

# Dr Anupam Das

Office 235, School of Computer Science  
University of Birmingham  
B15 2TT, UK.

Date of birth: 17<sup>th</sup> November, 1987.

Nationality: British.

Languages: English (native), French (fluent).

Email: [a.das@bham.ac.uk](mailto:a.das@bham.ac.uk)

Website: <http://www.anupamdas.com/>

## Career

- 09/19 - present Lecturer. School of Computer Science, University of Birmingham, UK.
- 09/17 - 08/19 Marie Skłodowska-Curie fellow. DIKU, University of Copenhagen, Denmark.
- 10/14 - 08/17 Postdoctoral researcher. LIP, École Normale Supérieure de Lyon, France.
- 11/13 - 09/14 Inria postdoctoral fellow. LIX, École Polytechnique, France.
- 10/10 - 10/13 PhD in Computer Science. University of Bath, UK.
- 10/06 - 08/10 Bachelor's and Master's studies in Mathematics. University of Oxford, UK.

## Papers

- 10/19 Proof complexity of systems of (non-deterministic) decision trees and branching programs. Sam Buss, Anupam Das and Alexander Knop. Accepted to *CSL 2020*.  
<https://arxiv.org/abs/1910.08503>
- 06/19 From QBFs to MALL and back via focussing. Anupam Das. Submitted.  
<https://arxiv.org/abs/1906.03611>  
This is an extended version of an *IJCAR 2018* paper.
- 03/19 A Functional (Monadic) Second-Order Theory of Infinite Trees. Anupam Das and Colin Riba. Accepted.  
<https://arxiv.org/abs/1903.05878>  
This is an extended version of a *LICS 2015* paper.
- 02/19 On the logical complexity of cyclic arithmetic. Anupam Das. Accepted to journal *Logical Methods in Computer Science*.  
<https://arxiv.org/abs/1807.10248>
- 23/10/18 Left-handed completeness for Kleene Algebra, via cyclic proofs. Anupam Das, Amina Doumane & Damien Pous. Proceedings of *LPAR 2018*.  
<https://doi.org/10.29007/hzq3>
- 29/08/18 A recursion-theoretic characterisation of the positive polynomial-time functions. Anupam Das & Isabel Oitavem. Proceedings of *CSL 2018*.  
<https://doi.org/10.4230/LIPIcs.CSL.2018.18>  
Invited to a special journal issue of selected papers from *CSL 2018*.
- 29/08/18 Non-wellfounded proof theory for (Kleene + action)(algebras + lattices). Anupam Das & Damien

- Pous. Proceedings of *CSL 2018*.  
<https://doi.org/10.4230/LIPIcs.CSL.2018.19>
- 30/06/18 Focussing, MALL and the polynomial hierarchy. Anupam Das. Proceedings of *IJCAR 2018*.  
[https://doi.org/10.1007/978-3-319-94205-6\\_45](https://doi.org/10.1007/978-3-319-94205-6_45)  
Invited to a special journal issue of selected papers from *IJCAR 2018*.
- 30/08/17 A cut-free cyclic proof system for Kleene Algebra. Anupam Das & Damien Pous. Proceedings of *Tableaux 2017*.  
[https://doi.org/10.1007/978-3-319-66902-1\\_16](https://doi.org/10.1007/978-3-319-66902-1_16)
- 07/17 Alternating time bounds from variants of focussed proof systems. Anupam Das. In revision.  
<http://anupamdas.com/alt-time-bnds-var-foc-sys.pdf>
- 28/12/16 On linear rewriting systems for Boolean logic and some applications to proof theory. Anupam Das & Lutz Straßburger. Journal *Logical Methods in Computer Science* special issue *Selected papers of RTA and TLCA 2015*.  
[http://dx.doi.org/10.2168/LMCS-12\(4:9\)2016](http://dx.doi.org/10.2168/LMCS-12(4:9)2016)
- 25/08/16 Free-cut elimination in linear logic and an application to a feasible arithmetic. Patrick Baillot & Anupam Das. Proceedings of *CSL 2016*.  
<http://dx.doi.org/10.4230/LIPIcs.CSL.2016.40>
- 05/07/16 From positive and intuitionistic bounded arithmetic to monotone proof complexity. Anupam Das. Proceedings of *LICS 2016*.  
<http://doi.org/10.1145/2933575.2934570>
- 03/09/15 On nested sequents for constructive modal logics. Ryuta Arisaka, Anupam Das & Lutz Straßburger. Journal *Logical Methods in Computer Science*.  
[http://dx.doi.org/10.2168/LMCS-11\(3:7\)2015](http://dx.doi.org/10.2168/LMCS-11(3:7)2015)
- 06/07/15 A complete axiomatization of MSO on infinite trees. Anupam Das & Colin Riba. Proceedings of *LICS 2015*.  
<http://dx.doi.org/10.1109/LICS.2015.44>  
Invited to a special journal issue of selected papers from *LICS 2015* and *LICS 2016*.
- 29/06/15 No complete linear term rewriting system for propositional logic. Anupam Das & Lutz Straßburger. Proceedings of *RTA 2015*.  
<http://dx.doi.org/10.4230/LIPIcs.RTA.2015.127>
- 06/03/15 On the relative proof complexity of deep inference via atomic flows. Anupam Das. Journal *Logical Methods in Computer Science* special issue *Selected papers of the Turing Centenary Conference: CiE 2012*.  
[http://dx.doi.org/10.2168/LMCS-11\(1:4\)2015](http://dx.doi.org/10.2168/LMCS-11(1:4)2015)
- 14/07/14 On the pigeonhole and related principles in deep inference and monotone systems. Anupam Das. Proceedings of *CSL-LICS 2014*.  
<http://doi.org/10.1145/2603088.2603164>
- 24/06/13 Rewriting with linear inferences in propositional logic. Anupam Das. Proceedings of *RTA 2013*.  
<http://dx.doi.org/10.4230/LIPIcs.RTA.2013.158>
- 18/06/12 Complexity of deep inference via atomic flows. Anupam Das. Proceedings of *Turing Centenary Conference: CiE 2012*.  
[http://dx.doi.org/10.1007/978-3-642-30870-3\\_15](http://dx.doi.org/10.1007/978-3-642-30870-3_15)

