

# Mikael Zayenz LAGERKVIST

## CONTACT INFORMATION

---

PLACE AND DATE OF BIRTH: Stockholm | May 5 1981  
ADDRESS: Rissnavägen 35, 163 42 Spånga  
PHONE: +46 70 477 48 87  
EMAIL: [zayenz@gmail.com](mailto:zayenz@gmail.com), [zayenz@optischedule.se](mailto:zayenz@optischedule.se)  
WEB: [zayenz.se](http://zayenz.se)

## PROFILE

---

I am an experienced software engineer with a range of skills and interests. With a background in research, implementation, and use of constraint programming systems for solving combinatorial optimization problems I have a strong theoretical and practical foundation for solving complex algorithmic problems. The goal is always to solve business relevant problems using pragmatic technology choices.

During my career I have worked on many different projects on all levels of the stack: Requirements gathering and project planning; Front end web applications development, mainly in React and Angular using TypeScript; Back end web services in a variety of languages and environments; Database schemas and query design; and algorithms and optimization for solving business problems. I have also worked with project planning, mentoring new hires, and teaching in a variety of settings. The domains have varied, including personnel scheduling, sheet metal cutting, oncology information systems, and industrial image recognition.

I value building sustainable and maintainable systems, making sure that what is built is both usable and needed. This includes many aspects such as planning and design, relevant and efficient testing, and the value of knowledge transfer and documentation.

## WORK EXPERIENCE

---

2021-current	<b>Co-founder and R&amp;D at <a href="#">Optischedule AB</a></b> Optischedule develops solutions, systems, and products for scheduling and optimization. Work includes optimization and scheduling algorithms as well as full-stack web application development using a Remix.run/React/TypeScript/Prisma/PostgreSQL stack deployed on AWS. Consulting in constraint programming and optimization.
2019-current	<b>Part time independent research, Zayenz AB, <a href="http://zayenz.se/research/">zayenz.se/research/</a></b> Independent research, mostly in constraint programming. Recent projects include new ideas for incomplete solving and models for board games in constraint programming. Development and project maintenance of the Gecode constraint programming system.
2020-2021	<b>Software developer, <a href="#">RaySearch Laboratories AB</a></b> Software developer working on <a href="#">RayCare</a> , an oncology information system. General development and testing of RayCare, mostly using C# and Typescript. System is a microservices architecture built with event sourcing and CQRS with MS SQL Server as the database back-end and RabbitMQ for messaging. Special focus on scheduling and resource allocation for clinics.

2011-2019	<p>Research and development, <a href="#">Tomologic AB</a></p> <p>Research and development in algorithms, optimization, search methods, and heuristics. Planning, design, requirements collection, implementation, testing, and evaluation of a large and complex AI geometric optimization system that is used to replace human expertise in sheet metal cutting. Mostly in Java, with some Scala.</p> <p>Teaching and on-boarding of new colleagues, internal website development with Django and PostgreSQL, packaging using Docker for deployment in Kubernetes, simple GUI programming, and so on.</p> <p>Additional long projects: Personnel rostering for retail using local search and constraint programming; Industrial image feature detection using deep neural networks in Keras/TensorFlow and C++ on embedded; Time series analysis of accelerometer sensor data.</p>
2005-2011	<p>PhD student, KTH - Royal Institute of Technology</p> <p>Research in constraint programming, and in particular constraint propagation systems. Topics include theoretical models for propagation systems, new system architecture for lowering complexity, and practical implementation and evaluation in a realistic system (<a href="#">Gecode</a>).</p> <p>Development of Gecode (in addition to core research) included: planning and design; high and low level programming in C++; testing and quality assurance; documentation; user support; etc.</p> <p>20% teaching duties. Courses: Computer Science II; Applied Programming; Compilers and Virtual Machines; Constraint Programming.</p>
2003-2004	<p>Teaching assistant, KTH - Royal Institute of Technology</p> <p>Courses: Introduction to Computer Science; Algorithms, Datastructures and Complexity.</p>

## EDUCATION

---

2005-2011	<p>PhD studies in Constraint Programming KTH - Royal Institute of Technology, Stockholm, Sweden</p> <p>My research area is constraint programming, and in particular constraint propagation systems. Topics include theoretical models for propagation systems, new system architecture for lowering complexity, and practical implementation and evaluation in a realistic system (<a href="#">Gecode</a>).</p>
Nov 2008	<p>Licentiate (<a href="#">Swedish intermediate postgraduate degree</a>) Thesis: <a href="#">Techniques for Efficient Constraint Programming</a></p>
2000-2005	<p>Master of Science and Engineering in Computer Science, KTH - Royal Institute of Technology, Stockholm, Sweden Swedish title: Civilingenjör i Datateknik Specialization: Formal methods Thesis: <a href="#">Machine Assisted Reasoning for Multi-Threaded Java Bytecode</a></p>

