# Dr. Frank de Meijer

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| **CONTACT INFORMATION** | Office 36.HB 04.230 <br> Research group Discrete Mathematics and Optimization <br> Delft Institute of Applied Mathematics (DIAM) <br> Faculty Electrical Engineering, Mathematics and Computer Science <br> TU Delft <br> Mekelweg 4, 2628 CD Delft <br> Tel: +31623695418 |

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**RESEARCH INTERESTS**

Mathematical Optimization, Discrete Optimization, Conic Optimization, Semidefinite Programming, Network Optimization, (Distributionally) Robust Optimization, Operations Research in Healthcare

**ACADEMIC POSITIONS**

Postdoctoral Researcher at **TU Delft**, The Netherlands.  august 2024–present

- My research focuses on stochastic and (distributionally) robust optimization approaches applied to scheduling problems in healthcare.
- Delft Institute of Applied Mathematics, TU Delft.
- Research group Discrete Mathematics and Optimization.
- Supervisor: Dr. ir. Theresia van Essen

Lecturer at **TU Delft**, The Netherlands.  august 2023–present

- Delft Institute of Applied Mathematics.
- Research group Discrete Mathematics and Optimization.
- Teaching several courses in Calculus, Mathematical Analysis and Linear Algebra.

Research and Teaching Assistant at **Tilburg University**, The Netherlands.  2017–2023

- Department of Econometrics and Operations Research.
- Working on several research projects in linear and semidefinite optimization.
- Serving as TA in several courses in Mathematical Optimization, Operations Research and Linear Algebra.

**EDUCATION**

**Ph.D. in Mathematical Optimization**.  2019–2023

- Tilburg University, Department of Econometrics and Operations Research.
- Ph.D. topic: *Integrality and Cutting Planes in Semidefinite Programming Approaches for Combinatorial Optimization*.
- Supervisors: Prof. dr. ir. Renata Sotirov and Prof. dr. Dion Gijswijt.

**Research Master in Business: track Operations Research**.  2018–2019

- Tilburg University, Research Master in Business: track Operations Research. GPA: **9.6/10** – via 60 credits.
- Thesis: *Semidefinite Programming for the Quadratic Cycle Cover Problem*, grade: 9.5/10.
- Graduated Cum Laude.

**Master Business Analytics and Operations Research**.  2017–2018

- Tilburg University, Business Analytics and Operations Research. GPA: **9.4/10** – via 60 credits

- Thesis: *Bounds on the Minimum Reload Cycle Cover Problem*, grade: 10/10.

- Graduated Cum Laude.

**Bachelor Econometrics and Operations Research.**                                    2014–2017

- Tilburg University, Econometrics and Operations Research. GPA: **9.0/10**– via 180 credits

- Thesis: *Column Generation for the Vehicle Routing Problem with Time Windows*, grade: 9.5/10.

- Graduated Cum Laude.

RESEARCH
PUBLICATIONS

**Publications in Peer-Reviewed Journals:**

- "Exploiting symmetries in optimal quantum circuit design", with Dion Gijswijt and Renata Sotirov. *Discrete Optimization*, 59:100925, 2026.

- "Spanning and splitting: Integer semidefinite programming for the quadratic minimum spanning tree problem", with Melanie Siebenhofer, Renata Sotirov and Angelika Wiegele. Accepted for publication in *European Journal of Operational Research*, 2025.

- "The Chvátal-Gomory procedure for integer SDPs with applications in combinatorial optimization", with Renata Sotirov. *Mathematical Programming, Series A*, 209:323–395, 2024.

- "On integrality in semidefinite programming for discrete optimization", with Renata Sotirov. *SIAM Journal on Optimization*, 34(1):1071-1096, 2024.

- "Automorphism groups of Cayley graphs generated by general transposition sets", with Dion Gijswijt. *The Electronic Journal of Combinatorics*, 31(3), 2024.

- "Partitioning through projections: Strong SDP bounds for large graph partition problems", co-authored with Renata Sotirov, Angelika Wiegele and Shudian Zhao. *Computers and Operations Research*, 151, March 2023.

