

Project website address: sqig.math.ist.utl.pt/GeTFun

(1) GENERAL PROGRESS OF THE PROJECT

>>> The project

(b) has achieved most of its objectives and technical goals for the period with relatively minor deviations;

>>> Description of the modifications

There have been no changes to technical content of the project, besides the recalendarization of Tasks B1 and H1 already included in the ongoing amendment. The plan of secondments has been followed with partial success, only. We expect that all project partners may be able to take full advantage of these resources in the forthcoming, and final, year.

>>> Qualitative indicators of progress and success in line with workplan and milestones (description of progress towards the milestones and deliverables)

Two milestones were set for the year 2015, both successfully accomplished. The corresponding deliverables are part of this report.

MS5 – the organization of the project's third workshop

The workshop GeTFun 3.0 was successfully held along with the NATAL@Logic event in Natal, Brazil on September 3–5, 2015. Details can be found inside this report, and on the webpage sqig.math.ist.utl.pt/GeTFun/3.0.

MS6 – the fulfilment of scientific goals corresponding to Tasks A2, C2, E2, F2, G2.

All five tasks, corresponding to the core (WP-A,C,G) and enabling (WP-E,F) packages of the project, were successful. Moreover, most relevant scientific results concerning these tasks were internationally

published in specialized scientific journals and books. Others await publication. Details can be found inside this report. Relevant progress has also been reported on most other work packages of the project, leading to a total accumulated number of 194 publications, by the end of 2015.

(2) PROJECT ACHIEVEMENTS

>>> Scientific highlights and research achievements

Expectedly, in the course of 2015, there was considerable scientific activity in all WPs of the GeTFun project. Of course, some work was particularly targeted at tasks of the core and enabling WPs (WP-A, WP-C, WP-E, WP-F, WP-G), namely at Tasks A2, C2, E2, F2, G2 which were due at the end of 2015 and whose main accomplishments we detail below.

WP-A: Algebraic valuation semantics

The foundational work on the second task of WP-A was mainly developed at IT-Portugal and TU-Wien and published in [18,119], both published in advance. As expected, there are deep connections with results in WP-C and WP-G.

Task A2

Study the connections between abstract valuations and non-deterministic matrices, and explore their relationships with proof-theoretic frameworks and corresponding metaproperties, e.g., relating the finite model property and decidability with proof-theoretic analyticity.

Papers [18,119] cover this topic, scoping over different kinds of proof systems: tableaux, hypersequents, and display calculi. The results obtained are well represented here by transcripts of their abstracts, namely, paper [18]:

“The paper is a contribution both to the theoretical foundations and to the actual construction of efficient automatizable proof procedures for non-classical logics. We focus here on the case of finite-valued logics, and exhibit: (i) a mechanism for producing a classic-like description of them in terms of an effective variety of bivalent semantics; (ii) a mechanism for extracting, from the bivalent semantics so obtained, uniform (classically-labeled) cut-free standard analytic tableaux with possibly branching invertible rules and paired with proof strategies designed to guarantee termination of the associated proof procedure; (iii) a mechanism to also provide, for the same logics, uniform cut-based tableau systems with linear rules. The latter tableau systems are shown to be adequate even when restricted to analytic cuts, and they are also shown to polynomially simulate truth-tables, a feature that is not enjoyed by the former standard type of tableau systems (not even in the 2-valued case). The results are based on suggestive generalizations of the notions of analyticity and compositionality, and illustrate a theory that applies to many other classes of non-classical logics.”

and paper [119]:

“The difficulty in finding analytic Gentzen sequent calculi for non-classical logics has lead to the development of many new proof frameworks (proof systems) that have been used to give analytic calculi for these logics. The multitude and diversity of such frameworks has made it increasingly important to identify their interrelationships and relative expressive power. Hypersequent and Display calculi are two widely-used proof frameworks employed to present analytic calculi for large classes of logics. In this article, we show how any hypersequent calculus can be used to construct a display calculus for the same logic. The display calculus we obtain preserves proof-theoretic properties of the original calculus including cut-elimination and the subformula property. Since the construction applies to any hypersequent calculus, this result shows that in

terms of presenting logics the display calculus formalism subsumes the hypersequent calculus formalism.”

Further relevant contributions to WP-A can be found in [19,154].

WP-C: Controlled non-determinism: metalogical properties

The work on WP-C was mainly developed at TAU-Israel, TU-Wien-Austria and IPI-PAN-Poland. Concerning the second task of WP-C, the main publications were [39, 122, 127].

Task C2

Explore variations of the basic framework, namely towards first-order logics and substructural systems, and investigate other syntactic properties of deduction systems, such as elimination of useful rules other than cut (e.g., the density rule).

Papers [39,127,122] give a good account of the contributions in this topic, exploring Gödel and T-norm logics, and including first and second-order versions. Namely, the abstract of paper [39]:

“We define a general family of hypersequent systems with well-behaved logical rules, of which the known hypersequent calculus for (propositional) Gödel logic, is a particular instance. We present a method to obtain (possibly, non-deterministic) many-valued semantics for every system of this family. The detailed semantic analysis provides simple characterizations of cut-admissibility and axiom-expansion for the systems of this family.”

paper [127]:

“We prove that the extension of the known hypersequent calculus for standard first-order Gödel

logic with usual rules for second-order quantifiers is sound and (cut-free) complete for Henkin-style semantics for second-order Gödel logic. The proof is semantic, and it is similar in nature to Schutte and Tait's proof of Takeuti's conjecture."

and paper [122]:

"We provide general – and automatedly verifiable – sufficient conditions that ensure standard completeness for logics formalized Hilbert-style. Our approach subsumes many existing results and allows for the discovery of new fuzzy logics which extend first-order Monoidal T-norm Logic with propositional axioms."

Further relevant contributions to WP-C can be found in [68,91,96,114,138–146,150,153].

WP-E: Information sources

The work on WP-E was mainly developed at TAU-Israel, MTA-Israel, IPI-PAN-Poland, HU-Israel and UFRN-BR. Task E2 is covered by article [2], along with results (still unpublished) delivered at several conference talks ("Do not be afraid of the unknown", by C. Blasio and J. Marcos).

Task E2

Explore information-based relations between the sources and the possibilities of reducing the set of sources while preserving their 'information power' (i.e., the joint amount of information provided by the group of sources); combining information on various levels, from sources and from processors, and exploring the laws governing such a combination; introduce a temporal dimension into the source-processor framework, examining the situations in which the sources gain new information with time or some inconsistent information is eliminated.