04/07/11 On the proof complexity of cut-free bounded deep inference. Anupam Das. Proceedings of *Tableaux 2011*.  
[http://dx.doi.org/10.1007/978-3-642-22119-4\\_12](http://dx.doi.org/10.1007/978-3-642-22119-4_12)

## Selected invited talks

19/07/18 Cyclic proofs, hypersequents and Kleene algebras. Invited talk at *Workshop on External and Internal Calculi for Non-Classical Logics*, Oxford.  
<http://weic2018.loria.fr/>

07/07/18 Proof complexity of deep inference: a survey. Invited talk at *Twenty Years of Deep Inference*, Oxford.  
<https://www.lix.polytechnique.fr/~lutz/orgs/TYDI2018.html>

14/04/18 Monotonicity in Logic and Complexity. Invited talk at *DICE 2018*.  
<http://cl-informatik.uibk.ac.at/users/zini/events/dice18/>

02/09/16 Proof complexity of deep inference: a survey. Invited talk at *LCC 2016*, Marseille.  
<http://lcc2016.cs.unibo.it/>

05/02/15 Theories of bounded arithmetic for deep inference proof systems. Invited talk at *CHoCoLa séminaire*, Lyon.  
<http://chocola.ens-lyon.fr/events/seminaire-2015-02-05/>

## PhD thesis

20/10/14 The complexity of propositional proofs in deep inference. Defended on 18<sup>th</sup> October 2013, University of Bath. Supervised by Alessio Guglielmi and John Power.  
<http://www.anupamdas.com/Thesis-AnupamDas.pdf>

## Notable grant funding

2020 - 2024 (£1,459,999) UKRI Future Leaders Fellowship for project *Structure vs. Invariants in Proofs*.

09/17 - 08/19 (€200,194.80) Marie Skłodowska-Curie Fellowship for project *Monotonicity in Logic and Complexity*. European Commission project 753431. Call *H2020-MSCA-IF-2016*, mathematics panel.

## Supervision

10/19 - present Avgerinos Delkos. Reasoning with small monotone circuits for majority (tentative title). Short-term research project, University of Birmingham.

02/19 - present Tim Waring. Proof theoretic extensions of graph-based models for Boolean logic. Master's thesis, University of Copenhagen.

06/16 - 08/16 Cameron Calk. A graph theoretic extension of Boolean logic. Undergraduate internship, ENS Lyon. Co-supervised by Olivier Laurent.  
Internship report: <http://www.anupamdas.com/graph-bool.pdf>

07/12 - 09/12 Alvin Šipraga. An automated search of linear inference rules. Undergraduate internship, University of Bath. Co-supervised by Alessio Guglielmi.  
Internship report: <http://arcturus.su/mimir/autolininf.pdf>  
Source code: <http://github.com/blahblahson/mimir/>

