Computational Logic in the Alps

University Center Obergurgl
September 5–9, 2016

Foreword

This booklet contains the program of CLA 2016 – Computational Logic in the Alps – which takes place from September 5 until September 9 in the University Center Obergurgl. CLA consists of four meetings.

- AJSW 2016 – 4th Austria-Japan Workshop on Rewriting / 45th TRS meeting
  organizers: Nao Hirokawa and Christian Sternagel

- IWC 2016 – 5th International Workshop on Confluence
  PC chairs: Beniamino Accattoli and Ashish Tiwari

- LC&A 2016 – Logic, Complexity and Automation
  organizers: Georg Moser and Thomas Powell

- WST 2016 – 15th International Workshop on Termination
  PC chairs: Aart Middeldorp and René Thiemann

The program consists of 56 regular talks as well as two competitions and 8 invited talks.

- CoCo 2016 – 5th international confluence competition

- termComp 2016 – 13th international termination and complexity competition

- Patrick Baillot – On a type-based complexity analysis of subrecursive programs

- Arnold Beckmann – Provably total NP search problems of bounded arithmetic

- Ulrich Berger – Program extraction: correctness vs. efficiency

- Reiner Hähnle – Refined resource analysis based on cost relations

- Florent Jacquemard – Some results on confluence: decision and what to do without

- Paul-André Melliès – Five basic concepts of axiomatic rewriting theory

- Silvia Steila – Reverse mathematical bounds for the termination theorem

- Florian Zuleger – Automated complexity analysis with the size-change abstraction

There is a joint social event on Wednesday for all meetings, consisting of a CLA dinner with wine tasting in the evening, preceded by either rafting or a visit to Ötzi-Village and the nearby Stuibenfall.

We wish you an interesting and enjoyable week in Obergurgl!

Martina Ingenhaeff-Falkner
René Thiemann
Benjamin Winder

Practical Informations

- The bus from Innsbruck to Obergurgl will leave on Sunday at 18:15 in front of the airport.

  If you arrive at the train station, take bus line F to go to the airport. You can buy a bus ticket for the F-bus on board or at a ticket machine.

  If you have a delay, please contact Sebastiaan Joosten (+43 670 2028986).

- Your room will be ready from 15 o'clock on your arrival day.

- Breakfast is served from 7 o'clock until 9 o'clock. Only on Saturday it starts on 6 o'clock.

- The library is available as meeting room.

- For internet access you can either connect to the WiFi "guest" with password "wlpasswordogu", or you can use your eduroam account.

- The registration fee includes breakfast, two coffee breaks (incl. small cakes), and dinner. At the regular dinners by default only water is served. The preferred way to order other beverages is to let them put on the bill of your room, and pay them on your departure. In case you are sharing a room with another person, please keep in mind what you consumed.

  For lunch, there are snacks (soup, Wiener Schnitzel, etc.) available at the university center, or you can take a short walk to the village center.

- Excursion

  - We will meet at 9:25 in front of the University Center to enter the bus. The bus for excursions will leave at 9:30 from the University Center.

  - Both excursions include lunch.

  - For rafting please bring your swimming clothes from home. For the excursion, you additionally have to bring a towel, e.g., the one from your bathroom in the University Center.

    The bus from rafting back to Obergurgl will leave around 14:15.

  - For Ötzi-Village and the Stuibenfalls there will be a guided tour starting at around 10:15. Lunch will be served at 11:45 at "Ötzis Einkehr". Afterwards there will be free time to further explore Ötzi-Village and the Stuibenfalls. The bus will depart at 15:00 from the parking place at Ötzi-Village.

  - Persons not attending the excursion can indicate on Monday whether they want to have lunch at the University Center or packed lunch on Wednesday.

  - The CLA dinner starts at 7 o'clock in the evening and afterwards there will be the wine tasting.

- You have to leave your room by 10 o'clock on your departure day.

- On Saturday, breakfast starts at 6 o'clock on Saturday. You can checkout starting from 6:45. The bus will leave at 7:30 from the park place of the university center. Please be there a bit earlier for storing your luggage in the bus.

- Receipts can be printed from the registration system. In case of problems, just let us know so that we can send you a PDF.