The contributions to this task can be well assessed in the abstract of paper [69]:

“The problem of inconsistent information in databases often arises in the context of data integration and data exchange. In these areas the common assumption is that the real world is consistent, thus an inconsistent database does not correspond to any reliable state and it needs to be “repaired” according to a chosen policy. Many of these policies have to deal with the problem of an exponential blowup in the number of possible repairs. For this reason, recent approaches advocate more flexible and fine-grained policies based on the user’s preference. In this paper we take a further step towards more personalized inconsistency management by incorporating ideas from context-aware systems. The idea is to employ grades of different repairs according to their relevance for a particular user. The outcome is a graded framework for inconsistency maintenance in database systems, controlled by context-aware and distance-based considerations.”

and of the work already presented at several conferences, but still unpublished, of C. Blasio and J. Marcos:

“Semantically, if an agent asserts or refutes some sentence it is commonplace to identify these attitudes with truth-values. We propose instead a useful model for representing and reasoning about information that accommodates distinct cognitive attitudes concerning acceptance or rejection by an agent. From that model, we show a generous four-place notion of entailment, henceforth called B-entailment, that generalizes the well-known approaches of multiple-conclusion entailment. One of the advantages of such model is that it provides a natural interpretation for non-classical logical values characterizing ‘the unknown’: some sentence unbeknownst to a given agent might be a sentence which the agent has reasons to accept and also reasons to reject; alternatively, the sentence might be unbeknown to the agent if she simultaneously has

reasons not to accept it and reasons not to reject it. As we will show, yet another advantage of our generalized notion of entailment and of its underlying many-dimensional structure of truth-values is that it provides a simple and appealing framework for the uniform representation of many known logics.

Further relevant contributions to WP-E are in preparation in joint work between IPI-PAN-Poland and HU-Israel.

WP-F: Labeled deductive systems

Several partners contributed to the work on WP-F, namely IT-Portugal, UNIVR-Italy, KCL-UK, TU-Wien-Austria, IMAR-Romania, UA-Portugal and UFRN-Brazil. The most relevant results covering task F2 are in [64,156,160].

Task F2

Develop a model theory of the hybridization of an institution (including a detailed study of the method of diagrams and a discussion of preservation results under ultraproduct constructions) and understand the role of PoC in this process of enrichment, guided by the application of labeled deduction systems to concrete case studies, to other reasoning techniques, and as a basis for the combination of logics.

After the seminal work already reported in previous reports in connection with WP-I, the model theory of hybridized logics has been studied, as accounted for in the abstracts of paper [64]:

“The definition of identity in terms of other logical symbols is a recurrent issue in logic. In particular, in First-Order Logic (FOL) there is no way of defining the global relation of identity, while in standard Second-Order Logic (SOL) this definition is not only possible, but widely used. In this paper,

the reverse question is posed and affirmatively answered: Can we define with only equality and abstraction the remaining logical symbols? Our present work is developed in the context of an equational hybrid logic (i.e. a modal logic with equations as propositional atoms enlarged with the hybrid expressions: nominals and the @ operator). Our logical base is propositional type theory. We take the propositional equality, λ abstraction, nominals, $\blacklozenge$ and @ operators as primitive symbols and we demonstrate that all of the remaining logical symbols can be defined, including propositional quantifiers and equational equality.”

and paper [160]:

“Hybrid logics, which add to the modal description of transition structures the ability to refer to specific states, offer a generic framework to approach the specification and design of reconfigurable systems, i.e., systems with reconfiguration mechanisms governing the dynamic evolution of their execution configurations in response to both external stimuli or internal performance measures. A formal representation of such systems is through transition structures whose states correspond to the different configurations they may adopt. Therefore, each node is endowed with, for example, an algebra, or a first-order structure, to precisely characterise the semantics of the services provided in the corresponding configuration. This paper characterises equivalence and refinement for these sorts of models in a way which is independent of (or parametric on) whatever logic (propositional, equational, fuzzy, etc) is found appropriate to describe the local configurations. A Hennessy–Milner like theorem is proved for hybridised logics.”

Case studies, namely with respect to the structure of concrete proof systems is well illustrated in [156]:

“We introduce a new Gentzen–style framework of grafted hypersequents that combines the formalism of nested sequents with that of hypersequents. To

illustrate the potential of the framework, we present novel calculi for the modal logics K5 and KD5, as well as for extensions of the modal logics K and KD with the axiom for shift reflexivity. The latter of these extensions is also known as SDL+ in the context of deontic logic. All our calculi enjoy syntactic cut-elimination and can be used in backwards proof search procedures of optimal complexity. The tableaufication of the calculi for K5 and KD5 yields simplified prefixed tableau calculi for these logics reminiscent of the simplified tableau system for S5, which might be of independent interest.”

Further relevant contributions to WP-F can be found in [7,30,133,161–2].

WP-G: Many-valuedness meets bivalence

The work on WP-G was mainly developed at IT-Portugal, UFRN-Brazil and UNIVR-Italy. The essential results were published in [18]. The article covers Task G1, as well as parts of Task G2, and brings about connections with the results in WP-C. Further important contributions to Task G2 can be found in [34,194].

Task G2

Study the efficiency of the associated proof systems, in particular by extracting rules adequate for cut-based (KE-like) tableau systems, and implement the proposed axiom-extraction algorithms in computer-assisted theorem provers.

The task was successfully met with results coping with cut-based tableaux systems, but also using natural deduction and resolution approaches, including implementation, as can be assessed from the abstracts of paper [18] (already quoted in connection with Task A2, earlier in this report), as well as paper [34]:

“Seegerberg presented a general completeness proof for

propositional logics. For this purpose, a deductive system was defined in a way that its rules were rules for an arbitrary k -place Boolean operator in a given propositional logic. Each of those rules corresponds to a row on the operator's truth-table. This article extends Segerberg's idea to finite-valued propositional logic. We maintain the idea of defining a deductive system whose rules correspond to rows of truth-tables, but instead of having n types of rules (one for each truth-value), we use a bivalent representation that makes use of the technique of separating formulas as defined by Carlos Caleiro and João Marcos."

and paper [194]:

"We present a resolution-based proof method for finite-valued propositional logics based on an algorithmic reduction procedure that expresses these logics in terms of bivalent semantics. Our approach is hybrid in using some elements which are internal and others which are external to the many-valued logic under consideration, as we embed its original language into a more expressive metalanguage to deal with the satisfiability problem. In contrast to previous approaches to the same problem, our target language is fully classical, what turns the design of the resolution-based rules for a specific many-valued logic into a straightforward task. Correctness results, which are proved in detail in the present study, follow easily from results on classical resolution. Implementation of reasoning tools can be achieved by direct translation into classical propositional logic and making use of reliable existing automated provers. We illustrate the application of the method with examples."

