

# Maarten De Boeck

*Curriculum Vitae*

## PERSONAL DETAILS

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*Birth* May 23, 1988  
*Address* Kerkhofstraat 47, 9420 Erpe-Mere  
Flanders - Belgium  
*Phone* (+32) 0474 84 59 81  
*Mail* maarten.deboeck@telenet.be

## EDUCATION

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### Academic Teacher Education in Mathematics

2014-2017

*Universiteit Gent (Ghent University)*

- I obtained the 'Teacher Qualification for Secondary Education' (Leraar) summa cum laude.

### Ph.D. in Mathematics

2010-2014

*Universiteit Gent (Ghent University)*

- Title: 'Intersection problems in finite geometries'.
- Supervisor: prof. dr. Leo Storme. I defended my thesis on March 27, 2014.

### MSc. in Mathematics, major in Pure mathematics

2008-2010

*Universiteit Gent (Ghent University)*

- Master thesis: 'Lineaire codes komende van projectieve ruimten en hun deelstructuren' (Linear codes arising from projective spaces and their substructures). Advisor: prof. dr. Leo Storme.
- I obtained the degree summa cum laude.

### BSc. in Mathematics

2005-2008

*Universiteit Gent (Ghent University)*

- Bachelor project: 'Kwadratische vormen van lage dimensie' (Small-dimensional quadratic forms). Advisor: prof. dr. Tom De Medts.
- I obtained the degree summa cum laude.

## WORK EXPERIENCE

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### Postdoc

2020-present

*Eindhoven University of Technology (TU/e)*

- Postdoc in the Combinatorial Optimization group of the Department of Mathematics and Computer Science.

### Doctor-assistant

2017-2020

*Ghent University (UGent)*

- Doctor-assistant at the Department of Mathematics: Algebra and Geometry of Ghent University (UGent).

## Postdoctoral fellowship

2014-2017

*Ghent University (UGent)*

- Supported by a BOF-postdoctoral fellowship (BOF: Bijzonder Onderzoeksfonds - Special Research Fund).
- Associated with the Department of Mathematics of Ghent University (UGent).

## Ph.D. fellowship (Dutch: Aspirant)

2010-2014

*Research Foundation - Flanders (FWO)*

- Working title: 'Intersection problems in finite geometries' Supervisor: prof. dr. Leo Storme.
- Associated with the Department of Mathematics of Ghent University (UGent).

## PUBLICATIONS

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In A1-journals:

1. Y. Fujiwara, D. Clark, P. Vandendriessche, M. De Boeck and V.D. Tonchev. Entanglement-assisted quantum low-density parity-check codes. *Phys. Rev. A*, 82(4):042338 (19 pp.), 2010.
2. M. De Boeck. Small weight codewords in the dual code of points and hyperplanes in  $\text{PG}(n, q)$ ,  $q$  even. *Des. Codes Cryptogr.*, 63(2):171–182, 2012.
3. M. De Boeck and L. Storme. Theorems of Erdős-Ko-Rado type in geometrical settings. *Sci. China Math.*, 56(7):1333–1348, 2013.
4. D. Bartoli, M. De Boeck, S. Fanali and L. Storme. On the functional codes defined by quadrics and Hermitian varieties. *Des. Codes Cryptogr.*, 71(1):21–46, 2014.
5. A. Blokhuis, M. De Boeck, F. Mazzocca and L. Storme. The finite field Kakeya problem: a gap in the spectrum and classification of the smallest examples. *Des. Codes Cryptogr.*, 72(1):21–31, 2014.
6. M. De Boeck. The largest Erdős-Ko-Rado sets of planes in finite projective and finite classical polar spaces. *Des. Codes Cryptogr.*, 72(1):77–117, 2014.
7. M. De Boeck and P. Vandendriessche. On the dual code of points and generators on the Hermitian variety  $\mathcal{H}(2n+1, q^2)$ . *Adv. Math. Commun.*, 8(3):281–296, 2014.
8. M. De Boeck. Small maximal partial  $t$ -spreads in  $\text{PG}(2t+1, q)$ . *European J. Combin.*, 45:47–58, 2015.
9. M. De Boeck. The largest Erdős-Ko-Rado sets in  $2 - (v, k, 1)$  designs. *Des. Codes Cryptogr.*, 75(3):465–481, 2015.
10. M. De Boeck, L. Storme and A. Švob. The Cameron-Liebler problem for sets. *Discrete Math.*, 339(2):470–474, 2016.
11. M. De Boeck. The second largest Erdős-Ko-Rado sets of generators of the hyperbolic quadrics  $\mathcal{Q}^+(4n+1, q)$ . *Adv. Geom.*, 16(2):253–263, 2016.
12. M. De Boeck. The small Kakeya sets in  $T_2^*(\mathcal{C})$ ,  $\mathcal{C}$  a conic. *J. Combin. Des.*, 24(6):265–278, 2016.
13. M. De Boeck and G. Van de Voorde. A linear set view on KM-arcs. *J. Algebraic Combin.*, 44(1):131–164, 2016.