## Teaching (research level)

- 03-07/12/18 Lecturer for the course *Introduction to proof theory*. *Logic Summer School 2018*, Canberra.  
<http://www.anupamdas.com/wp/lss18/>
- 13-17/08/18 Lecturer for the course *Introduction to proof theory*. Co-lectured by Thomas Powell. *ESSLLI 2018*, Sofia.  
<http://www.anupamdas.com/esslli18>
- 25-29/06/18 Lecturer for the course *Proof interpretations: a modern perspective*. Co-lectured by Thomas Powell. *NASSLLI 2018*, Pittsburgh.  
<http://www.anupamdas.com/nasslli18>
- 25/09/17 Lecturer for the tutorial *From proof systems to complexity bounds*, co-located with *Tableaux 2017*, *FroCoS 2017*, and *ITP 2017*, Brasília.  
<http://www.anupamdas.com/wp/from-proof-systems-to-complexity-bounds/>
- 03 - 14/08/15 Lecturer for the course *Normalisation and Deep Inference*. Co-lectured by Alessio Guglielmi. *ESSLLI 2015*, Barcelona.  
<http://www.cs.bath.ac.uk/ag/ESSLLI/>

## Teaching (undergraduate and master's level)

- 04/19 - 06/19 Lecturer for the course *Introduction to Mathematical Logic*. Mathematics Master's, University of Copenhagen. Co-lectured by Asger Törnquist.
- 03/19 Guest lecturer for the course *Computability and Complexity*. Computer Science Master's, University of Copenhagen.
- 09-12/18 Lecturer for *Grundlæggende Datalogi* (basic computer science). Co-lectured by Jakob Simonsen and Anders Søgaard. Humanities years 1 - 2, University of Copenhagen.
- 06/18 Guest lecturer for *Introduction to Mathematical Logic*. Mathematics Master's, University of Copenhagen.
- 01/17 - 05/17 Laboratory tutor for *Introduction aux Réseaux et au Web* (introduction to networks and the web). Informatique year 1, Université Claude Bernard Lyon 1.
- 01/16 - 05/16 Classroom tutor and course assistant for *Logique Mathématique* (mathematical logic). Informatique year 3, ENS Lyon.
- 09/15 - 01/16 Classroom and laboratory tutor and course assistant for *Théorie de la Programmation* (theory of programming). Informatique year 3, ENS Lyon.
- 02/13 - 05/13 Classroom tutor for *Algebra 2B*. Mathematics year 2, University of Bath.
- 10/12 - 01/13 Laboratory tutor for *Programming and Discrete Mathematics*. Mathematics year 1, University of Bath.
- 02/12 - 05/12 Laboratory tutor for *Analytical Mathematics for Applications*. Computer Science year 1, University of Bath.
- 02/11 - 05/11 Classroom tutor for *Algebra 2B*. Mathematics year 2, University of Bath.

## Program and organising committees

- 20-22/11/19 Programme committee member for *Circularity in Syntax and Semantics*, Gothenburg.  
<http://www.cse.chalmers.se/~bahafs/CiSS2019/>
- 03-05/09/19 Programme committee member for *28<sup>th</sup> International Conference on Automated Reasoning with*

*Analytic Tableaux and Related Methods*, London.

<https://tableaux2019.org/>

- 08/07/19 Programme committee member for *20<sup>th</sup> International Workshop on Logic and Computational Complexity*, to be co-located with *ICALP 2019*, Patras.  
<http://www.cs.swansea.ac.uk/lcc/>
- 29-30/06/19 Chair of the *5<sup>th</sup> Workshop on Structures and Deduction*, co-located with *FSCD 2019*, Dortmund. Co-chaired by Pierre Clairambault and Sonia Marin.  
<http://www.anupamdas.com/sd19>
- 17-21/06/19 Organiser of *Caleidoscope School on Computational Complexity*, Paris. Co-organised by Alexander Knop, Damiano Mazza and Thomas Seiller.  
<https://caleidoscope.sciencesconf.org/>
- 08-09/09/17 Chair of the *4<sup>th</sup> Workshop on Structures and Deduction*, co-located with *FSCD 2017*, Oxford. Co-chaired by Kaustuv Chaudhuri & Willem Heijltjes.  
<http://www.anupamdas.com/sd17>
- 18/06/17 Chair of the *2<sup>nd</sup> Logic Mentoring Workshop*, co-located with *LICS 2017*, Reykjavík. Co-chaired by Valeria Vignudelli & Fabio Zanasi.  
<http://lics.rwth-aachen.de/lics17/lmw.html>
- 07-10/11/16 Organising committee member of *Linear Logic: interaction, proofs and computation*, Lyon.  
<http://ll2016.sciencesconf.org/>
- 14 - 16/12/15 Organiser of the *Workshop on Efficient and Natural Proof Systems*, Bath. Co-organised by Paola Bruscoli, Willem Heijltjes & Lutz Straßburger.  
<http://www.cs.bath.ac.uk/ag/ENPS/wenps2015.html>
- 11-12/04/15 Program committee member of *DICE 2015*, Queen Mary University, London.  
<http://dice15.computing.dundee.ac.uk/>
- 23/05/12 Organiser of the *14<sup>th</sup> Wessex Theory Seminar*, University of Bath.  
<https://wiki.bath.ac.uk/display/wessex/14th+Wessex+Theory+Seminar>

## Steering committees

- 2019- Steering committee member for *Structures and Deduction* workshop series.
- 2017 - Steering committee member for the *Logic Mentoring Workshop* series.