Further relevant contributions to WP-G can be found in [114,192,193].

Other WPs

Notwithstanding, there was also notable progress on the remaining WPs (WP-B, WP-D, WP-H, WP-I, WP-J). Succintly, we have can list the following references, only from 2015:

- WP-B: Curry-Howard proof-systems and focusing
[145,149,151,158,138,139,96,140,141,91,142,143,157,159,182,99,183,184,185,186]
- WP-D: Distance-based reasoning
[2,69,173,174,111,181]
- WP-H: Non-determinism and premaximal consistency references
[137,87,147]
- WP-I: Semantics-informed proof theory of modal and fuzzy logics
[133,109,107,172,175,176,177,178,179,180,99,157,187,188]
- WP-J: Truth-values
[87,148,155,156,158]

>>> Transfer of knowledge and training activities

Third GeTFun Workshop

The Third GeTFun Workshop was set as milestone (MS5) of the project. It was organized, as planned, jointly with the event NAT@Logic, in Natal, Brazil. It served as a forum for project participants and other experts in the topics of the projects to exchange points of view and recent results and research. A brief report can be found below.

The Third GeTFun Workshop was advertised as follows:

Compositional Meaning in Logic [GeTFun 3.0]
September 3-5, 2015

The workshop was organized by Carlos Caleiro (IT, Portugal) and João Marcos (UFRN, Brazil). The call for papers, inspired by the project summary is shown below:

The Fregean-inspired Principle of Compositionality of Meaning (PoC), for formal languages, may be construed as asserting that the meaning of a compound expression is deterministically (and often recursively) analysable in terms of the meaning of its constituents, taking into account the mode in which these constituents are combined so as to form the compound expression. From a logical point of view, this amounts to prescribing a constraint – that may or may not be respected – on the internal mechanisms that build and give meaning to a given formal system. Within the domain of formal semantics and of the structure of logical derivations, PoC is often directly reflected by metaproperties such as truth-functionality and analyticity, characteristic of computationally well-behaved logical systems. After the success of its first and second editions, the workshop GeTFun 3.0 is dedicated to the study of various well-motivated ways in which the attractive properties and metaproperties of truth-functional logics may be stretched so as to cover more extensive logical grounds. The ubiquity of non-classical logics in the formalization of practical reasoning demands the formulation of more flexible theories of meaning and compositionality that allow for the establishment of coherent and inclusive bases for their understanding. Such investigations presuppose not only the development of adequate frameworks from the perspectives of Model Theory, Proof Theory and Universal Logic, but also the construction of solid bridges between the related approaches based on various generalizations of truth-functionality. Applications of broadly truth-functional logics, in their various guises, are envisaged in several areas of computer science, mathematics, philosophy and linguistics, where the ever increasing complexity of systems continuously raise new and difficult challenges to compositionality.

The workshop welcomes submissions on all topics related to compositionality of meaning in logic, and in particular to issues connected to generalizations of metalogical notions such as:

- truth-functionality
- nondeterminism in semantics
- logical bivalence vs algebraic many-valuedness
- analyticity
- subformula principle and complexity measures
- semantic effectiveness and decision procedures for non-classical logics
- cut-free vs cut-based proof formalisms
- proof strategies and proof-search
- modular logical specification formalisms
- rule invertibility, structurality and logical harmony

Submissions should consist of an abstract of up to 1,000 words, sent by email before April 19, 2015 to the Gmail account: getfunw.

Each contributed talk is planned to have the duration of 25 minutes, divided into 20 minutes of presentation and 5 minutes of discussion.

The GeTFun 3.0 workshop occurs within the scope of the Marie Curie EU FP7 IRSES project GeTFun.

As keynote speakers, invited by the organization, there were 3 project members, and additionally 2 international experts in the field.

- Ofer Arieli (MTA, IL)
Sequent-based Argumentation
- Alessandra Palmigiano (TU Delft, NL)
Unified Correspondence as a Proof-Theoretic Tool
- Luiz Carlos Pereira (PUC-Rio, BR)
Schematic rules and atomic polymorphism
- Guillaume Hoffmann (UNCordoba, AR)
Relation- and Domain-Changing modal operators
- Heinrich Wansing (RUB, DE)
Compositionality in Proof-Theoretic Semantics

The workshop counted also with 21 contributed talks, by members of the project, but also by researchers

from other institutions interested in the proposed research topics.

- Fabien Schang (HSE, RU)
Agreeing about Disagreement
- René Gazzari (UTubingen, DE)
Calculus of Natural Calculations
- Francicleber Martins Ferreira (UFC, BR)
Bounded-Degree Quantification and MSO_2
- Hugo Macedo, Edward Hermann Haeusler (PUC-Rio, BR)
Yoneda's embedding and Post completeness
- Samuel Gomes da Silva (UFBA, BR), Valeria de Paiva (UFRN, BR)
Dialectica Categories, Cardinalities of the Continuum and Combinatorics of Ideals
- Revantha Ramanayake (TU Wien, AT), Agata Ciabattoni (TU Wien, AT), Nikolaos Galatos (UDenver, US)
Analyticity and Conservativity in the Display Calculus
- Björn Lellmann, Roman Kuznets (TU Wien, AT)
Grafting Hypersequents onto Nested Sequents
- Elaine Pimentel (UFRN, BR), Agata Ciabattoni (TU Wien, AT), Carlos Olarte (UFRN, BR)
On proofs, systems, specification and verification
- Marcela Quispe-Cruz (UPT, PE), Vaston Costa (PUC-Rio, BR), Edward Hermann Haeusler (PUC-Rio, BR)
Np full system and Mimp-fol Association
- Carlos Olarte (UFRN, BR), Elaine Pimentel (UFRN, BR), Vivek Nigam (UFPB, BR)
Subexponential concurrent constraint programming
- R. Santiago (UFRN, BR), B. Bedregal (UFRN, BR), J. Marcos (UFRN, BR), C. Caleiro (UL, PT)
Semi-BCI-Algebras
- Ofer Arieli (MTA, IL), Arnon Avron (TAU, IL)
Minimal Paradefinite Logics for Reasoning with Incompleteness and Inconsistency
- Benjamín Bedregal (UFRN, BR), Regivan Santiago (UFRN, BR), João Marcos (UFRN, BR)
Toward Nondeterministic Interval-Valued Fuzzy Logics: The case of the Negations
- Sanderson Molick (UFRN, BR), Carlos Caleiro (UL, PT), João Marcos (UFRN, BR)