## PROJECTS AND ACTIVITIES

---

GECODE	<p>Constraint programming system, <a href="http://www.gecode.org">www.gecode.org</a></p> <p>One of three main developers of Gecode, an open source constraint programming system. Gecode is written in C++ and is an industrial strength library that is fully open and modifiable for users and researchers. Significant technical documentation is available (<a href="#">Modelling and Programming with Gecode</a>).</p> <p>Since the initial release in 2006, Gecode has become widely used in research (many 100's of citations), for teaching, and in industry. Gecode won the international MiniZinc Challenge the first five years in a row (<a href="#">2008-2012</a>). The library is licensed under the MIT license.</p>
KATTIS	<p>Programming contest system</p> <p>Part of the early development team of the KATTIS programming contest system, including helping out at the ACM ICPC World Finals from 2010 to 2013. Linux system administration, programming (PHP, Python, and Java), and databases (PostgreSQL).</p>

## LANGUAGES

---

SWEDISH | Native language

ENGLISH | Fluent

## COMPUTER SKILLS

---

PROGRAMMING LANGUAGES | SIGNIFICANT EXPERIENCE: Java, Kotlin, C++, MiniZinc  
REGULARLY USED: TypeScript, Rust, Python  
SOMETIMES USED: Erlang, Scala, C#, Unix shell scripting, Oz, Perl, PHP, ...

SPECIALITIES | Constraint programming systems, optimization systems, library design, compilers, formal methods, artificial intelligence, multi-threaded and distributed programming

VARIOUS | Gecode, Remix.run, React, Prisma, PostgreSQL, Docker, Git

## PUBLICATIONS

---

- *Half-checking propagators*, Mikael Z. Lagerkvist and Magnus Rattfeldt  
The 19th workshop on Constraint Modelling and Reformulation 2020 [\[summary\]](#) [\[pdf\]](#)
- *Nmbr9 as a Constraint Programming Challenge*, Mikael Z. Lagerkvist  
Poster at The 25th International Conference on Principles and Practice of Constraint Programming 2019 [\[summary\]](#) [\[pdf\]](#) [\[arxiv\]](#)
- *State Representation and Polyomino Placement for the Game Patchwork*, Mikael Z. Lagerkvist  
The 18th workshop on Constraint Modelling and Reformulation 2019 [\[summary\]](#) [\[pdf\]](#) [\[arxiv\]](#)
- *Monte Carlo Methods for the Game Kingdomino*, Magnus Gedda, Mikael Z. Lagerkvist, and Martin Butler  
IEEE Conference on Computational Intelligence and Games 2018, Maastricht, The Netherlands. [\[summary\]](#) [\[pdf\]](#) [\[arxiv\]](#)
- *Laser Cutting Path Planning Using CP*, Mikael Z. Lagerkvist, Martin Nordkvist, and Magnus Rattfeldt  
The 19th International Conference on Principles and Practice of Constraint Programming 2013 [\[summary\]](#) [\[pdf\]](#)
- *Modelling and Programming with Gecode*, Christian Schulte, Guido Tack, Mikael Z. Lagerkvist.  
Technical documentation for the Gecode system. More than 500 pages of in-depth documentation of the Gecode system. [\[pdf\]](#)
- *Propagator Groups*, Mikael Z. Lagerkvist and Christian Schulte.  
The 15th International Conference on Principles and Practice of Constraint Programming 2009 [\[summary\]](#) [\[pdf\]](#)
- *Techniques for Efficient Constraint Propagation*, Mikael Z. Lagerkvist.  
Licentiate thesis, KTH - Royal Institute of Technology, Stockholm, Sweden. November 2008. [\[summary\]](#) [\[pdf\]](#)
- *Modeling Irregular Shape Placement Problems with Regular Constraints*, Mikael Z. Lagerkvist and Gilles Pesant.  
*First Workshop on Bin Packing and Placement Constraints (BPPC'08)*, associated with *CPAIOR'08*, Paris, France. May 2008. [\[summary\]](#) [\[pdf\]](#)
- *Advisors for Incremental Propagation*, Mikael Z. Lagerkvist and Christian Schulte.  
The 13th International Conference on Principles and Practice of Constraint Programming 2007 [\[summary\]](#) [\[pdf\]](#)
- *Machine Assisted Reasoning for Multi-Threaded Java Bytecode*, Mikael Z. Lagerkvist.  
Masters thesis, KTH - Royal Institute of Technology, Stockholm, Sweden. May 2005. [\[summary\]](#) [\[pdf\]](#)