14. J. De Beule and M. De Boeck. A combinatorial characterisation of embedded polar spaces. *Discrete Math.*, 341(10):2841–2845, 2018.
15. M. De Boeck and G. Van de Voorde. A New Lower Bound for the Size of an Affine Blocking Set. *Electron. J. Combin.*, 25(4): P4.40, 11 pp., 2018.
16. M. De Boeck, M. Rodgers, L. Storme and A. Švob. Cameron-Liebler sets of generators in finite classical polar spaces. *J. Combin. Theory Ser. A*, 167:340–388, 2019.
17. A. Blokhuis, M. De Boeck and J. D’haeseleer. Cameron-Liebler sets of  $k$ -spaces in  $PG(n, q)$ . *Des. Codes Cryptogr.*, 87(8):1839–1856, 2019.
18. M. De Boeck and G. Van de Voorde. Elation KM-arcs. *Combinatorica*, 39(3):501–544, 2019.
19. M. De Boeck and J. D’haeseleer. Equivalent definitions for (degree one) Cameron-Liebler classes of generators in finite classical polar spaces. *Discrete Math.*, 343(1): 111642, 13pp., 2019.
20. M. De Boeck and G. Van de Voorde. A note on large Kakeya sets. *Adv. Geom.*, 21(3):401–405, 2021.

In conference proceedings:

1. M. De Boeck. Functional codes arising from quadrics and Hermitian varieties. Proceedings of the contact forum ‘Coding theory and cryptography IV’, 31–48, 2013.

PhD thesis:

M. De Boeck. Intersection problems in finite geometries. PhD thesis, UGent, 2014.

## **TALKS AT CONFERENCES**

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1. Linear codes arising from projective spaces. NATO Advanced Study Institute on Information Security and Related Combinatorics, Opatija, 30/05/2010-11/06/2010.
2. Small weight codewords in the dual code of points and hyperplanes in  $PG(n, q)$ ,  $q$  even. BCRYPT PhD day, Gent, 17/11/2010.
3. The dual code of points and  $t$ -spaces in the projective space. WCC 2011, Paris, 11/04/2011-15/04/2011.
4. The classification of the smallest Kakeya sets. Finite Geometries 2011 - Third Irsee Conference, Irsee, 19/06/2011-25/06/2011.
5. Functional codes of quadrics and Hermitian varieties. Fq10, Gent, 11/07/2011-15/07/2011.
6. Functional codes arising from quadrics and Hermitian varieties. Contact forum Coding Theory and Cryptography IV, Brussel, 09/09/2011.
7. The largest Erdős-Ko-Rado sets of planes in finite projective and polar spaces. Giornate di Geometria, Vicenza, 13/02/2012-14/02/2012.