Bivaluations and generalized analyticity

- Arnon Avron (TAU, IL)

Semantic Proofs of Cut-elimination

- Sérgio Marcelino, Carlos Caleiro (UL, PT)

Combined logics: characterizing mixed reasoning and applications

- Manuel Martins (UA, PT), Diana Costa (UA, PT), João Marcos (UFRN, BR)

A hybrid logic that allows [local] inconsistencies

- Claudio Callejas (UFRN, BR)

Should a new hierarchy in AAL be built?

- Umberto Rivieccio (TU Delft, NL)

Many-valued modal logic over residuated lattices via duality

- Adriano Dodó (UFRN, BR), João Marcos (UFRN, BR)

Axiomatizing normal modal [paraconsistent] logics

- Alexandre Rademaker, Edward Hermann Haeusler (PUC-Rio BR)

How Kelsenian Jurisprudence and Intuitionistic Logic help to avoid Contrary-to-Duty paradoxes in Legal Ontologies

Further details, as well as the workshop schedule, can be consulted at the webpage sqig.math.ist.utl.pt/GeTFun/3.0.

Student supervision

On the subject of supervision of students, one should mention that:

- Master student Filipa Montez at IST, U Lisboa, Portugal is being supervised by C. Caleiro (IT) on topics related to ???.
- L. Carlos Pereira at PUC-Rio, Brazil started a PhD supervision in 2015 of a student working in proof-theoretical semantics – Bruno Rigonato Mundim, advised Sanderson Molick (Natal) as MA student, Daniel Skurt (RUB) and Thomas Ferguson (New York) as PhD students.
- Agata Ciabattoni students defended their thesis: Paolo Baldi on "Standard completeness: proof-

theoretic and algebraic methods" in August 2015, and Lara Spindler on "Tools for the Investigation of Non-classical Logics" in June 2015.

- Jean-Yves Beziau is advising Pedro Vasconcelos Junqueira Gomlevsky, MD, Laws of Nature, and Antonio Marmo, PhD, Truth and Reality Federal both in University of Rio de Janeiro.
- The students of Regivan Santiago and Benjamin Bedregal, Flaulles Boone Bergamaschi and Liliane Ribeiro da Silva defended their thesis ("Strong Primality in Fuzzy Environment" and "An Interval Framework for Clustering Interval Data", respectively). The student Emmanuely Monteiro Silva de Sousa defended his master thesis ("Gradual Complex Numbers and the Evaluation of Classifiers").
- Elaine Pimentel and Carlos Olarte are advising the following master students: Paulo Maia, João Neto, Laura dell Orto, Bruno Xavier.
- Joao Marcos's student Sanderson Molick defended his master thesis "Of madness and many-valuedness: an investigation into Suszko's Thesis".

>>> Dissemination of results

Talks

Broadcasting the results of GeTFun related research, in many cases in collaboration with partner institutions within the project, sometimes work in progress, project members have delivered over 100 talks on relevant research topics, in international conferences, conferences and workshops during the course of 2015.

- Y. Shramko. "Modal Translation for the Dual-Intuitionistic Logic" (9th Congress of the Gesellschaft für analytische Philosophie, Osnabrück, Germany – September 14-18).
- O.Arieli, C.Strasser. Sequent-based logical argumentation. The 10th Workshop on Logical and Semantic Frameworks with Applications (LFSA'15, Invited Talk), Natal, Brazil, September 2015.

- O. Arieli, A. Avron. Parafinite logics for reasoning with incompleteness and inconsistency. The 3rd Workshop on Compositional Meaning in Logic (GeTFun 3.0). Natal, Brazil, September 2015. (Tasks H2, J2)
- E. Herman. NP system and Mimp-graph association. 5th World Congress and School on Universal Logic, 2015.
- L. Pereira. "The Russell-Prawitz translation: a view from proof-theory", General Proof Theory, 27–29 November 2015, Tübingen.
- L. Pereira. "Schematic rules and atomic polymorphism" 3rd Workshop on Generalizations of Truth ;Functionality, Dates: Sep 1–3, 2015, Natal, Brazil
- L. Pereira. "Translations: a view from proof-theory". "BeyondLogic", 21–22 May, Rome.
- H. Wansing. "Compositionality in proof-theoretic semantics". 3rd Workshop on Generalizations of Truth-Functionality (Natal, September 1–3, 2015)
- Y. Shramko "A Modal Translation for Dual-Intuitionistic Logic", Osnabrueck (Germany), September 14–17, 2015. At GAP.9
- H. Wansing. "On split negation, falsification, and verification", Osnabrueck (Germany), September 14–17, 2015. At GAP.9
- H. Wansing. lecture at the workshop "Proof theory of modal and nonclassical logics". CLMPS 2015, August 2015
- H. Wansing. invited talk on "Natural deduction for bi-connexive logic". CLMPS 2015, August 2015
- H. Wansing. "On symmetry between

verification and falsification". IV Workshop
"Cientico LogIA – PenCogLin" Fortaleza (Brazil),
August 2015

- H. Wansing. invited talk on
"Compositionality in proof-theoretic semantics". 3rd
Workshop on Generalizations of Truth-Functionality.
Natal (Brazil), September 2015

- H. Wansing. invited talk on
"Compositionality in proof-theoretic semantics". 7th
Conference "Non-Classical Logic. Theory and
Applications". Torun (Poland), September 2015

- H. Wansing. invited talk on "A more general
general proof theory". conference "General Proof
Theory Celebrating 50 Years of Dag Prawitz's "Natural
Deduction"" Tuebingen (Germany), November 2015

- Arnon Avron. Semantic Proofs of Cut-
elimination Workshop on Proof Theory (invited) April
16–18, Utrecht, Holland

- Arnon Avron. Using Assumptions in Gentzen-
type Systems Workshop on the proof theory of modal
and non-classical logics Congress of Logic,
Methodology and Phil. of Science August 3–8, Helsinki

- Arnon Avron. What is a classical LFI, and
when are two such logics identical Workshop on Logics
of Formal Inconsistency Logic@NAT conference, August
31– September 4, Natal, Brazil

- L. Cohen and R. Constable. Intuitionistic
Ancestral Logic as a Dependently Typed Abstract
Programming Language. WoLLIC 2015 (22nd Workshop on
Logic, Language, Information and Computation) July
20–23, Bloomington, Indiana, USA

- B. LELLMANN, R. RAMANAYAKE: "Invited
Tutorial: Proof Theoretic Reasoning"; TRS Reasoning
School, Nat@logic 2015, Natal; 31.08.2015 –
04.09.2015.

