

(Short) CV of Enrico Malizia PhD

(updated June 2024)

PERSONAL INFORMATION

Family name, First name: *Malizia, Enrico*

Researcher unique identifiers: *ORCID: 0000-0002-6780-4711; Scopus Author ID: 36551220000*

DBLP page: <https://dblp.uni-trier.de/pid/01/4274.html>

Google Scholar page: <https://scholar.google.com/citations?user=bWxAXwYAAAAJ>

Current Position: Associate Professor, Dept. of Computer Science & Engineering (DISI), University of Bologna, Italy

Research Interests: Artificial Intelligence, Knowledge Representation and Reasoning, Computational Complexity, Theoretical Computer Science, Computational Game Theory & Social Choice, and Algorithms on (Hyper)Graphs

EDUCATION

Nov. 2006 – Jan. 2010	“Dottorato di Ricerca” degree (PhD) in Computer and Systems Engineering, University of Calabria, Italy.
Oct. 2003 – Apr. 2006	“Laurea Specialistica” degree, <i>Summa cum Laude</i> , (Two-year MSc, first class honours) in Computer Engineering, University of Calabria, Italy.
Oct. 2000 – Sep. 2003	“Laurea” degree, <i>Summa cum Laude</i> , (Three-year BSc, first class honours) in Computer Engineering, University of Calabria, Italy.

ACADEMIC POSITIONS

Jan. 2024 – current	Associate Professor, DISI, University of Bologna, Italy.
Jan. 2021 – Dec. 2023	Senior Assistant Professor, DISI, University of Bologna, Italy.
Feb. 2020 – Dec. 2020	Assistant Professor, Dept. of Informatics, King’s College London, UK.
Oct. 2017 – Jan. 2020	Assistant Professor, Dept. of Computer Science, University of Exeter, UK.
Nov. 2014 – Sep. 2017	Post-doc Research Assistant, Dept. of Computer Science, University of Oxford, UK.
Jun. 2012 – Nov. 2014	Post-doc Visiting Scientist, Dept. of Computer Science, University of Oxford, UK.
Sep. 2011 – Dec. 2013	Fellowship for a Post-doctoral position, DIMES, University of Calabria, Italy.
Nov. 2009 – Aug. 2011	Post-doc Research Assistant, DIMES, University of Calabria, Italy.
Nov. 2006 – Nov. 2009	PhD Student, DIMES, University of Calabria, Italy.
May 2006 – Dec. 2006	Research Assistant, DIMES, University of Calabria, Italy.

ACADEMIC AND PROFESSIONAL HABILITATIONS AND RECOGNITIONS

Feb. 2022	Habilitation as Associate Professor in Italy for the area 09/H1 – Information processing systems
Jan. 2020	Habilitation as Associate Professor in Italy for the area 01/B1 – Informatics
Jan. 2020	Fellowship of the Higher Education Academy (FHEA), UK
Mar. 2018	Habilitation as Lecturer/Assistant Professor in Catalonia, Spain
2006	Chartered Engineer in Italy for the area Information Technology

TEACHING EXPERIENCE

Teaching at the University of Calabria, Italy

Teaching assistant for the following courses and academic years:

- *Theoretical Computer Science*, undergraduate & graduate course, 2006 – 2012.
- *Artificial Intelligence*, graduate course, 2006 – 2012.
- *Formal Languages and Compilers*, undergraduate course, 2010/2011.
- *Computability and Complexity*, undergraduate course, 2006 – 2010.
- *Computer Architectures*, post-graduate course, 2006/2007.

Teaching at the University of Oxford, UK

Teaching assistant for the following course and academic year:

- *Theory of data and knowledge bases*, undergraduate, graduate, & PhD, course, 2015/2016.

Teaching at the University of Exeter, UK

Lecturer/Course leader for the following courses and academic years:

- *Computer Languages and Representations*, undergraduate course, 2017 – 2020
 - 2017 – 2019: taught two third of the course, more specifically, the parts on logic programming and Prolog, formal languages and finite-state automata
 - 2019/2020: course leader
- *Computability and Complexity*, undergraduate course, 2018 – 2020 (course leader).
- *Logic, Ontologies and Knowledge Representation*, graduate course, 2018/2019 (course leader).