- In case of problems, you can reach the organizers and the University Center by phone:
  Martina Ingenhaeff-Falkner (+43 650 3685628)
  René Thiemann (+43 650 3589769)
  University Center (+43 512 507 37201)

  The address of the University Center is
  Universitätszentrum Obergurgl
  6456 Obergurgl
  Austria

Monday, September 5

LC&A Session 1 (chair: Georg Moser)
09:00–10:00 Shared invited LC&A talk: Silvia Steila (**in front part of lecture hall**)
Reverse mathematical bounds for the termination theorem
10:00–10:30 Thomas Powell (**in back part of lecture hall**)
Complexity in Higher types

WST Session 1 (in front part of lecture hall; chair: Johannes Waldmann)
10:00–10:30 Christophe Alias, Carsten Fuhs and Laure Gonnord
Estimation of Parallel Complexity with Rewriting Techniques

10:30–11:00 **Coffee break**

LC&A Session 2 (in back part of lecture hall; chair: Stéphane Gimenez)
11:00–11:30 Manuel Schneckenreither
Amortized resource analysis meets term rewrite systems
11:30–12:00 Jürgen Giesl
Lower bounds for runtime complexity of term rewriting
12:00–12:30 Guillaume Bonfante
On the complexity of regular languages

WST Session 2 (in front part of lecture hall; chair: Aart Middeldorp)
11:00–11:30 Alfons Geser, Johannes Waldmann and Mario Wenzel
Symbolic Enumeration of One-Rule String Rewriting Systems
11:30–12:00 Hans Zantema and Alexander Fedotov
Nontermination of string and cycle rewriting by automata
12:00–12:30 Thomas Sternagel and Christian Sternagel
A Characterization of Quasi-Decreasingness

12:30–14:15 **Lunch break**

LC&A Session 3 (in back part of lecture hall; chair: Georg Moser)
15:15–15:45 Michael Schaper
Term based abstractions

WST Session 3 (in front part of lecture hall; chair: René Thiemann)
14:15–15:15 Shared invited WST talk: Reiner Hähnle
Refined Resource Analysis Based on Cost Relations
15:15–15:45 Hans Zantema, Dennis Nolte and Barbara König
Termination of Term Graph Rewriting

15:45–16:15 **Coffee break**

LC&A Session 4 (in front part of lecture hall; chair: Thomas Powell)
16:15–16:45 Alexander Maringele
FLEA dismantlement
16:45–17:45 Shared invited LC&A talk: Ulrich Berger
Program Extraction: Correctness vs. Efficiency
17:45–18:15 Johannes Waldmann
Two concrete challenges in complexity analysis of actual Haskell code

WST Session 4 (in back part of lecture hall; chair: Christian Sternagel)
16:15–16:45 Cynthia Kop
Non-deterministic Characterisations

19:00– **Dinner**

Tuesday, September 6

LC&A and WST Session 5 (in front part of lecture hall; chair: Georg Moser)

08:45–09:30 Termination and complexity competition: start and tool presentations
AProVE, CeTA, CoFloCo, Loopus, and VeryMax

09:30–10:30 Shared invited LC&A talk: Florian Zuleger
Automated complexity analysis with the size-change abstraction

10:30–11:00 **Coffee break**

LC&A Session 6 (in back part of lecture hall; chair: Thomas Powell)

11:00–12:00 Invited LC&A talk: Patrick Baillot
On a type-based complexity analysis of subrecursive programs

12:00–12:30 Nao Hirokawa
Automated normalization analysis for term rewriting

WST Session 6 (in front part of lecture hall; chair: Reiner Hähnle)

11:00–11:30 Jera Hensel, Jürgen Giesl, Florian Frohn and Thomas Ströder
Termination Analysis of Programs with Bitvector Arithmetic by Symbolic Execution

11:30–12:00 Cristina Borralleras, Marc Brockschmidt, Daniel Larraz, Albert Oliveras, Enric Rodríguez Carbonell and Albert Rubio
Proving termination through conditional termination

12:00–12:30 Florian Frohn, Marc Brockschmidt and Jürgen Giesl
Automated Inference of Upper Complexity Bounds for Java Programs

12:30–14:15 **Lunch break**

LC&A Session 7 (in back part of lecture hall; chair: Stéphane Gimenez)

15:00–16:00 Invited LC&A talk: Arnold Beckmann
Provably total NP search problems of Bounded Arithmetic

WST Session 7 (in front part of lecture hall; chair: Albert Rubio)

14:15–15:00 Termination and complexity competition: tool presentations and results
cycsrs, MultumNonMulta, and NaTT

15:00–15:30 Florian Frohn, Matthias Naaf, Jera Hensel, Marc Brockschmidt and Jürgen Giesl
Lower Runtime Bounds for Integer Programs

15:30–16:00 Marc Brockschmidt, Sebastiaan Joosten, René Thiemann and Akihisa Yamada
Certifying Safety and Termination Proofs for Integer Transition Systems

16:00–16:30 **Coffee break**

LC&A Session 8 (in back part of lecture hall; chair: Thomas Powell)

16:30–17:00 Stéphane Gimenez
A simple protocol for parallel computation

17:00–17:30 Flavien Breuvart
On higher-order probabilistic subrecursion

17:30–18:00 Maria Schett
Trees and graphs, sharing and termination

18:00–18:30 Georg Moser
Complexity of acyclic term graph rewriting

WST Session 8 (in front part of lecture hall; chair: Jürgen Giesl)