- B. LELLMANN: "Linear Nested Sequents"; Workshop on Efficient and Natural Proof Systems, Bath, 2015.
- B. LELLMANN: "The Framework of Linear Nested Sequents"; Researcher's Seminar of the Theory and Logic Group, TU Wien, 2015.
- B. LELLMANN: "Linear Nested Sequents, 2-sequents and Hypersequents" TABLEAUX 2015, Wrocław.
- B. LELLMANN: "Grafting Hypersequents onto Nested Sequents" GeTFun 3.0, Nat@logic 2015, Natal.
- R. RAMANAYAKE: "Between Axioms and Structural Rules in the Display Calculus" Algebra and Coalgebra meet Proof Theory (ALCOP VI), Delft University of Technology, Netherlands, Delft; 06.05.2015 – 08.05.2015.
- R. RAMANAYAKE: "Conservativity and internal calculi via the Display Calculus." GeTFun 3.0 Workshop, Nat@logic 2015, Natal; 31.08.2015 – 04.09.2015.
- R. RAMANAYAKE: "Internal calculi for substructural logics via syntactic proofs of conservativity." Topology, Algebra, and Categories in Logic 2015 (TACL), Ischia; 21.06.2015 – 26.06.2015.
- P. BALDI "Density Elimination II", Workshop on Admissible Rules and Unification II, 30 January – 2 February 2015 Les Diablerets (Switzerland)
- P. BALDI "Standard Completeness for Uninorm-Based Logics", IEEE International Symposium on Multiple-Valued Logic May 18–20, 2015, Waterloo, Ontario, Canada
- A. CIABATTONI Invited talk at Topology, Algebra, and Categories in Logic 2015 (TACL 2015), June 2015, Ischia (Italy)
- A. CIABATTONI Invited talk at Algebra and

Coalgebra meet Proof Theory VI, 2015 (ALCOP VI),
Delft University of Technology, Netherlands, Delft;
06.05.2015 – 08.05.2015.

- A. CIABATTONI Invited talk at the European Conference on Logics in Artificial Intelligence (JELIA 2014) , September 2014, Madeira (Portugal)
- A. CIABATTONI Invited talk at the 87th Workshop on General Algebra (AAA87), February 2014, Linz (Austria)
- A. CIABATTONI Invited tutorial at Boolean Algebras, Lattices, Algebraic & Quantum Logic, Universal Algebra, Set Theory, and Set-theoretic and Point-free Topology (BLAST 2015) , June 2015, Denton US
- A. CIABATTONI, "Density Elimination I", Workshop on Admissible Rules and Unification II, 30 January – 2 February 2015 Les Diablerets (Switzerland)
- A. CIABATTONI "A proof theoretic approach to standard completeness" Workshop BEYOND 2014, December 03-05, 2014 – University of Florence – Italy
- M Martins. Quasi hybrid logic: Semantics and Proof Theory, by Diana Costa and Manuel A. Martins 5th World Congress on universal Logic (UNILOG 2015) Istanbul, Turkey.
- M Martins. Behavioral equivalence of equivalent hidden logics, 5th World Congress on universal Logic (UNILOG 2015) Istanbul, Turkey.
- M Martins. A hybrid logic that allows [local] inconsistencies, 3rd GeTFun: Generalizations of Truth-Functionality Natal, Brasil.
- J.Y. Beziau. The hexagon of analogy. First World Congress on Analogy November 5-8, 2015, Puebla, Mexico

- J.Y. Beziau. Logicity – Philosophy of Logic Workshop September 8–9, 2015, Mexico City, Mexico
Logic is not logic
- J.Y. Beziau. IX Principia International Symposium Possible worlds and their applications in philosophy and the sciences August 17–20, 2015, Florianópolis, Brazil What is a possible world? Award Ceremony First Newton da Costa prize of Logic
- J.Y. Beziau. Round squares are no contradiction. Logic Colloquium 2015 August, 3–8, 2015, Helsinki, Finland
- J.Y. Beziau. Semiotics of Modern Logic. Workshop History and Philosophy of Logic Notations. August, 1–2, 2015, Tallinn, Estonia
- J.Y. Beziau. Opening and Closing Sessions. 5th World Congress and School on Universal Logic June 20–30, 2015, Istanbul, Turkey
- J.Y. Beziau. Introduction to Universal Logic 10th Panhellenic Logic Symposium June 11–15, 2015, Karlovassi, Samos, Greece
- J.Y. Beziau. Un cercle carré n'est pas une contradiction. Logic in Question V June 8–9, 2015, Paris, France
- J.Y. Beziau. Paraconsistent Logic and Contradictory Viewpoints 44th Annual Meeting of the Society for Exact Philosophy – SEP May 22–24, 2015, Hamilton, Canada
- J.Y. Beziau. Is God Paraconsistent? 1st World Congress on Logic and Religion April 1–5, 2015, João Pessoa, Brazil
- J.Y. Beziau. The Future of Logic 3rd Workshop LOGIA – Logic and Artificial Intelligence March 27, 2015, Fortaleza, Brazil
- J.Y. Beziau. Interaction between oppositions

and colours 2nd International Colloquium on Colours and Numbers March 23–26, 2015, Fortaleza, Brazil

- J.Y. Beziau. Introduction to Paraconsistent Logic II. University of Tel Aviv – Dpt of Philosophy December 24, 2015, Tel Aviv, Israel

- J.Y. Beziau. Introduction to Paraconsistent Logic I. University of Tel Aviv – Dpt of Philosophy. December 24, 2015, Tel Aviv, Israel

- J.Y. Beziau. General Formulations of Lindenbaum Maximalization Theorem and Their Applications to a Huge Variety of Logical Systems. University of Tel Aviv – School of Computer Science. December 17, 2015, Tel Aviv, Israel.

