

CV

Geertrui Van de Voorde
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Affiliation

University of Canterbury, Christchurch, New Zealand
Lecturer 2017–2019
Senior Lecturer 2020– 2022
Senior Lecturer above the Bar 2023–

Previous positions

Post doctoral positions at
Ghent University, Ghent, Belgium (2012-2021)
Vrije Universiteit Brussel, Brussels, Belgium (2010-2016)

PhD student at Ghent University (2006-2010)
Thesis: *Blocking sets in finite geometry and coding theory*
advisors: Leo Storme and Michel Lavrauw.

Grants and awards

• Phd Scholarships

- Bijzonder Onderzoeksfonds (BOF) of Ghent University, Belgium (2006).
- Agency for Innovation through Science and Technology (IWT), Belgium (2007–2008).
- Research Foundation - Flanders (FWO) (2008–2010).

• Travel grants

- Research Foundation - Flanders (FWO): Vicenza, Italy (May-June 2011), 3000NZD
- Research Foundation - Flanders (FWO): Fort Collins, Colorado (November-December 2011), 6000NZD
- Fonds Wuytack, Ghent University: Arco, Italy (June 2018), 2000NZD

• Post-doctoral fellowships

- Research Foundation - Flanders (FWO) (2012–2016) (Salary+ 27000NZD bench fee)
New aspects of field reduction
 - Research Foundation - Flanders (FWO) (2016–2021) (Salary+ 27000NZD bench fee)
Translation structures: groups, graphs, geometries
 - **College of Engineering Strategic Research grant (2018)**
University of Canterbury
The geometry of rank-metric codes, 3500NZD.
 - **Marsden Fast-Start grant (2019)**
Royal Society of New Zealand, Marsden Fund: MFP-UOC1805:
The geometry of rank-metric codes 01/03/2019–28/02/2022, 300 000 NZD.
AI: John Sheekey, University College Dublin, Ireland.
 - **NZMS Early Career Research award (2020)**
New Zealand Mathematical Society
 - **College of Engineering New and Emerging Researcher award (2020)**
University of Canterbury
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Editorial work and professional memberships

Editor for the following international journals:

- Journal of Algebraic Combinatorics (JACO) (since 2017)
- Bulletin of the Institute of Combinatorics and their Applications (ICA) (since 2017)
- Bulletin of the Belgian Mathematical Society (BMS)–Simon Stevin (since 2019)

Member of the following societies:

- ICA, Institute of Combinatorics and their Applications (since 2017)
 - BMS, Belgian Mathematical Society–Simon Stevin (since 2019)
 - NZMS, New Zealand Mathematics Society (since 2017), **Council member** since 2021.
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Supervision of PhD students

Completed

- (co-supervisor) Sara Rottey.
Characterising substructures of finite projective spaces.
Ghent University and Vrije Universiteit Brussel, 2013.
- (co-supervisor) Jozefien D'haeseleer.
Families of Intersecting Subspaces.
Ghent University, 2021.

- (associate supervisor) George Drummond.
University of Canterbury, 2022.

In progress

- (senior supervisor) Dibyayoti Jena.
University of Canterbury. October 2019–
- (associate supervisor) Rosie Findlay.
University of Canterbury. October 2019–

Supervision of Master students

Completed

- (co-supervisor) Arne Botteldoorn.
Codes from finite planes. Ghent University, 2016.
- (co-supervisor) Jozefien D'haeseleer.
Subspace codes en hun meetkundig achtergrond (Subspace codes and their geometric background).
Ghent University, 2017.

In progress

- (senior supervisor) Jake Faulkner. University of Canterbury.

Supervision of Bachelor projects

- Joni D'Hoe.
Blokkerende verzamelingen (blocking sets).
Vrije Universiteit Brussel, 2011.
 - Lobke Van Impe.
Sudoku's, Vrije Universiteit Brussel.
Vrije Universiteit Brussel, 2012.
 - (co-supervisor) Jozefien D'Haeseleer.
Een meetkundige studie van Sudoku's (a geometric study of Sudokus)
Ghent University, 2015.
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Supervision of summer projects

- Jake Faulkner.
Latin hypercubes and finite projective geometry
University of Canterbury, 2021.
 - David Walle.
Eigenvalue techniques for graph theory
University of Canterbury, 2022.
 - Matthias Chan.
Projective planes and complete arcs
University of Canterbury, 2022.
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Publications