Teaching at King's College London, UK

Lecturer for the following courses and academic years:

- *Elementary Logic with Applications*, undergraduate course, 2020/2021 (taught the second half of the course, more specifically, the parts on first-order logic and introduction to logic programming).

Teaching at the University of Bologna, Italy

Lecturer/Course leader for the following courses and academic years:

- *Algorithms and Data Structure in Biology* (taught in English), undergraduate course, 2020 – 2024 (course leader).
- *Network, Security, and Databases*, (taught in English), undergraduate course, 2023/2024 (taught the second part of the course, more specifically, the parts on Computational Complexity, Cryptography, and Computational Learning Theory)

RESEARCH FUNDING

Dec. 2023 – Nov. 2025	co-Investigator of the Italian MUR PRIN grant P2022KHTX7 “DISTORT: Dynamic Dis-information Networks: Where is the Truth?”, with the role of Team & Research Leader (Responsabile Unità Locale) of the University of Bologna Research Team—research project approved by MUR with D.D. n. 1382 del 1 Settembre 2023.
Sep. 2011 – Dec. 2013	Fellowship for a post-doctoral position awarded to my research proposal “Computational complexity of solution concepts related problems in compact coalitional games”, funded by the European Commission and the Calabria Region (Italy). <i>My research proposal was ranked in the top 10% proposals among all participants.</i>

SERVICE EXPERIENCE

Institutional & departmental support roles

2020/2021	Coordinator of the academic module for the final project (dissertation/thesis) for all the Computer Science-related MSc programmes of the Department of Informatics at King's College London, UK (more specifically, MSc in: Advanced Computing, Advanced Software Engineering, Artificial Intelligence, Cybersecurity, Computational Finance, and Data Science)
2020/2021	Academic Tutor providing pastoral care and academic support to a group of tutees (graduates & undergraduates students), at the Department of Informatics, King's College London, UK
2018/2019	Academic Tutor providing pastoral care and academic support to a group of tutees (undergraduate students), at the Department of Computer Science, University of Exeter, UK
2017/2018	Academic Tutor providing pastoral care and academic support to a group of tutees (undergraduate students), at the Department of Computer Science, University of Exeter, UK

PhD examiner & faculty board roles

Since 2022	Member of the Faculty Board (collegio docenti) of the Doctoral Programme in Information and Communication Technologies for the academic years 2022/2023 and 2023/2024, at DIMES, University of Calabria, Italy
Sep. 2021	Committee member for a PhD Final Exam, DIMES, University of Calabria, Italy
Oct. 2020	Committee chair for a PhD Upgrade Exam, Department of Informatics, King's College London, UK

Editorial/reviewer roles

- Guest editor of the special issue on “*Reasoning with Inconsistent, Incomplete, and Uncertain Knowledge*” of the journal *IEEE Intelligent Systems* (Volume: 37; Issue: 6).
- Served, or serving, as reviewer for journals:
 - Artificial Intelligence
 - Theoretical Computer Science
 - European Journal of Operational Research
 - Journal of Systems and Software
 - Journal of Logics and their Applications
- Served, or serving, as programme committee member:
 - Member of the IJCAI Program Committee Board for the period 2022-2024
 - Senior PC member:
 - * IJCAI 2021, 2020;
 - * AAI 2022, 2021
 - PC member:
 - * ECAI 2024;
 - * ICTCS 2024;
 - * KR 2020;
 - * IJCAI 2019, 2018, 2017, 2016, 2015.
- Served, or serving, as reviewer in various conferences and workshops:
 - IJCAI 2024, 2023, 2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015, 2009
 - ECAI 2024
 - AAI 2022, 2021, 2011, 2007
 - PODS 2021
 - KR 2020
 - ICALP 2014
 - MFCS 2013
 - ECAI 2012
 - AAMAS 2012, 2008
 - IAT 2013, 2010, 2008, 2007, 2006
 - DL 2007

OTHER SCIENTIFIC ACTIVITIES

Academic supervisor roles

2019/2020	Supervised 5 BSc dissertations, at the Department of Informatics, King's College London, UK Supervised 1 BSc dissertation, at the Department of Computer Science, University of Exeter, UK
2018/2019	Supervised 4 BSc dissertations, at the Department of Computer Science, University of Exeter, UK co-Supervised 2 MSc dissertations, at the University of Exeter Business School, UK