- J.Y. Beziau. Paraconsistency, Contradiction and the Square of Opposition. University of San Jose – Dept of Cognitive Science. November 13, 2015, San Jose, Costa Rica

- J.Y. Beziau. The Semiotic Hexagon of Opposition. University of San Jose – Dept of Cognitive Science. November 12 2015, San Jose, Costa Rica

- J.Y. Beziau. Identity and the Square of Opposition. University of San Jose – Dept of Cognitive Science. November 11, 2015, San Jose, Costa Rica

- J.Y. Beziau. From Dichotomy to the Hexagon of Opposition. University of San Jose – Dept of Cognitive Science. November 10, 2015, San Jose, Costa Rica

- J.Y. Beziau. The Square of Opposition in Historical Perspective. University of San Jose – Dept of Cognitive Science. November 9, 2015, San Jose, Costa Rica

- J.Y. Beziau. Logic – Past, Present and Future. University of California, Irvine, Dept of Logic and Philosophy of Science. October 23, 2015,

Irvine, California, USA

- J.Y. Beziau. Lindenbaum Maximalization Theorem. University of California, Los Angeles, Dept of Mathematics. October 9, 2015, Los Angeles, California, USA
- J.Y. Beziau. Squaring Complexity. Santa Fe Institute. October 1, 2015, Santa Fe, New Mexico, USA
- J.Y. Beziau. Logic – Past, Present and Future. University of Lisbon, IST, Dept of Mathematics. May 29, 2015, Lisbon, Portugal
- J.Y. Beziau. Introduction to Paraconsistent Logic II. University of California, San Diego, Dept of Philosophy. May 18, 2015, San Diego, California, USA
- J.Y. Beziau. Introduction to Paraconsistent Logic I. University of California, San Diego, Dept of Philosophy. May 14, 2015, San Diego, California, USA
- J.Y. Beziau. Possibility, Imagination and Conception. University of Miami – Dept of Philosophy. April 29, 2015, Miami, Florida, USA.
- J.Y. Beziau. Round Square are No Contradictions. Columbia University – Dept of Philosophy. April 24, 2015, New York, New York, USA.
- J.Y. Beziau. The Semiotic Hexagon. University of Yale – Dept of Linguistics. April 13, 2015, Yale, Connecticut, USA
- J.Y. Beziau. Um Círculo Quadrado não é uma Contradição. University of Brasilia – Dept of Philosophy. March 17, 2015, Brasilia, Federal District, Brazil
- J.Y. Beziau. Round Square are No Contradictions. University of California, Davis, Dept of Philosophy. February 6, 2015, Davis, California, USA

- B. R. C. BEDREGAL. Construction of Typical Hesitant Triangular Norms regarding Xu-Xia-partial Order, IFSA-Eusflat 2015.
- B. R. C. BEDREGAL. On the laws of contraposition for residual implications derived from overlap functions, Fuzzy Systems (FUZZ-IEEE), 2015 IEEE International Conference on
- B. R. C. BEDREGAL. Fuzzy implications and the law of 0-conditionality. The case of residual implications derived from overlaps functions
- R. Santiago On properties of Uniformly Strongly Prime fuzzy ideals, Fuzzy Information Processing Society (NAFIPS) held jointly with 2015 5th World Conference on Soft Computing (WConSC), 2015 Annual Conference of the North American.
- R. Santiago. Some Instances of Graded Consequence in the Context of Interval-Valued Semantics, 6th Indian Conference on Logic and its Applications (ICLA)
- R. Santiago. Towards robustness and duality analysis of intuitionistic fuzzy aggregations. Conference on Fuzzy Systems (FUZZ-IEEE), 2015 IEEE International.
- R. Santiago. i-Metric, fuzzy metric, topology, metrizability. IFSA-Eusflat 2015.
- E. Pimentel. Invited talk: "Proof search in modal logics", Workshop on Logic, Language and Information (Wolli 2015 – Niterói, Brazil)
- E. Pimentel. Invited speaker: "Focusing, computation, specification and reasoning", 1st Workshop on Focusing (WoF 2015 -- Fiji Islands)
- C. Olarte. "From subexponentials in linear logic to concurrent programming and back", Workshop on Logic, Language and Information (Wolli 2015 –

Niterói, Brazil) (Invited talk)

- J. Marcos. "What Makes for a Good Paraconsistent Negation?" (Invited talk) at the V Workshop Científico do LOGIA – PenCogLin, Fortaleza, BR, Nov 2015.
- J. Marcos. "On the birth of the LFIs: Some alternative histories" (Invited talk), at the Workshop commemorating the 15 years of the Logics of Formal Inconsistency (LFIs¹⁵), Natal, BR, Sep 2015.
- J. Marcos. "Consequiland: on logics with many dimensions" (Invited talk) at the V World Congress and School on Universal Logic (UniLog 2015), Istanbul, TR, Jun 2015.
- J. Marcos. "Breaking the Proof Code" at the seminars of CIDMA – Center for Research and Development in Mathematics and Applications, Aveiro, PT, May 2015.
- J. Marcos. III Workshop Científico LOGIA – PenCogLin. "Breaking the Proof Code". Fortaleza, BR, Mar 2015.
- J. Marcos. "Notes Regarding a Colourful Metalogic" (Invited talk) at the 2nd International Colloquium on Colours and Numbers: How Colours Matter for Philosophy, Fortaleza, BR, Mar 2015.
- J. Marcos. "O Bem Que Ela Me Faz: como a Lógica pode contribuir para a sua vida" at the XII Seminário Informal(, mas Formal!) do Grupo de Teoria da Computação da UnB – GTC/UnB, Brasília, BR, Feb 2015.
- C. Caleiro Fibring logics: decidability and conservativity, Part I World Congress on Universal Logic 2015, Istanbul, Turquia (Junho 2015).
- S. Marcelino. Fibring logics: decidability and conservativity, Part II World Congress on Universal Logic 2015, Istanbul, Turquia (Junho 2015).