8. The largest Erdős-Ko-Rado sets of planes in finite projective and polar spaces. Conference on finite geometries in honour of Frank De Clerck, Ferrara, 17/09/2012-18/09/2012.
9. Erdős-Ko-Rado theorems in geometrical settings. Colloquium on Galois geometry, Gent, 29/03/2013.
10. Erdős-Ko-Rado theorems in geometrical settings. CanaDAM 2013, St. John's, 10/06/2013-13/06/2013.
11. Erdős-Ko-Rado theorems in geometrical settings. Eindhoven Seminar Combinatorial Theory, Eindhoven, 25/09/2013.
12. Kakeya sets in the linear representation of a conic. Combinatorics 2014, Gaeta, 01/06/2014-06/06/2014.
13. The dual code of points and generators of the Hermitian variety. Finite Geometries 2014 - Fourth Irsee Conference, Irsee, 14/09/2014-20/09/2014.
14. Erdős-Ko-Rado theorems in geometrical settings. Seminar at the University of Rijeka, Rijeka, 27/10/2014.
15. A linear set view on KM-arcs in  $PG(2, q)$ . Workshop on Algebraic Combinatorics, Tilburg, 17/06/2015-18/06/2015.
16. The Cameron-Liebler problem for polar spaces. Combinatorics 2016, Maratea, 29/05/2016-04/06/2016.
17. The Cameron-Liebler problem for polar spaces. BSL 2016, Logroño, 06/06/2016-08/06/2016.
18. A new family of KM-arcs. Finite Geometry Workshop 2017, Szeged, 28/04/2017-01/05/2017.
19. New families of KM-arcs. ULB-UGent-VUB Seminar on Incidence Geometry, Brussels, 18/05/2017.
20. New families of KM-arcs. Fq13, Gaeta, 04/06/2017-10/06/2017.
21. New families of KM-arcs. Finite Geometries - Fifth Irsee Conference, Irsee, 10/09/2017-16/09/2017.
22. The duck test for polar spaces. Combinatorics 2018, Arco, 03/06/2018-09/06/2018.
23. Cameron-Liebler classes for finite geometries. 9th Slovenian International Conference on Graph Theory - Bled '19, 23/06/2019-29/06/2019.
24. Intriguing sets in projective and polar geometries. 27th British Combinatorial Conference, Birmingham, 29/07/2019-02/08/2019.
25. Small blocking sets and large Kakeya sets in affine planes. Finite Geometry and Extremal Combinatorics, Newark, 21/08/2019-24/08/2019.
26. Intriguing sets in projective and polar geometries. 42ACCMCC, Sydney, 09/12/2019-13/12/2019.
27. Small blocking sets and large Kakeya sets in affine planes. Finite geometry: a workshop in honour of Tim Penttila, Adelaide, 16/12/2019-17/12/2019.

- 28. Neumaier graphs. APP-GVL spring meeting, Lille, 14/06/2021.
- 29. Neumaier graphs. Combinatorial Designs and Codes, Rijeka (online), 12/07/2021-16/07/2021.

## RESEARCH

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### Research stays

- Università degli Studi di Padova. April 2–13, 2012. I collaborated with prof. dr. Michel Lavrauw and I gave a talk entitled ‘The largest Erdős-Ko-Rado sets of planes in finite projective and polar spaces’.
- Justus-Liebig-Universität Gießen. June 5–22, 2012. I collaborated with prof. dr. Klaus Metsch and I gave a talk entitled ‘Erdős-Ko-Rado sets of planes in finite projective and polar spaces, with a focus on the polar spaces of small rank’.
- Eötvös Loránd University (Budapest). December 9–20, 2012. I collaborated with prof. dr. Tamás Szőnyi and I gave a talk entitled ‘The largest Erdős-Ko-Rado sets in finite projective and polar spaces’.
- University of Zagreb. October 23 – November 7, 2014. I collaborated with dr. Anamari Nakić and I gave a talk entitled ‘Erdős-Ko-Rado sets in geometries: an overview’.
- University of Canterbury (Christchurch). December 6, 2017 – January 18, 2018. I collaborated with dr. Geertrui Van de Voorde.
- University of Canterbury (Christchurch). October 23, 2019 – December 8, 2019. I collaborated with dr. Geertrui Van de Voorde.

### PhD theses - supervising

*Ghent University*

- Jozefien D’haeseleer (FWO fellowship), Subspaces relevant for coding theory and geometry, started in October 2017, expected to defend in September 2021, co-supervisor.

### PhD theses - jury

*Vrije Universiteit Brussel*

- Sara Rottey, Characterising substructures of finite projective spaces, December 16, 2015, jury member.

## TEACHING

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### Lecturer

2014-2020

*UGent (Ghent University)*

- Capita selecta in de meetkunde (together with prof. dr. L. Storme), 2014-2015.  
*optional course master in mathematics*
- Capita selecta in de meetkunde (together with prof. dr. L. Storme and prof. dr. H. Van Maldeghem), 2016-2017.  
*optional course master in mathematics*
- Capita selecta in de meetkunde (together with prof. dr. L. Storme and prof. dr. K. Thas), 2018-2019.  
*optional course master in mathematics*

- Discrete Wiskunde II (together with prof. dr. H. Van Maldeghem), 2015-2016 and 2016-2017.  
*compulsory course first year bachelor in mathematics*
- Vakkennis wiskunde (together with prof. dr. H. Van Maldeghem), 2017-2018, 2018-2019 (2x).  
*optional course minor education in mathematics*
- Vakkennis wiskunde, 2019-2020 (2x).  
*optional course minor education in mathematics*
- Lineaire Algebra en Meetkunde II, 2017-2018, 2018-2019, 2019-2020.  
*compulsory course first year bachelor in mathematics*