Seminars and short courses

Nov. 2023	"The Hypergraph Transversal Problem", DIAPASoN Seminar, DISI, University of Bologna, Italy.
Nov. 2021	"The Hypergraph Transversal Problem", RAP Seminar, Dept. of Informatics, King's College London, UK.
Aug. 2019	"The Hypergraph Transversal Problem", seminar at the Samsung AI Center, Cambridge, UK.
Oct. 2018	"Combinatorial Preference Aggregation via Global Voting over (m)CP-nets", seminar at the Dept. of Computer Science, University of Oxford, UK.
Mar. 2018	Short course (12 hours) "Game Theory for Multi-Agent System" for the PhD Programme in "Information and Communication Technologies" at DIMES, University of Calabria, Italy. The course was comprised of four lectures on the following topics: "Introduction to Game Theory and Strategic Games", "Extensive Games", "Coalitional Games", and "Social Choice".

Talks and presentations at conferences

Dec. 2022	"Pareto and Majority Voting in mCP-nets", and "Explanations for Negative Query Answers under Existential Rules", talks at the 21st International Conference of the Italian Association for Artificial Intelligence (AIxIA 2022), Udine, Italy.
Jun. 2022	"Query Answer Explanations under Existential Rules", "Explanations for Inconsistency-Tolerant Query Answering under Existential Rules", and "Complexity of Inconsistency-Tolerant Query Answering in Datalog $_{+/-}$ under Cardinality-Based Repairs", talks at the 30th Symposium on Advanced Database System (SEBD 2022), Tirrenia (Pisa), Italy.
Jul. 2018	"More complexity results about reasoning over (m)CP-nets", talk at the 17th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2018), Stockholm, Sweden.
Feb. 2016	"On the complexity of m CP-Nets", talk at the 30th AAAI Conference on Artificial Intelligence (AAAI-16), Phoenix, Arizona, USA.
Aug. 2012	"Hard and easy k -typed compact coalitional games: The knowledge of player types marks the boundary", talk at the 20th European Conference on Artificial Intelligence (ECAI 2012), Montpellier, France.
Jul. 2011	"On the complexity of the core over coalition structures", poster presentation at the 22nd International Joint Conference on Artificial Intelligence (IJCAI-11), Barcelona, Spain.
Jul. 2009	"On the complexity of compact coalitional games", talk at the 21st International Joint Conference on Artificial Intelligence (IJCAI-09), Pasadena, California, USA.
May 2009	"Constrained coalitional games: formal framework, properties, and complexity results", poster presentation, at the 8th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2009), Budapest, Hungary.