1. V. Fack, Sz.L. Fancsali, L. Storme, G. Van de Voorde, and J. Winne. Small weight codewords in codes arising from Desarguesian projective planes. *Des. Codes Cryptogr.* **46 (1)** (2008), 25–43.
2. M. Lavrauw, L. Storme, and G. Van de Voorde. On the code generated by the incidence matrix of points and hyperplanes in $PG(n, q)$ and its dual. *Des. Codes Cryptogr.* **48 (3)** (2008), 231–245.
3. M. Lavrauw, L. Storme, and G. Van de Voorde. On the code generated by the incidence matrix of points and k -spaces in $PG(n, q)$ and its dual. *Finite Fields Appl.* **14 (4)** (2008), 1020–1038.
4. V. Pepe, L. Storme, and G. Van de Voorde. Small weight codewords in the LDPC codes arising from linear representations of geometries. *J. Combin. Des.* **17 (1)** (2009), 1–24.
5. M. Lavrauw, L. Storme, P. Sziklai, and G. Van de Voorde. An empty interval in the spectrum of small weight codewords in the code of points and k -spaces of $PG(n, q)$. *J. Combin. Theory, Ser. A* **116 (4)** (2009), 996–1001.
6. S. Dodunekov, L. Storme, and G. Van de Voorde. Partial covers of $PG(n, q)$, *European J. Combin.* **31 (6)** (2010), 1611–1616.
7. V. Pepe, L. Storme, and G. Van de Voorde. On codewords in the dual code of classical generalised quadrangles and classical polar spaces. *Discrete Math.*, **310 (22)** (2010), 3132–3148.
8. M. Lavrauw and G. Van de Voorde. On linear sets on a projective line. *Des. Codes Cryptogr.* **56 (2–3)** (2010), 89–104.
9. M. Lavrauw, L. Storme, and G. Van de Voorde. Linear codes from projective spaces. *Error-correcting codes, finite geometries and cryptography*, 185–202, *Contemp. Math.* **523**, Amer. Math. Soc., Providence, RI, 2010
10. G. Van de Voorde. LDPC codes from finite geometries. *Proceedings of the Academy Contact Forum ‘Coding Theory and Cryptography III’*.

11. M. Lavrauw, L. Storme, and G. Van de Voorde. A proof of the linearity conjecture for k -blocking sets in $PG(n, p^3)$, p prime. *J. Combin. Theory, Ser. A* **118 (3)** (2011), 808–818.
12. G. Van de Voorde. On the linearity of higher-dimensional blocking sets. *Electron. J. Combin.* **17 (1)** (2010), Research Paper 174, 16 pp.
13. G. Van de Voorde. On sets without tangents and exterior sets of a conic, *Discrete Math.* **311(20)** (2011), 2253–2258.
14. P. Sziklai and G. Van de Voorde. A small minimal blocking set in $PG(n, p^t)$, spanning a $(t - 1)$ -space, is linear. *Des. Codes Cryptogr.* **68(1-3)** (2013), 25–32.
15. M. Lavrauw and G. Van de Voorde. Scattered linear sets and pseudoreguli. *Electronic J. Combin.* **20(1)** (2013), 15 pp.
16. T. Penttila and G. Van de Voorde. Extending pseudo-arcs in odd characteristic. *Finite Fields Appl* **22** (2013), 101–113.
17. P. Cara, S. Rottey and G. Van de Voorde. The isomorphism problem for linear representations and their graphs. *Adv. Geom.* **14 (2)** (2014), 353–367.
18. P. Cara, S. Rottey and G. Van de Voorde. A construction for infinite families of semisymmetric graphs revealing their full automorphism group. *J. Algebraic Combin.* **39 (4)** (2014), 967–988.
19. S. De Winter, S. Rottey and G. Van de Voorde. Linear representations of subgeometries. *Des. Codes Cryptogr.*, **77 (1)** (2015), 203–215.
20. M. Lavrauw and G. Van de Voorde. Field reduction and linear sets in finite geometry. *Contemp. Math.* **632** Amer. Math. Soc., Providence, RI, 2015.
21. S. Rottey and G. Van de Voorde. Pseudo-ovals in even characteristic and ovoidal Laguerre planes. *J. Combin. Theory Ser. A* **129** (2015), 105–121.
22. S. Rottey, J. Sheekey and G. Van de Voorde. Subgeometries in the André/Bruck-Bose representation. *Finite Fields Appl* **35** (2015), 115–138.
23. S. Rottey and G. Van de Voorde. Characterisations of elementary pseudo-caps and good eggs. *Electron. J. Combin.* **22(1)** (2015), P1.49.
24. G. Van de Voorde. Constructing minimal blocking sets using field reduction. *J. Combin. Designs* **24** (2016), 36–52.
25. M. De Boeck and G. Van de Voorde. A linear set view on KM-arcs. *J. Algebraic Combin.* **44** (2016), 131–164.
26. J. De Beule, T. Héger, T. Szőnyi, and G. Van de Voorde. Blocking and double blocking sets in finite planes. *Electronic J. Combin.* **23 (2)** (2016), P2.5.
27. G. Van de Voorde. Desarguesian spreads and field reduction for elements of the semilinear group. *Linear Algebra Appl.* **507** (2016), 96–120.

