# Victor Lagerkvist, Ph.D.

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## Employment History

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| November 2022 – ···· | Associate professor (universitetslektor) at TCSLAB, Linköping University, Sweden. |
| May 2020 – October 2022 | Assistant professor (biträdande universitetslektor) at TCSLAB, Linköping University, Sweden. |
| April 2018 – April 2020 | Postdoctoral researcher at TCSLAB, Linköping University, Sweden. |
| March 2016 – March 2018 | Postdoctoral researcher at the institute of algebra, Technische Universität Dresden, Germany. |
| November 2012 – Februari 2016 | PhD student at TCSLAB, Linköping University, Sweden. |
| Juli 2012 – October 2012 | Research assistant at TCSLAB, Linköping University, Sweden. |

## Academic Degrees

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| 2020 | Habilitation (docent), Linköping University, Sweden. |
| 2016 | PhD in Computer Science, Linköping University, Sweden. Thesis Title: *Strong Partial Clones and the Complexity of Constraint Satisfaction Problems: Limitations and Applications*. Advisor: Peter Jonsson. |
| 2012 | M.Sc in Computer Science, Linköping University, Sweden. Thesis Title: *Restricted Constraint Satisfaction Problems and the Exponential-time Hypothesis*. Examiner: Peter Jonsson. |
| 2010 | B.Sc in Computer Science, Linköping University, Sweden. Thesis Title: *A Comparison of SL- and Unit-resolution Search Rules for Stratified Logic Programs*. Examiner: Ulf Nilsson. |
| 2006 | Gymnasieexamen, IT-gymnasiet, Uppsala. |

## Publications

### Journal Articles

1. Jonsson, P., & Lagerkvist, V. (2023). General lower bounds and improved algorithms for infinite-domain CSPs. *Algorithmica*. 🔗 doi:10.1007/s00453-022-01017-8

2. Baril, A., Couceiro, M., & Lagerkvist, V. (2022b). Component twin-width as a parameter for BINARY-CSP and its semiring generalisations. *CoRR*, *abs/2207.12368*. 🔗 doi:10.48550/arXiv.2207.12368. arXiv: 2207.12368

3. Couceiro, M., Haddad, L., & Lagerkvist, V. (2022). A survey on the fine-grained complexity of constraint satisfaction problems based on partial polymorphisms. *Journal of Multiple-Valued Logic and Soft Computing*, *38*(1-2), 115–136.

4. Jonsson, P., Lagerkvist, V., & Ordyniak, S. (2022). Computational short cuts in infinite domain constraint satisfaction. *Journal of Artificial Intelligence Research*, *75*. 🔗 doi:https://doi.org/10.1613/jair.1.13787

5. Lagerkvist, V., & Roy, B. (2022). C-maximal strong partial clones and the inclusion structure of boolean weak bases. *Journal of Multiple Valued Logic and Soft Computing*, *38*(3-4), 333–353.

6. Lagerkvist, V., & Wahlström, M. (2022). The (coarse) fine-grained structure of NP-hard SAT and CSP problems. *ACM Transactions on Computation Theory*, *14*(1). 🔗 doi:10.1145/3492336

**7**   Jonsson, P., Lagerkvist, V., & Osipov, G. (2021). Acyclic orders, partition schemes and CSPs: Unified hardness proofs and improved algorithms. *Artificial Intelligence, 296*, 103505.

**8**   Jonsson, P., Lagerkvist, V., & Roy, B. (2021). Fine-grained time complexity of constraint satisfaction problems. *ACM Transactions on Computation Theory, 13*(1).

**9**   Jonsson, P., Lagerkvist, V., Schmidt, J., & Uppman, H. (2021). The exponential-time hypothesis and the relative complexity of optimization and logical reasoning problems. *Theoretical Computer Science, 892*, 1–24.

**10**   Lagerkvist, V., & Roy, B. (2021). Complexity of inverse constraint problems and a dichotomy for the inverse satisfiability problem. *Journal of Computer and System Sciences, 117*, 23–39.

**11**   Lagerkvist, V., & Wahlström, M. (2020). Sparsification of SAT and CSP problems via tractable extensions. *ACM Transactions on Computation Theory, 12*(2).

**12**   Jonsson, P., & Lagerkvist, V. (2017). An initial study of time complexity in infinite-domain constraint satisfaction. *Artificial Intelligence, 245*, 115–133.   doi:10.1016/j.artint.2017.01.005

**13**   Jonsson, P., Lagerkvist, V., Nordh, G., & Zanuttini, B. (2017). Strong partial clones and the time complexity of SAT problems. *Journal of Computer and System Sciences, 84*, 52–78.