- S. Marcelino. Cancellation, many-valuedness, and combined logics, World Congress on Universal Logic 2015, Istambul, Turquia (Junho 2015).
- S. Marcelino. Combined logics: characterizing mixed reasoning and applications, NAT@logic2015 (GeTFun 3.0), Natal, Brasil (Agosto 2015).
- S. Marcelino. Disjointly fibred logics: characterizing mixed reasoning and applications" LoLITA seminar 12 February 2016, Natal, Brasil.
- V. de Paiva. Invited talk at LSFA2015 on "Modal Type Theory", based on work with Eike Ritter, submitted to especial issue.
- V. de Paiva. Invited talk at Berkeley Colloquium on "Intuitionistic Modal Logic: 15 years later", 6March, 2015.
- V. de Paiva, Charles Stewart, Natasha Alechina. Intuitionistic Modal Logic: A 15-year retrospective. Journal of Logic and Computation, 01 August 2015
- S. Gomes da Silva, Valeria de Paiva. Dialectica Categories, Cardinalities of the Continuum and Combinatorics of Ideals. 5th World Congress School on Universal Logic (UniLog 2015), Istanbul, TR, Jun 2015
- U. RIVIECCIO. Johannesburg (South Africa), 9 January 2015. Logic and Algebra Day at the University of Johannesburg. Invited talk on "Non-classical public announcement logics".
- U. RIVIECCIO. Barcelona (Spain), 15 April 2015. Non-classical logics seminar of the University of Barcelona. Invited talk on "An algebraic view of dynamic epistemic logics".
- U. RIVIECCIO. Samos (Greece), 13 June 2015. 10th Panhellenic Logic Symposium. Contributed talk on

"Łukasiewicz public announcement logic".

- U. RIVIECCIO. Ischia (Italy), 26 June 2015. TACL 2015: Topology, Algebra, and Categories in Logic. Contributed talk on "Bilattice Logic of Epistemic Action and Knowledge".
- U. RIVIECCIO. Natal (Brazil), 3 September 2015. NAT@Logic 2015 – 3rd Workshop on Generalizations of Truth-Functionality. Contributed talk on "Many-valued modal logic over residuated lattices via duality".
- U. RIVIECCIO. Fortaleza (Brazil), 10 December 2015. 1st Joint Meeting Brazil–Spain in Mathematics, Special session on Mathematical Logic and Set Theory. Invited talk on "Non-classical dynamic epistemic logics".
- U. RIVIECCIO. Les Diablerets (Switzerland), 12 December 2015. ManyVal 2015. Contributed talk on "Łukasiewicz public announcement logic".
- S. Molick. "Dualizing q-consequence operations" (joint work with Daniel Skurt), at the V World Congress and School on Universal Logic (UNILOG 2015), Istanbul, TR, Jun 2015.
- S. Molick. "On logical pluralism and non-Tarskian entailment", at the Second Workshop on Philosophy, Logic and Analytical Metaphysics (FILOMENA 2), Natal, BR, Sep 2015.
- S. Molick. "Bivaluations and generalized analyticity" (joint work with João Marcos and Carlos Caleiro) , at the 3rd GetFun Workshop, Natal, BR, Sep 2015.
- Joao Daniel. "What does the slingshot needs to shoot?: Slingshot arguments and plural logics" at the V World Congress and School on Universal Logic (UniLog 2015), Istanbul, TR, Jun 2015
- Joao Daniel "On Singshots and Plural Logic"

at the Second Workshop on Philosophy, Logic and Analytical Metaphysics (FILOMENA 2), Natal, BR, Sep 2015.

- E. Erickson. "Como ser ou nao ser um pluralista logico" at the XXV Semana de Filosofia da UFRN, Natal, BR, May 2015.
- E. Erickson. "Putting into question Beall & Restall's pluralism" at the Second Workshop on Philosophy, Logic and Analytical Metaphysics (FILOMENA 2), Natal, BR, Sep 2015.

Publications

Over the course of 2015, the GeTFun project had 63 new publications, numbered 132–194 below. These publications include 28 papers published or accepted for publication in international scientific journals of the area, and another 6 papers submitted, plus 14 chapters in serials and books with international peer review, as well as 15 articles in international conference proceedings. Emphasis should be put on the fact that, among the papers published in these 3 years, more than two dozens are coauthored by project members coming from more than one GeTFun participant institution, which highlights the merits of the collaboration provided by the project.

Additional information can be found at the project web page in sqig.math.ist.utl.pt/GeTFun/publications/

[1] M. Alviano, F. Calimeri, G. Charwat, M. Dao-Tran, C. Dodaro, G. Ianni, T. Krennwallner, M. Kronegger, J. Oetsch, A. Pfandler, J. Puehrer, C. Redl, F. Ricca, P. Schneider, M. Schwengerer, L. Spendier, J. P. Wallner and G. Xiao.

The Fourth Answer Set Programming Competition: Preliminary Report. LPNMR 2013, P. Cabalar and T.C. Son (Eds.), LNAI 8148, pp. 42–53, 2013.

[2] O. Arieli, A. Zamansky. A dissimilarity-based framework for generating inconsistency-tolerant

logics. *Annals of Mathematics and Artificial Intelligence* 73(1-2) pp.47--73, 2015.

[3] Arnon Avron. Paraconsistency, Paracompleteness, Gentzen Systems, and Trivalent Semantics. *Journal of Applied Non-Classical Logic* 24:12-34, 2014.

[4] Arnon Avron, Beata Konikowska, Anna Zamansky: Cut-free sequent calculi for C-systems with generalized finite-valued semantics. *J. Log. Comput.* 23(3): 517-540 (2013).

[5] M. Baaz and A. Ciabattoni. Proof theory of witnessed Goedel logic: a negative result. Accepted for Publication in *Journal of Logic and Computation*, 2013.

[6] Matthias Baaz, Ori Lahav, Anna Zamansky. Finite-valued Semantics for Canonical Labelled Calculi. *J. Autom. Reasoning* 51(4): 401-430 (2013).

[7] L.S. Barbosa, Manuel A. Martins, M. Carreteiro, Hilbert-style Axiomatisation for Equational Hybrid Logic, accepted in *Journal of Logic, Language and Information*, 2013.

[8] Benjamín C. Bedregal, Renata Reiser, Humberto Bustince Sola, Carlos Lopez-Molina and Vicenç Torra. Aggregation functions for typical hesitant fuzzy elements and the action of automorphisms. *Information Sciences* 255:82-99, 2014.

[9] B. Bedregal, R. Reiser and G. Dimuro. Revisiting XOR-implications: classes of fuzzy (co)implications based on F-XOR (F-XNOR) connectives, *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, v. 21, p. 899-925, 2013.