2020-present

*Eindhoven University of Technology*

- Algebraic combinatorics (course coordinator: prof. dr. A. Abiad Monge).  
*optional course master in industrial and applied mathematics*

### **Project supervisor**

2020-present

*Eindhoven University of Technology*

- Programming and modelling (course coordinator: prof. dr. ir. C. Hurkens), 2020-2021.  
*compulsory course first year bachelor in applied mathematics*

### **Teaching assistant**

2010-2017

*UGent (Ghent University)*

- Codeertheorie (prof. dr. L. Storme and dr. J. De Beule), 2010-2011 and 2011-2012.
- Projectieve Meetkunde (prof. dr. F. De Clerck), 2010-2011 and 2011-2012.
- Projectieve Meetkunde (prof. dr. B. De Bruyn), 2012-2013, 2013-2014, 2014-2015 and 2015-2016.
- Lineaire Algebra en Analytische Meetkunde I (prof. dr. T. De Medts and dr. G. Van de Voorde), 2013-2014.
- Discrete Wiskunde I (dr. J. De Beule), 2014-2015.
- Discrete Wiskunde I (prof. dr. L. Storme), 2015-2016 and 2016-2017.

### **Master's theses**

*UGent (Ghent University)*

- Lien Lambert, Random network coding and designs over  $\mathbb{F}_q$  (master thesis), 2012-2013, jury member.
- Andries Vansweevelt, Cameron-Liebler sets and related geometrical structures (master thesis), 2013-2014, jury member.
- Lisa Hernandez Lucas, Meetkundige verbanden met subspace codes en locally recoverable codes (Links between geometry, subspace codes and locally recoverable codes) (master thesis), 2016-2017, jury member.
- Dago Van Poeck, Evenaarsmeetkunden van eindige gebouwen (Equator geometries of finite geometries), 2017-2018, jury member.
- Elisabeth Heyrman, Onderzoek van enkele meetkundes bepaald door axioma's (Research on some geometries defined by axioms), 2018-2019, jury member.
- Kenneth Genbrugge, Deelstructuren in eindige projectieve ruimten en eindige polaire ruimten. (Substructures in finite projective spaces and finite polar spaces), 2019-2020, co-supervisor.

### **Bachelor's theses**

*UGent (Ghent University)*

- Heidi Van den Camp, Vandermondeverzamelingen (Vandermonde sets), 2017-2018, supervisor.
- Robin Simoens, Neumaiergrafen (Neumaier graphs), 2019-2020, supervisor.

## **AWARDS**

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- First Prize at the Junior Wiskunde Olympiade (Junior Mathematics Olympiad), 2003.
- First Prize at the Vlaamse Wiskunde Olympiade (Flemish Mathematics Olympiad), 2005.
- Honourable Mention at the 46<sup>th</sup> International Mathematical Olympiad, 2005.
- Award ‘Prof. Frans Wuytack’ (mathematics student at UGent with overall best results), 2010.

## **SERVICE**

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- Reviewer for ‘Ars Mathematica Contemporanea’, ‘Combinatorica’, ‘Designs, Codes and Cryptography’, ‘Discrete Mathematics’, ‘European Journal of Combinatorics’, ‘Finite Fields and Their Applications’, ‘Forum Mathematicum’, ‘Graphs and Combinatorics’, ‘Journal of Combinatorial Theory, Series A’, ‘The Australasian Journal of Combinatorics’ and ‘The Electronic Journal of Combinatorics’.
- Reviewer for Mathematical Reviews (AMS).
- Faculty council member for the Faculty of Sciences (UGent), 2018-2020.
- Member of the FCWO (Facultaire commissie voor wetenschappelijk onderzoek - Faculty committee on scientific research, UGent), 2018-2020.
- Member of the Faculty Research Council (Facultaire onderzoeksraad, UGent), 2020.
- Secretary of the OCW (Opleidingscommissie wiskunde - curriculum committee for mathematics), UGent, 2014-2016.
- From 2018 until 2020 I was the ‘coordinating postdoc’ of the math departments WE01 and WE16, responsible for the distribution of teaching assistant duties and exam surveillance duties over PhD students and postdocs.
- I was involved in the UniMath project from 2011 until 2020. In this project members of the mathematics departments teach some advanced mathematics to secondary school children. From 2018 until 2020 I was a co-organiser.
- I was co-organiser of the activities that the math departments at Ghent University organise during the science week and at the science festival.
- I am a jury member of the Vlaamse Wiskunde Olympiade (Flemish Mathematics Olympiad) since 2016, presiding the jury committee since 2021.