**14**   Lagerkvist, V., & Wahlström, M. (2017b). The power of primitive positive definitions with polynomially many variables. *Journal of Logic and Computation, 27*(5), 1465–1488.   doi:10.1093/logcom/exw005

**15**   Jonsson, P., Lagerkvist, V., & Nordh, G. (2015). Constructing NP-intermediate problems by blowing holes with parameters of various properties. *Theoretical Computer Science, 581*(100), 67–82.   doi:10.1016/j.tcs.2015.03.009

**16**   Lagerkvist, V. (2014). Weak bases of Boolean co-clones. *Information Processing Letters, 114*(9), 462–468.

## Conference Proceedings

**1**   Eriksson, L., & Lagerkvist, V. (2023a). A fast algorithm for consistency checking partially ordered time. In *Proceedings of the 32nd international joint conference on artificial intelligence (IJCAI-2023)*. To appear, ijcai.org.

**2**   Eriksson, L., & Lagerkvist, V. (2023b). Improved algorithms for Allen's interval algebra by dynamic programming with sublinear partitioning. In *Proceedings of the 32nd international joint conference on artificial intelligence (IJCAI-2023)*. To appear, ijcai.org.

**3**   Baril, A., Couceiro, M., & Lagerkvist, V. (2022a). An algebraic approach towards the fine-grained complexity of graph coloring problems. In *Proceedings of the 52nd international symposium on multiple-valued logic (ISMVL-2022)* (pp. 94–99).   doi:10.1109/ISMVL52857.2022.00021

**4**   Eriksson, L., & Lagerkvist, V. (2022). A multivariate complexity analysis of qualitative reasoning problems. In *Proceedings of the 31st international joint conference on artificial intelligence (IJCAI-2022)* (pp. 1804–1810).   doi:10.24963/ijcai.2022/251

**5**   Eriksson, L., & Lagerkvist, V. (2021). Improved algorithms for Allen's interval algebra: A dynamic programming approach. In *Proceedings of the 30th international joint conference on artificial intelligence (IJCAI-2021)* (pp. 1873–1879). ijcai.org.

**6**   Jonsson, P., Lagerkvist, V., & Ordyniak, S. (2021). Reasoning short cuts in infinite domain constraint satisfaction: Algorithms and lower bounds for backdoors. In *Proceedings of the 27th international conference on principles and practice of constraint programming (CP-2021)* (Vol. 210, 32:1–32:20). Schloss Dagstuhl - Leibniz-Zentrum für Informatik.

**7**   Jonsson, P., & Lagerkvist, V. (2020). Lower bounds and faster algorithms for equality constraints. In *Proceedings of the 29th international joint conference on artificial intelligence (IJCAI-2020)* (pp. 1784–1790).

**8** Lagerkvist, V. (2020). A new characterization of restriction-closed hyperclones. In *Proceedings of the 50th international symposium on multiple-valued logic (ISMVL-2020)* (pp. 303–308). doi:10.1109/ISMVL49045.2020.00063

**9** Couceiro, M., Haddad, L., & Lagerkvist, V. (2019). Fine-grained complexity of constraint satisfaction problems through partial polymorphisms: A survey. In *Proceedings of the 49th international symposium on multiple-valued logic (ISMVL-2019)* (pp. 170–175). IEEE Computer Society.

**10** Lagerkvist, V., & Nordh, G. (2019). On the strength of uniqueness quantification in primitive positive formulas. In *Proceedings of the 44th international symposium on mathematical foundations of computer science (MFCS-2019)* (Vol. 138, 36:1–36:15). Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik.

**11** Lagerkvist, V., & Roy, B. (2019). The inclusion structure of Boolean weak bases. In *Proceedings of the 49th international symposium on multiple-valued logic (ISMVL-2019)* (pp. 31–36). IEEE Computer Society.

**12** Jonsson, P., & Lagerkvist, V. (2018). Why are CSPs based on partition schemes computationally hard? In *Proceedings of the 43rd international symposium on mathematical foundations of computer science (MFCS-2018)* (Vol. 117, 43:1–43:15). Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik.

**13** Couceiro, M., Haddad, L., Lagerkvist, V., & Roy, B. (2017). On the interval of Boolean strong partial clones containing only projections as total operations. In *Proceedings of the 47th international symposium on multiple-valued logic (ISMVL-2017)* (pp. 88–93). IEEE Computer Society.

**14** Jonsson, P., Lagerkvist, V., & Roy, B. (2017). Time complexity of constraint satisfaction via universal algebra. In *Proceedings of the 42nd international symposium on mathematical foundations of computer science (MFCS-2017)* (17:1–17:15). Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik.

**15** Lagerkvist, V., & Roy, B. (2017). A dichotomy theorem for the inverse satisfiability problem. In *Proceedings of the 37th iarcs annual conference on foundations of software technology and theoretical computer science (FSTTCS-2017)* (Vol. 93, 39:39–39:14).

**16** Lagerkvist, V., & Wahlström, M. (2017a). Kernelization of constraint satisfaction problems: A study through universal algebra. In *Proceedings of the 23rd international conference on principles and practice of constraint programming (CP-2017)* (pp. 157–171). Springer International Publishing.

**17** Lagerkvist, V., & Roy, B. (2016). A Preliminary Investigation of Satisfiability Problems Not Harder than 1-in-3-SAT. In *Proceedings of the 41st international symposium on mathematical foundations of computer science (MFCS-2016)* (Vol. 58, 64:1–64:14). Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik.