## Recent outreach events

- 05/12/18 *Computing in the Pub* speaker. Popular science event for local community, Canberra.
- 08/06/18 *DIKU Bits* speaker. Popular science lecture to undergraduates, Copenhagen.
- 26/10/17 Introduction to theoretical computer science, speaker, and guided tour of DIKU. High School students, Copenhagen.
- 17/05/17 *Pint of Science* speaker. Popular science event for local community, Lyon.
- 11/16 - 12/16 Instructor at *Berkeley Math Circle: Intermediate II*. High School students, California.

## Other invitations and short-term appointments

- 02-07/02/20 Participant of *SAT and Interactions* Dagstuhl seminar, Schloss Dagstuhl–Leibniz Center for In-

formatics, Dagstuhl.

- 15-19/07/19 Participant of *Proof, Computation, Complexity* program, Institut Mittag-Leffler, Djursholm.
- 01-03/19 Research visit to University of California, San Diego.
- 11-12/18 Research visit to Australian National University, Canberra.
- 07-08/18 Participant of *Types, Sets and Constructions* trimester, Hausdorff Research Institute for Mathematics, Bonn.
- 10/16 - 12/16 Visting Scholar at Department of Mathematics, UC Berkeley, California.  
Participant of *Logical Structures in Computation* program, Simons Institute.
- 04/14 - 07/14 Participant of Trimester in *Semantics of proofs and certified mathematics*. Institut Henri Poincaré, Paris.
- 09/11 - 12/11 Participant of MALOA *Special Semester in Logic and Complexity*. Charles University, Prague.

## Workshops and conferences without published proceedings

- 11/09/19 On cut-elimination for non-wellfounded proofs: the case of PDL. Anupam Das, Rajeev Goré and Sonia Marin. *Proof Society Workshop 2019*, Swansea.
- 17/07/19 From QBFS to MALL and back via focussing - fragments of MALL complete for each level of the polynomial hierarchy. Anupam Das. *PCC 2019*, Djursholm.
- 13/07/18 A recursion-theoretic characterisation of the positive polynomial-time functions. Anupam Das & Isabel Oitavem. *LCC 2018*, Oxford.
- 08/07/18 On the logical complexity of cyclic arithmetic. Anupam Das. *Programming and Reasoning on Infinite Structures*, Oxford.
- 08/07/18 Towards theories for positive polynomial time and monotone proofs with extension. Anupam Das. *Proof Complexity 2018*, Oxford.
- 07/07/18 Some ideas on cut-elimination for cyclic arithmetic proofs. Anupam Das. *Classical Logic & Computation 2018*, Oxford.
- 12/06/18 On the logical complexity of cyclic arithmetic. Anupam Das. *10<sup>th</sup> Scandinavian Logic Symposium*, Gothenburg.
- 12/12/17 On the logical complexity of cyclic proofs in arithmetic. Anupam Das. *Logical Structures in Computation Reunion Workshop*, Berkeley.
- 03/11/17 Some theories of bounded arithmetic for monotone complexity. Anupam Das. *Prague Workshop on Bounded Arithmetic*, Prague.
- 19/06/17 An implicit characterisation of the polynomial hierarchy in an unbounded arithmetic. Patrick Baillot & Anupam Das. *LCC 2017*, Reykjavík.
- 15/12/16 From focussed proof systems to complexity bounds. Anupam Das. *DaleFest*, seminar in honour of the 60<sup>th</sup> birthday of Dale Miller, Paris.
- 02/08/16 Intuitionistic bounded arithmetic and monotone proof complexity. Anupam Das. *Logic Colloquium 2016*, Leeds.
- 03/04/16 Towards feasibility in arithmetic via linear logic. Patrick Baillot & Anupam Das. *DICE 2016*, Eindhoven.
- 05/07/15 Bounded arithmetic for monotone and deep inference systems. Anupam Das. *LCC 2015*, Kyoto.
- 13/07/14  $n^{O(\log \log n)}$ -size monotone proofs of the weak pigeonhole principle. Anupam Das. *Proof Complexity 2014*, Vienna.
- 15/05/14 Towards a bounded arithmetic for analytic deep inference. Anupam Das. *PCC 2014*, Paris.

- 06/11/13 Some ideas on bounded arithmetics for systems of monotone proofs. Anupam Das. *LIX Colloquium 2013*, Paris.
- 17/08/12 Combinatorial principles in deep inference. Anupam Das. *PCC 2012*, Copenhagen.
- 24/11/11 On proof compression mechanisms and deep inference. Anupam Das. *LAC-GeoCal 2011*, Paris.