[10] Benjamín Bedregal and Regivan Santiago. Interval representations, Łukasiewicz implicators and Smets-Magrez axioms. *Information Sciences*. 221: 192-200, 2013.

[11] B. Bedregal, R. Santiago, H. Bustince, D.

Paternain and R. Reiser. Typical Hesitant Fuzzy Negations. *International Journal of Intelligent Systems* 29:525–543, 2014.

[12] J.-Y. Béziau. The metalogical hexagon of opposition. *Argumentos*, 10 (2013).

[13] J.-Y. Béziau and A. Buchsbaum, “Let us be Antilogical: Anti-Classical Logic as a Logic”, in A. Moktefi, A. Moretti and F. Schang (eds), *Let us be Logical*, College Publication, London, 2016.

[14] J.-Y. Béziau, “The relativity and universality of logic”, *Synthese – Special Issue Istvan Némethi 70th Birthday*, 192 (2015), pp.1939–1954.

[15] J.-Y. Béziau. Three Sisters : Philosophy, Mathematics and Logic. In O. Pombo (ed), *The place of philosophy of science at Lisbon University*, University of Lisbon, 2013.

[16] J.-Y. Béziau, “Paraconsistent logic and contradictory viewpoints”, *Revista Brasileira de Filosofia*, 242 (2015).

[17] I. Cafezeiro, J. Viterbo, A. Rademaker, E.H. Haeusler and M. Endler. Specifying ubiquitous systems through the Algebra of Contextualized Ontologies, accepted in *Knowledge Engineering Review*.

[18] C. Caleiro, J. Marcos, M. Volpe. Bivalent semantics, generalized compositionality and analytic classic-like tableaux for finite-valued logics. *Theoretical Computer Science* 603:84–110, 2015.

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[21] C. Caleiro, L. Viganò and M. Volpe. A labeled

deduction system for the logic UB. Proc. of the 20th Intl. Symp. on Temporal Representation and Reasoning (TIME 2013). IEEE Computer Society Press, 2013.

[22] G. Charwat, G. Ianni, T. Krennwallner, M. Kronegger, A. Pfandler, C. Redl, M. Schwengerer, L. Spendier, J. P. Wallner and G. Xiao. VCWC: A Versioning Competition Workflow Compiler. LPNMR 2013, P. Cabalar and T.C. Son (Eds.), LNAI 8148, pp. 233--238, 2013.

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[26] Agata Ciabattoni, Ori Lahav, Lara Spendier, Anna Zamansky: Automated Support for the Investigation of Paraconsistent and Other Logics. LFCS 2013: 119-133.

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Journal of Logic and Computation, 2013.

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[32] R. Diaconescu, T. Mossakowski and A. Tarlecki. The institution-theoretic scope of logic theorems. Accepted in *Logica Universalis*, 2013.

[33] Adriano Dodó. “On Rich Modal Logics”, MSc Thesis, UFRN, Brazil, 2013. Supervised by J. Marcos.

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[37] Ori Lahav. From Frame Properties to Hypersequent Rules in Modal Logics. *Proceedings of LICS 2013*.

[38] Ori Lahav. Studying Sequent Systems via Non-deterministic Multiple-Valued Matrices. Accepted to *Journal of Multiple-Valued Logic and Soft Computing (MVLSC)*.

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(3) PROJECT MANAGEMENT

>>> Overview of the activities carried out by the partnership; Identification of problems encountered and corrective action taken

In 2015, the GeTFun project had 63 new research articles published or submitted, covering all the tasks that had been planned. Emphasis should be put on the fact that, among the papers published in these 3 years, more than two dozens are coauthored by project members coming from more than one GeTFun participant institution, which highlights the merits of the collaboration provided by the project.

After the last amendment, the GeTFun project involves 16 partners from 9 different countries. Up to 2015, members of the project were involved in close to 60 secondments. Project members were involved in 12 secondments in 2015, as listed below.

- Y. Shramko (KDPU) visited RUB, Germany – 13–28 September 2015
- C. Caleiro (IT) visited UFRN, Brazil – August 2015
- S. Marcelino (IT) visited UFRN, Brazil – 23 August– 2 October 2015
- A. Avron (MTA) visited UFRN, Brazil – 31 August– 4 September 2015
- R. Ramanayake (TU-Wien) visited UFRN, Brazil – August 2015
- B. Lellmann (TU-Wien) visited UFRN, Brazil – 31 August– 4 September 2015
- M. Martins (UA) visited RUB, Germany – September 12–28
- J.-Y. Beziau (UB) visited TAU, Israel, December 15, 2015 – February 15, 2016
- Elaine Pimentel (UFRN) visited TU-Wien, Austria May 27 – June 27, 2015
- Carlos Olarte (UFRN) visited TU-Wien, June 16

– June 27, 2015

- J. Marcos (UFRN) visited UA, Portugal, May 17
– May 23, 2015

- J. Marcos (UFRN) visited UL, Portugal, May 24
– 2 July, 2015

The number of secondments in 2015 is roughly half of those initially proposed. We have encouraged project participants to organize and take better profit of this essential cooperation mechanism in 2016, also according to the amendment underway.

As planned, the project's third international workshop was held in Natal, Brazil, organized by Elaine Pimentel (UFRN, BR), João Marcos (UFRN, BR) and Carlos Caleiro (IT, PT), as reported above. The GeTFun 3.0 Workshop program included, according to plan, a short project meeting. The meeting could count with project members from a majority of participating institutions. The meeting was used to discuss the progress of the various running WPs, as well as the details of the ongoing amendment. All project members were strongly encouraged to take better profit of the secondment resources available, besides fulfilling the scientific goals of the project (all in line with the plan). Furthermore, all those present backed up the possibility of organizing the Fourth GeTFun Workshop jointly with the IJCAR 2016 international conference in Coimbra, Portugal with the help of our partners in UA and IT.

For the project logo, a summary, and further details on GeTFun see the website sqig.math.ist.utl.pt/GeTFun.

(4) ADDITIONAL INFORMATION

>>> Additional information, which may be considered useful to assess the work done during the reporting period

The organization of the fourth workshop of the

project is already underway (<http://sqig.math.ist.utl.pt/GeTFun/4.0>). It will be held in Coimbra, Portugal on July 1–2, 2016, co-located with the IJCAR 2016 event (<http://www.ijcar-2016.info>), and co-organized by Manuel Martins (UA, PT), João Marcos (UFRN, BR), and Carlos Caleiro (IT, PT).