PUBLICATIONS

Articles published in scientific journals

- [1] T. Lukasiewicz and E. Malizia. “On the Complexity of Preference Aggregation over (m) CP-nets: Max and Rank Voting”. In: *Artificial Intelligence* 303 (2022), art. no. 103636, 34 pages. DOI: 10.1016/j.artint.2021.103636.
- [2] T. Lukasiewicz, E. Malizia, M. V. Martinez, C. Molinaro, A. Pieris, and G. I. Simari. “Inconsistency-tolerant Query Answering for Existential Rules”. In: *Artificial Intelligence* 307 (2022), art. no. 103685, 39 pages. DOI: 10.1016/j.artint.2022.103685.
- [3] E. Malizia, C. Molinaro, and F. Parisi. “Guest Editorial: Reasoning With Inconsistent, Incomplete, and Uncertain Knowledge”. In: *IEEE Intelligent Systems* 37.6 (2022), pp. 13–17. DOI: 10.1109/MIS.2022.3218913.
- [4] T. Lukasiewicz and E. Malizia. “On the Complexity of Preference Aggregation over (m) CP-nets: Pareto and Majority voting”. In: *Artificial Intelligence* 272 (2019), pp. 101–142. DOI: 10.1016/j.artint.2018.12.010.
- [5] Y. Bachrach, E. Elkind, E. Malizia, R. Meir, D. Pasechnik, J. S. Rosenschein, J. Rothe, and M. Zuckerman. “Bounds on the Cost of Stabilizing a Cooperative Game”. In: *Journal of Artificial Intelligence Research* 63 (2018), pp. 987–1023. DOI: 10.1613/jair.1.11270.
- [6] G. Gottlob and E. Malizia. “Achieving New Upper Bounds for the Hypergraph Duality Problem through Logic”. In: *SIAM Journal on Computing* 47.2 (2018), pp. 456–492. DOI: 10.1137/15M1027267.
- [7] T. Lukasiewicz and E. Malizia. “A Novel Characterization of the Complexity Class Θ_k^P Based on Counting and Comparison”. In: *Theoretical Computer Science* 694 (2017), pp. 21–33. DOI: 10.1016/j.tcs.2017.06.023.
- [8] G. Greco, E. Malizia, L. Palopoli, and F. Scarcello. “The Complexity of the Nucleolus in Compact Games”. In: *ACM Transactions on Computation Theory* 7.1 (2014), 3:1–3:52. DOI: 10.1145/2692372.2692374.
- [9] G. Greco, E. Malizia, L. Palopoli, and F. Scarcello. “On the complexity of core, kernel, and bargaining set”. In: *Artificial Intelligence* 175.12–13 (2011), pp. 1877–1910. DOI: 10.1016/j.artint.2011.06.002.
- [10] G. Greco, E. Malizia, L. Palopoli, and F. Scarcello. “Non-Transferable Utility Coalitional Games via Mixed-Integer Linear Constraints”. In: *Journal of Artificial Intelligence Research* 38 (2010), pp. 633–685. DOI: 10.1613/jair.3060.

Articles published in proceedings of international conferences

- [11] T. Lukasiewicz, E. Malizia, and C. Molinaro. “Complexity of Inconsistency-Tolerant Query Answering in Datalog+/- under Preferred Repairs”. In: *Proceedings of the 20th International Conference on Principles of Knowledge Representation and Reasoning (KR 2023)*. 2023, pp. 472–481. DOI: 10.24963/kr.2023/46.
- [12] T. Lukasiewicz, E. Malizia, and C. Molinaro. “Explanations for Negative Query Answers under Inconsistency-Tolerant Semantics”. In: *Proceedings of the 31st International Joint Conference on Artificial Intelligence (IJCAI-22)*. 2022, pp. 2705–2711. DOI: 10.24963/ijcai.2022/375.
- [13] Í. Í. Ceylan, T. Lukasiewicz, E. Malizia, C. Molinaro, and A. Vaiceniavičius. “Preferred Explanations for Ontology-Mediated Queries under Existential Rules”. In: *Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI-21)*. 2021, pp. 6262–6270. DOI: 10.1609/aaai.v35i7.16778.
- [14] E. Tsamoura, D. Carral, E. Malizia, and J. Urbani. “Materializing Knowledge Bases via Trigger Graphs”. In: *Proceedings of the 47th International Conference on Very Large Data Bases (VLDB 2021)*. 2021, pp. 943–956. URL: <http://www.vldb.org/pvldb/vol114/p943-tsamoura.pdf>.
- [15] Í. Í. Ceylan, T. Lukasiewicz, E. Malizia, C. Molinaro, and A. Vaiceniavičius. “Explanations for Negative Query Answers under Existential Rules”. In: *Proceedings of the 17th International Conference on Principles of Knowledge Representation and Reasoning (KR 2020)*. 2020, pp. 223–232. DOI: 10.24963/kr.2020/23.
- [16] Í. Í. Ceylan, T. Lukasiewicz, E. Malizia, and A. Vaiceniavičius. “Explanations for Ontology-Mediated Query Answering in Description Logics”. In: *Proceedings of the 24th European Conference on Artificial Intelligence (ECAI 2020)*. 2020, pp. 672–679. DOI: 10.3233/FAIA200153.
- [17] T. Lukasiewicz, E. Malizia, and C. Molinaro. “Explanations for Inconsistency-Tolerant Query Answering under Existential Rules”. In: *Proceedings of the 34th AAAI Conference on Artificial Intelligence (AAAI-20)*. 2020, pp. 2909–2916. DOI: 10.1609/aaai.v34i03.5682.
- [18] Í. Í. Ceylan, T. Lukasiewicz, E. Malizia, and A. Vaiceniavičius. “Explanations for Query Answers under Existential Rules”. In: *Proceedings of the 28th International Joint Conference on Artificial Intelligence (IJCAI-19)*. 2019, pp. 1639–1646. DOI: 10.24963/ijcai.2019/227.