16:30–17:00 Christian Sternagel
The Generalized Subterm Criterion in TTT2

17:00–17:30 Carsten Fuhs
SMT-Based Techniques in Automated Termination Analysis

17:30–18:00 WST business meeting

19:00– **Dinner**

Thursday, September 8

IWC Session 1 (chair: Beniamino Accattoli)

09:00–09:20   Stefan Kahrs and Connor Smith
Non-omega-overlapping TRSs are UN

09:20–09:40   Bertram Felgenhauer
Efficiently Deciding Uniqueness of Normal Forms and Unique Normalization for Ground TRSs

09:40–10:00   Luis Moraes and Rakesh Verma
Joinability Reduces to Confluence

10:00–10:45   Invited talk: Florent Jacquemard
Some results on confluence: Decision and what to do without

10:45–11:15   **Coffee break**

AJSW Session 1 (chair: Akihisa Yamada)

11:15–11:35   Chengcheng Ji and Masahito Kurihara
Lazy Evaluation Schemes for Efficient Implementations of Multi-Context Algebraic Reasoning Systems

11:35–11:55   Takahiro Nagao
Proving Inductive Validity of Constrained Inequalities

11:55–12:15   Naoki Nishida
Heuristics for Proving Termination of Constrained Rewriting Systems via Rule Duplication

12:15–12:35   Thomas Sternagel
Operational Termination of Conditional Term Rewriting Systems

12:35–14:35   **Lunch break**

IWC Session 2 (chair: Nao Hirokawa)

14:35–14:55   Franziska Rapp and Aart Middeldorp
Confluence Properties on Open Terms in the First-Order Theory of Rewriting

14:55–15:15   Takahito Aoto and Yoshihito Toyama
Ground Confluence Proof with Pattern Complementation

15:15–15:55   Confluence Competition

15:55–16:25   **Coffee break**

AJSW Session 2 (chair: Christian Sternagel)

16:25–16:45   Julian Nagele
Analysing GHC Rewrite Rules

16:45–17:05   Aart Middeldorp
Abstract Completion Revisited (1)

17:05–17:25   Nao Hirokawa
Abstract Completion Revisited (2)

17:25–17:45   Christian Sternagel
Mechanized AC-Equivalence Checking in Isabelle/HOL

17:45–18:05   Vincent van Oostrom
Confluence and Higher-Order Critical-Pair-Closing Systems

18:30–   **Dinner**

Friday, September 9

IWC Session 3 (chair: Vincent van Oostrom)

09:00–09:45   Invited talk: Paul-André Melliès
  Five Basic Concepts of Axiomatic Rewriting Theory
09:45–10:05   Cyrille Chenavier
  An Algebraic Approach of Confluence and Completion
10:05–10:25   Joerg Endrullis, Jan Willem Klop and Roy Overbeek
  Decreasing Diagrams: Two Labels Suffice
10:25–10:45   Clément Alleaume and Philippe Malbos
  Coherence of quasi-terminating decreasing 2-polygraphs

10:45–11:15   **Coffee break**

AJSW Session 3 (chair: Temur Kutsia)

11:15–11:35   Bertram Felgenhauer
  Undecidability of Satisfiability in the First-Order Theory of Rewriting
11:35–11:55   Masahiko Sakai
  Programming in the Esoteric Language Malbolge for Obfuscation
11:55–12:15   Cleopatra Pau
  Anti-Unification Algorithm Library and Applications
12:15–12:35   Takahito Aoto
  Semantics and completeness proof of general inductive theorems

12:35–14:35   **Lunch break**

IWC Session 4 (chair: Bertram Felgenhauer)

14:35–14:55   Julian Nagele, Vincent van Oostrom and Christian Sternagel
  A Short Mechanized Proof of the Church-Rosser Theorem in Nominal Isabelle
14:55–15:15   Thomas Sternagel and Christian Sternagel
  Formalized Confluence of Quasi-Reductive, Strongly Deterministic Conditional TRSs
15:15–15:35   Naoki Nishida
  Notes on Confluence of Ultra-WLL SDCTRSs via a Structure-Preserving Transformation
15:35–15:55   Sayaka Ishizuki, Masahiko Sakai and Michio Oyamaguchi
  Conditions for confluence of innermost terminating term rewriting systems

15:55–16:25   **Coffee break**

AJSW Session 4 (chair: Aart Middeldorp)

16:25–16:45   Akihisa Yamada
  Reachability for Termination
16:45–17:05   Michio Oyamaguchi
  Confluence of Innermost Reduction is Undecidable for Terminating TRSs
17:05–17:25   Yoshihito Toyama
  Termination of TRS Synthesis by Rewriting Induction
17:25–17:45   Temur Kutsia
  Computing Generalizations in Description Logic EL
17:45–17:50   AJSW business meeting

18:30–   **Dinner**

Sponsors

We are grateful for financial support from our sponsors.

- University of Innsbruck, Vizerektorat für Forschung and International Relations Office

- Hypo Tirol Bank

- Volksbank Tirol Innsbruck-Schwaz AG