- "SDP-based bounds for the Quadratic Cycle Cover Problem via cutting plane augmented Lagrangian methods and reinforcement learning", co-authored with Renata Sotirov. *INFORMS Journal on Computing*, 33(4), 1262–1276, 2021.

  – Winner of INFORMS Meritorious Paper Award 2021

- "The Quadratic Cycle Cover Problem: special cases and efficient bounds", co-authored with Renata Sotirov. *Journal of Combinatorial Optimization*, 39:1096–1128, 2020.

**Preprints:**

- "Lagrangian duality for mixed-integer semidefinite programming: Theory and algorithms", with Renata Sotirov. July 2025, in first review round for publication in *Journal of Optimization Theory and Applications*.

**Dissertation:**

- "Integrality and cutting planes in semidefinite programming approaches for combinatorial optimization", Doctoral thesis, TiSEM Dissertation series, CentER, November 2023.

**Work in Progress:**

- "Semidefinite programming relaxations for ternary optimization problems", with Veronica Piccialli, Renata Sotirov and Antonio Sudoso.

- "On improved SDP relaxations for the quadratic traveling salesman problem via cutting planes", single-authored.

- "Distributionally robust operational surgery scheduling under unified uncertainty", with Theresia van Essen.

- "Distributionally robust chance-constraints in MILPs via augmented Lagrangian methods", single-authored.

**Publications in Non-Refereed Journals:**

- "Facial reduction for Semidefinite Programming Problems", single-authored. *Nekst*, Triangle, 28:2, 2019.

- "Bounds on the Minimum Reload Cost Cycle Cover Problem", single-authored. *Nekst*, Practical Report, 27:1, 2018.

- "Recognizing DNA patterns by solving the quadratic traveling salesman problem", single-authored. *Nekst*, Triangle, 29:4, 2021.

**Conference Talks:**

- European Conference on Operational Research (EURO) 2025, invited minisymposium

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  |---|---|
  | *Title:* | Integer Lagrangian duality for mixed-integer semidefinite programming and its applications |
  | *Date:* | June 25, 2025. |
  | *Location:* | University of Leeds, Leeds, United Kingdom. |

- European Conference on Operational Research (EURO) 2024, invited minisymposium

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  |---|---|
  | *Title:* | Exploiting Symmetries for Optimal Quantum Circuit Design |
  | *Date:* | July 3, 2024. |
  | *Location:* | Technical University of Denmark (DTU), Copenhagen, Denmark. |

- SIAM Conference on Optimization (OP23), invited minisymposium

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  |---|---|
  | *Title:* | Integer semidefinite programming formulations for combinatorial optimization problems and applications |
  | *Date:* | June 2, 2023. |
  | *Location:* | The Sheraton Grand Seattle, Seattle, WA, USA. |

- International Conference on Continuous Optimization 2022 (ICCOPT2022), invited minisymposium

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  |---|---|
  | *Title:* | The Chvátal-Gomory procedure for integer SDPs with applications in combinatorial optimization |
  | *Date:* | July 25, 2022 |
  | *Location:* | Lehigh University, Bethlehem, PA, USA. |

- SIAM Conference on Optimization (OP20), invited minisymposium

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  |---|---|
  | *Title:* | Discrete Semidefinite Programming Techniques for the Quadratic Traveling Salesman Problem |
  | *Date:* | July 21, 2021 |
  | *Location:* | Virtual |

- LNMB Conference 2021

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  |---|---|
  | *Title:* | A cutting plane augmented Lagrangian method to solve SDP relaxations of binary quadratic problems |
  | *Date:* | January 22, 2021 |
  | *Location:* | Virtual |

**Seminars:**

- Discrete Optimization Seminar, Technische Universität Dortmund, Department of Mathematics

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  |---|---|
  | *Title:* | Chvátal-Gomory cuts for integer SDPs with applications in combinatorial optimization |
  | *Date*: | February 8, 2023 |
  | *Location*: | Technische Universität Dortmund, Dortmund, Germany. |

- Tutte Colloquium, University of Waterloo, Department of Combinatorics and Optimization

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  |---|---|
  | *Title:* | The Chvátal-Gomory procedure for integer SDPs with applications in combinatorial optimization |
  | *Date*: | May 21, 2022 |
  | *Location*: | Virtual |