- [19] T. Lukasiewicz, E. Malizia, and A. Vaiceniavičius. “Complexity of Cardinality-Maximal Approximate Query Answering under Inconsistency in Datalog+/-”. In: *Proceedings of the 33rd AAAI Conference on Artificial Intelligence (AAAI-19)*. 2019, pp. 2962–2969. DOI: 10.1609/aaai.v33i01.33012962.
- [20] T. Lukasiewicz, E. Malizia, and C. Molinaro. “Complexity of Approximate Query Answering under Inconsistency in Datalog[±]”. In: *Proceedings of the 27th International Joint Conference on Artificial Intelligence (IJCAI-18)*. 2018, pp. 1921–1927. DOI: 10.24963/ijcai.2018/265.
- [21] E. Malizia. “More complexity results about reasoning over (*m*)CP-nets”. In: *Proceedings of the 17th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2018)*. 2018, pp. 1540–1548. URL: <http://ifaamas.org/Proceedings/aamas2018/pdfs/p1540.pdf>.
- [22] T. Lukasiewicz and E. Malizia. “On the Complexity of *m*CP-nets”. In: *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI-16)*. 2016, pp. 558–564. DOI: 10.1609/aaai.v30i1.10039.
- [23] G. Gottlob and E. Malizia. “Achieving New Upper Bounds for the Hypergraph Duality Problem through Logic”. In: *Proceedings of the Joint Meeting of the 23rd EACSL Annual Conference on Computer Science Logic (CSL) and the 29th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS) (CSL-LICS 2014)*. 2014, art. no. 43, 10 pages. DOI: 10.1145/2603088.2603103.
- [24] G. Greco, E. Malizia, F. Scarcello, and L. Palopoli. “Hard and Easy *k*-Typed Compact Coalitional Games: The Knowledge of Player Types Marks the Boundary”. In: *Proceedings of the 20th European Conference on Artificial Intelligence (ECAI 2012)*. 2012, pp. 372–377. DOI: 10.3233/978-1-61499-098-7-372.
- [25] G. Greco, E. Malizia, L. Palopoli, and F. Scarcello. “On The Complexity of the Core over Coalition Structures”. In: *Proceedings of the 22nd International Joint Conference on Artificial Intelligence (IJCAI-11)*. 2011, pp. 216–221. DOI: 10.5591/978-1-57735-516-8/IJCAI11-047.
- [26] R. Meir, J. S. Rosenschein, and E. Malizia. “Subsidies, Stability, and Restricted Cooperation in Coalitional Games”. In: *Proceedings of the 22nd International Joint Conference on Artificial Intelligence (IJCAI-11)*. 2011, pp. 301–306. DOI: 10.5591/978-1-57735-516-8/IJCAI11-060.
- [27] G. Greco, E. Malizia, L. Palopoli, and F. Scarcello. “Constrained coalitional games: formal framework, properties, and complexity results (Extended Abstract)”. In: *Proceedings of the 8th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2009)*. 2009, pp. 1295–1296. URL: https://www.ifaamas.org/Proceedings/aamas09/pdf/02_Extended_Abstract/D_SP_0223.pdf.
- [28] G. Greco, E. Malizia, L. Palopoli, and F. Scarcello. “On the Complexity of Compact Coalitional Games”. In: *Proceedings of the 21st International Joint Conference on Artificial Intelligence (IJCAI-09)*. 2009, pp. 147–152. URL: <http://www.ijcai.org/papers09/Papers/IJCAI09-035.pdf>.
- [29] E. Malizia, L. Palopoli, and F. Scarcello. “Infeasibility Certificates and the Complexity of the Core in Coalitional Games”. In: *Proceedings of the 20th International Joint Conference on Artificial Intelligence (IJCAI-07)*. 2007, pp. 1402–1407. URL: <http://www.ijcai.org/papers07/Papers/IJCAI07-226.pdf>.