**18** Jonsson, P., & Lagerkvist, V. (2015). Upper and lower bounds on the time complexity of infinite-domain CSPs. In *Proceedings of the 21st international conference on principles and practice of constraint programming (CP-2015)* (Vol. 9255, pp. 183–199). doi:10.1007/978-3-319-23219-5_14

**19** Lagerkvist, V. (2015). Precise upper and lower bounds for the monotone constraint satisfaction problem. In *Proceedings of the mathematical foundations of computer science 2015 (MFCS-2015)* (Vol. 9234, pp. 357–368). doi:10.1007/978-3-662-48057-1_28

**20** Lagerkvist, V., Wahlström, M., & Zanuttini, B. (2015). Bounded bases of strong partial clones. In *Proceedings of the 45th international symposium on multiple-valued logic (ISMVL-2015)* (pp. 189–194). Waterloo, Canada: IEEE Computer Society.

**21** Jonsson, P., Lagerkvist, V., Schmidt, J., & Uppman, H. (2014). Relating the time complexity of optimization problems in light of the exponential-time hypothesis. In *Proceedings of the 39th international symposium on mathematical foundations of computer science (mfcs-2014)* (pp. 408–419). Berlin, Heidelberg: Springer-Verlag.

**22** Lagerkvist, V., & Wahlström, M. (2014). Polynomially closed co-clones. In *Proceedings of the 44th international symposium on multiple-valued logic (ISMVL-2014)* (pp. 85–90). IEEE Computer Society.

**23** Jonsson, P., Lagerkvist, V., & Nordh, G. (2013). Blowing holes in various aspects of computational problems, with applications to constraint satisfaction. In *Proceedings of the 19th international conference on principles and practice of constraint programming (CP-2013)* (Vol. 8124, pp. 398–414). 🔗 doi:10.1007/978-3-642-40627-0_32

**24** Jonsson, P., Lagerkvist, V., Nordh, G., & Zanuttini, B. (2013). Complexity of SAT problems, clone theory and the exponential time hypothesis. In *Proceedings of the 24th annual ACM-SIAM symposium on discrete algorithms (SODA-2013)* (pp. 1264–1277). SIAM.

## Academic Award and Grants

- 🔖 *Snabbare algoritmer och undre gränser för icke-monotona resonemang* (*Faster algorithms and lower bounds for non-monotonic reasoning*). The Swedish Research Council, co-PI, 2023-01-01.
- 🔖 *Finkornig komplexitet för satisfierbarhets- och villkorsproblem* (*Fine-grained complexity of satisfiability and constraint satisfaction problems*). The Swedish Research Council, starting grant, 2020-01-01.
- 🔖 Recipient of the 2017 young researcher price of the Ruth and Nils-Erik Stenbäck foundation.

## Workshops and Seminars

- 🔖 Speaker at *Logic and Search* (LASH-2017), Melbourne, Australia, 2017.
- 🔖 Invited speaker at *QuantLA research seminar*, Dresden, Germany, 2017.
- 🔖 *SAT and Interactions*, Dagstuhl, Germany, 2016.
- 🔖 Speaker at *Workshop on Qualitative Spatial and Temporal Reasoning* (QUAC-2015), Dresden, Germany, 2015.

## Refereeing

- 🔖 Reviewer for the *American Mathematical Society* (AMS).
- 🔖 Program committee member for the *29th International Joint Conference on Artificial Intelligence and the 17th Pacific Rim International Conference on Artificial Intelligence* (IJCAI-PRICAI-2020).
- 🔖 Referee for several international conferences and journals in computer science, including the *International Conference on Principles and Practice of Constraint Programming* (CP), the *ACM-SIAM Symposium on Discrete Algorithms* (SODA), the *International Colloquium on Automata, Languages and Programming* (ICALP), and the *International Symposium on Theoretical Aspects of Computer Science* (STACS).
- 🔖 Expert referee for three grant proposals from *Agence Nationale de la Recherche* (ANR), the *Czech Science Foundation* (GACR), and the *Austrian science Fund* (FWF).

## Supervision

- 🔖 Main supervisor of Leif Eriksson, PhD student, TCSLAB, Linköping University.
- 🔖 Secondary supervisor of Baril Ambroise, PhD student, Université de Lorraine.
- 🔖 Secondary supervisor of George Osipov, PhD student, TCSLAB, Linköping University.
- 🔖 Secondary supervisor of Biman Roy, PhD student, TCSLAB, Linköping University. Thesis title: *Applications of Partial Polymorphisms in (Fine-Grained) Complexity of Constraint Satisfaction Problems*, 2020.
- 🔖 Examiner of Leif Eriksson, master's student, Linköping University. Thesis title: *Solving Temporal CSPs via Enumeration and SAT Compilation*, 2019.
- 🔖 Supervisor of Adam Shi, master's student, Linköping University. Thesis title: *Automatic Enumeration of Intervals of Partial Co-Clones*, 2016.