- TU/e seminar on Combinatorial Optimization, Eindhoven University of Technology, Department of Mathematics and Computer Science. Research Group Statistics, Probability and Operations Research

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  |---|---|
  | *Title:* | The Chvátal-Gomory procedure for integer SDPs with applications in combinatorial optimization |
  | *Date*: | May 13, 2022 |
  | *Location*: | Eindhoven University of Technology, Eindhoven, The Netherlands. |

- Doctoral Seminar, Alpen-Adria Universität Klagenfurt, Department of Mathematics

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  |---|---|
  | *Title:* | SDP-based bounds for the Quadratic Cycle Cover Problem via cutting plane augmented Lagrangian methods and reinforcement learning |
  | *Date*: | June 16, 2021 |
  | *Location*: | Virtual |

- OR Seminar, Tilburg University, Department of Econometrics and Operations Research

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  |---|---|
  | *Title:* | SDP-based bounds for the Quadratic Cycle Cover Problem via cutting plane augmented Lagrangian methods and reinforcement learning |
  | *Date*: | May 20, 2021 |
  | *Location*: | Virtual |

**Poster Presentations:**

- Integer Programming and Combinatorial Optimization (IPCO2022)

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  |---|---|
  | *Title:* | The Chvátal-Gomory procedure for integer SDPs with applications in combinatorial optimization |
  | *Date*: | June 27-29, 2022 |
  | *Location*: | Eindhoven University of Technology, Eindhoven, The Netherlands |

- CRM/DIMACS Workshop on Mixed-Integer Nonlinear Programming

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  |---|---|
  | *Title:* | Semidefinite Programming for the Quadratic Cycle Cover Problem |
  | *Date*: | October 7, 2019 |
  | *Location*: | École Polytechnique de Montréal, Montréal, Canada |

RESEARCH
ACTIVITIES

**Attended Workshops:**

- 50th LNMB Conference on Mathematics of Operations Research

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  |---|---|
  | *Date*: | January 13-15, 2025 |
  | *Location*: | Soesterberg, Utrecht, Netherlands. |

- ICCOPT Summer School 2022

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  |---|---|
  | *Date*: | July 23-24, 2022 |
  | *Location*: | Lehigh University, Bethlehem, PA, USA. |

- Summer School Integer Programming and Combinatorial Optimization (IPCO2022)

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  |---|---|
  | *Date*: | June 25-26, 2022 |
  | *Location*: | Eindhoven University of Technology, Eindhoven, The Netherlands |

- Mixed Integer Programming Workshop (MIP2021)

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  |---|---|
  | *Date*: | May 24-27, 2021. |
  | *Location*: | Virtual |

- POEMA Online Workshop 2

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  |---|---|
  | *Date*: | October 20, November 26, December 11, 2020. |
  | *Location*: | Virtual |

- CRM/DIMACS Workshop on Mixed-Integer Nonlinear Programming

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  |---|---|
  | *Date*: | October 7-10, 2019 |
  | *Location*: | École Polytechnique de Montréal, Montréal, Canada |

**Research Visits:**

- University of Waterloo, Department of Combinatorics and Optimization

  *Period*:  July 13-22, 2022.
  *Host*:  Henry Wolkowicz.

- Alpen-Adria Universität Klagenfurt, Department of Mathematics

  *Period*:  June 15-18, 2021.
  *Host*:  Angelika Wiegele.

TEACHING
EXPERIENCE

- **Linear Algebra I**, *(Responsible Lecturer)*, undergraduate

  – 1st year BA Mechanical and Maritime Engineering, 1st year BA Civil Engineering, TU Delft.
  – Lecturer: 2023-2024, 2024-2025, 2025-2026.

- **Linear Algebra II**, *(Responsible Lecturer)*, undergraduate

  – 1st year BA Mechanical and Maritime Engineering, 1st year BA Civil Engineering, TU Delft.
  – Lecturer: 2023-2024, 2024-2025, 2025-2026.

- **Calculus I**, undergraduate

  – 1st year BA Mechanical and Maritime Engineering, TU Delft.
  – Lecturer: 2023-2024, 2024-2025, 2025-2026.