Articles published in proceedings of workshops or national conferences

- [30] İ. İ. Ceylan, T. Lukasiewicz, E. Malizia, C. Molinaro, and A. Vaiceniavičius. “Explanations for Negative Query Answers under Existential Rules”. In: *Proceedings of the Discussion Papers - 21st International Conference of the Italian Association for Artificial Intelligence (AIxIA 2022 DP)*. 2022, pp. 65–74. URL: <https://ceur-ws.org/Vol-3419/paper8.pdf>.
- [31] İ. İ. Ceylan, T. Lukasiewicz, E. Malizia, and A. Vaiceniavičius. “Query Answer Explanations under Existential Rules”. In: *Proceedings of the 30th Italian Symposium on Advanced Database Systems (SEBD 2022)*. 2022, pp. 481–488. URL: <http://ceur-ws.org/Vol-3194/paper56.pdf>.
- [32] T. Lukasiewicz and E. Malizia. “Pareto and Majority Voting in *m*CP-nets”. In: *Proceedings of the Discussion Papers - 21st International Conference of the Italian Association for Artificial Intelligence (AIxIA 2022 DP)*. 2022, pp. 23–31. URL: <https://ceur-ws.org/Vol-3419/paper3.pdf>.
- [33] T. Lukasiewicz, E. Malizia, and C. Molinaro. “Explanations for Inconsistency-Tolerant Query Answering under Existential Rules”. In: *Proceedings of the 30th Italian Symposium on Advanced Database Systems (SEBD 2022)*. 2022, pp. 489–496. URL: <http://ceur-ws.org/Vol-3194/paper57.pdf>.
- [34] T. Lukasiewicz, E. Malizia, and A. Vaiceniavičius. “Complexity of Inconsistency-Tolerant Query Answering in Datalog+/- under Cardinality-Based Repairs”. In: *Proceedings of the 30th Italian Symposium on Advanced Database Systems (SEBD 2022)*. 2022, pp. 530–537. URL: <http://ceur-ws.org/Vol-3194/paper62.pdf>.

- [35] Ī. Ī. Ceylan, T. Lukasiewicz, E. Malizia, and A. Vaicenaųiĳius. “Explanations for Ontology-Mediated Query Answering in Description Logics (Extended Abstract)”. In: *Proceedings of the 33rd International Workshop on Description Logics (DL 2020)*. 2020. URL: <http://ceur-ws.org/Vol-2663/abstract-10.pdf>.
- [36] Ī. Ī. Ceylan, T. Lukasiewicz, E. Malizia, and A. Vaicenaųiĳius. “Explanations for Query Answers under Existential Rules (Extended Abstract)”. In: *Proceedings of the Workshop on Explainable Logic-Based Knowledge Representation @ KR 2020 (XLoKR 2020)*. 2020. URL: <https://lat.inf.tu-dresden.de/XLoKR20/XLoKRpaper392.pdf>.
- [37] T. Lukasiewicz, E. Malizia, and C. Molinaro. “Complexity of Approximate Query Answering under Inconsistency in Datalog[±]”. In: *Proceedings of the 26th Italian Symposium on Advanced Database Systems (SEBD 2018)*. 2018. URL: <http://ceur-ws.org/Vol-2161/paper22.pdf>.
- [38] V. Fionda and E. Malizia. “How much navigable is the Web of Linked Data?” In: *Proceedings of the ISWC 2014 Posters & Demonstrations. A track of the 13th International Semantic Web Conference (ISWC 2014)*. 2014, pp. 317–320. URL: http://ceur-ws.org/Vol-1272/paper_68.pdf.

(Selected) Technical reports

- [39] E. Malizia. *Hausdorff Reductions and the Exponential Hierarchies*. Tech. rep. arXiv:2402.00791. Feb. 2024. URL: <https://arxiv.org/abs/2402.00791>.
- [40] E. Tsamoura, D. Carral, E. Malizia, and J. Urbani. *Materializing Knowledge Bases via Trigger Graphs*. Tech. rep. arXiv:2102.02753. Feb. 2021. URL: <https://arxiv.org/abs/2102.02753>.
- [41] G. Gottlob and E. Malizia. *Achieving New Upper Bounds for the Hypergraph Duality Problem through Logic*. Tech. rep. arXiv:1407.2912. Nov. 2017. URL: <http://arxiv.org/abs/1407.2912>.