	LUNCH BREAK
14.00 – 15.00	RESEARCH TALK: Jussi Rintanen <i>Solving AI Planning Problems with SAT</i>
15.00 – 15.30	COFFEE BREAK
15.30 – 17.00	LECTURE: Anton Belov <i>Algorithms for Analysis and Repair of Inconsistent Boolean Formulas</i>
20:00	SOCIAL EVENT: Joint Dinner at <i>Bautzner Tor</i> http://goo.gl/maps/y57fz Tramway 6,11,13, stop <i>Bautzner Straße / Rothenburger Straße</i>

Tuesday, 19 November

9.00 – 10.00	RESEARCH TALK: Nicolas Maudet <i>Playing with Argumentation</i>
10.00 – 10.30	COFFEE BREAK
10.30 – 11.30	RESEARCH TALK: Anton Belov <i>SAT Preprocessing for MUS Extraction and MaxSAT</i>
11.30 – 13.00	LUNCH BREAK
13.00 – 14.00	PRESENTATION: Ario Santoso <i>Verification of Semantically-Enhanced Artifact Systems</i>
14.00 – 14.30	COFFEE BREAK
14.30 – 15.30	PRESENTATION: Peter Steinke <i>Encoding Pseudo-Boolean Constraints into CNF</i>