- **Calculus II**, undergraduate

  – 1st year BA Mechanical and Maritime Engineering, BA Applied Earth Sciences, TU Delft.
  – Lecturer: 2023-2024, 2024-2025, 2025-2026.

- **Analysis I**, undergraduate

  – 1st year BA Aerospace Engineering, TU Delft.
  – Lecturer: 2023-2024.

- **Calculus II for Engineering**, undergraduate

  – Various pre-master programmes, TU Delft.
  – Lecturer: 2023-2024.

- **Advanced Linear Algebra**, undergraduate

  – 2nd year BA Econometrics and Operations Research, Tilburg University.
  – TA: 2022-2023.

- **Linear Algebra**, undergraduate

  – 1st year BA Econometrics and Operations Research, Tilburg University.
  – TA: 2019-2020, 2020-2021, 2021-2022, 2022-2023.

- **Operations Research Methods**, undergraduate

  – 3rd year bachelor Econometrics and Operations Research, Tilburg University.
  – SA: 2017-2018, 2018-2019, TA: 2019-2020, 2020-2021, 2021-2022, 2022-2023.

- **Wiskunde**, undergraduate

  – 1st year BA Business Economics, BA Fiscal Economics, BA Economics and Business Economics, Tilburg University.
  – TA: 2019-2020, 2020-2021, 2021-2022.

- **Combinatorial Optimization**, undergraduate

  – 1st year BA Econometrics and Operations Research, Tilburg University.
  – SA: 2017-2018, 2018-2019.

- **Quantitative Methods in Business and Economics**, undergraduate

  – 2nd year BA Liberal Arts and Sciences, Tilburg University.
  – SA: 2017-2018, 2018-2019.

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| AWARDS AND SCHOLARSHIPS | **Awards:** |

- Excellent Teacher Award 2022-2023, Course: Advanced Linear Algebra
  Price awarded by Tilburg School of Economics and Management (TiSEM) to educational personel based on total student evaluation scores.

- INFORMS Meritorious Paper Award 2021
  Price awarded by editor-in-chief of INFORMS Journal on Computing for papers that are recognized as "truly superior in their field".

- Jan Brouwer Thesis Award 2019
  National prize for the best Master's thesis of the Netherlands in the field Economics awarded by the Royal Dutch Society of Sciences and Humanities (Dutch: Koninklijke Hollandsche Maatschappij der Wetenschappen).

- Socrates Award 2014
  Nominated for prize for the best Dutch student on secondary education in the class of 2014 based on overall GPA.

**Scholarships:**

- Contract Extension via Excellence PhD Program, 2022-2023
  Offered by CentER Graduate School.

- Koopmans Scholarship 2018-2019
  Offered by CentER Graduate School.

SKILLS

**Computer:** Python (advanced), Matlab (advanced), Julia (advanced), Microsoft Excel (advanced), Microsoft Office (advanced), Aimms (intermediate), R (intermediate), Arena (intermediate), Stata (intermediate), SQL (intermediate).

**Language:** Dutch (fluent), English (fluent), German (intermediate).

OTHER ACTIVITIES

- Participant in University Teaching Qualification (UTQ/BKO) track at TU Delft. Expected end date: January 13, 2026.

- Participant in Integrated Healthcare Timetabling Competition 2024, in collaboration with Cindy Pistorius.

- Member of Socrates Honours Society,                                       2014-present
  Society consisting of top 10% students graduated secondary education

- Giving tutorships in Mathematics, Physics and Chemistry,             2012-2020
  Tutor in Physics and Chemistry to secondary education students and tutor in Mathematics to secondary education students and undergraduate university students.

REFERENCES

Prof. dr. ir. **Renata Sotirov**
Department of Econometrics and Operations Research, Tilburg University.
E-mail: r.sotirov@tilburguniversity.edu

Prof. dr. **Dion Gijswijt**
Delft Institute of Applied Mathematics, TU Delft.
E-mail: d.c.gijswijt@tudelft.nl

Prof. dr. **Angelika Wiegele**
Department of Mathematics, Alpen-Adria Universität Klagenfurt.
E-mail: angelika.wiegele@aau.at

Dr. ir. **Theresia van Essen**
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