28. J. D'haeseleer, K. Metsch, L. Storme, and G. Van de Voorde. On the maximality of a set of mutually orthogonal Sudoku Latin Squares. *Des. Codes Cryptogr.* **84** (1–2) (2017), 143–152.
29. M. De Boeck and G. Van de Voorde. Elation KM-arcs. *Combinatorica* **39** (2019), 501–544.
30. M. De Boeck and G. Van de Voorde. A new lower bound on the size of an affine blocking set. *Electronic J. Combin.* **25** (4)(2018), P 4.40.
31. S. Rottey and G. Van de Voorde. Unitals with many Baer secants through a fixed point. *Adv. Geom* **19** (1) (2019), 21–30.
32. J. De Beule and G. Van de Voorde. The minimum size of a linear set. *J. Combin. Theory Ser. A.* **164** (2019), 109–124.
33. J. Sheekey and G. Van de Voorde. Rank-metric codes, linear sets and their duality. *Des. Codes Cryptogr.* **88** (2020), 655–675.
34. K. Metsch and G. Van de Voorde. On a question of Thas on partial $3-(q^n + 1, q + 1, 1)$ designs. *J. Combin. Designs* **28** (1) (2020), 25–32.
35. J. D'Haeseleer and G. Van de Voorde. Translation hyperovals and \mathbb{F}_2 -linear sets of pseudo-regulus type. *Electronic J. Combin.* **27** (3) (2020), P3.21.
36. J. Sheekey, G. Van de Voorde and J.F. Voloch. On the product of elements with prescribed trace. *Journal of Australian Math Soc.* DOI: 10.1017/S1446788720000178
37. M. Lavrauw and G. Van de Voorde. Locally repairable codes with high availability based on generalised quadrangles. *Advances in Mathematics of Communications.* DOI 10.3934/amc.2020099
38. D. Jena and G. Van de Voorde. On linear sets of minimum size. *Discrete Math.* **344**(3) (2021), 112230.
39. M. De Boeck and G. Van de Voorde. A note on large Kakeya sets. *Adv. Geom* **21** (3) (2021), 401–405.
40. D. Jena and G. Van de Voorde. The geometric field of linearity of linear sets. *Des. Codes Cryptogr.* **90** (2022), 779–799.
41. J. Schillewaert and G. Van de Voorde. Characterising elliptic and hyperbolic hyperplanes of the parabolic quadric $Q(2n, q)$. *Finite Fields Appl.* **78** (2022), 101961.
42. M. De Boeck and G. Van de Voorde. The weight distribution of linear sets in $PG(1, q^5)$. *Finite Fields Appl.* doi.org/10.1016/j.ffa.2022.102034.
43. J. Schillewaert and G. Van de Voorde. Quasi-polar spaces. To appear in *Combinatorial Theory*
44. M. De Boeck and G. Van de Voorde. Embedded antipodal planes and the minimum weight of the dual code of points and lines in projective planes of order p^2 . To appear in *Designs Codes Cryptogr.*

Submitted:

1. J. Faulkner and G. Van de Voorde. On the Equivalence, Stabilisers, and Feet of Buekenhout-Tits Unitals.
 2. L. Denaux, J D'haeseleer and G. Van de Voorde. A higgledy-piggledy set of planes based on the ABB-representation of linear sets.
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Invited (plenary) talks

1. Colloquium on Galois Geometry, Ghent University (Belgium)
27/05/2011
LDPC codes from finite geometries
2. FQ11, International conference on finite fields and their applications, Magdeburg (Germany)
22/07/2013—26/07/2013
Field reduction in finite projective geometry
3. Arithmétique en Plat Pays (Getaltheorie in het vlakke land), Brussels (Belgium)
18/04/2016
Field reduction in finite projective geometry (Invited talk)
4. Combinatorics 2018, Arco (Italy)
03/06/2018—09/06/2018
The tragedy of the Baer subplanes
5. Colloquium of the New Zealand Mathematical Society, Dunedin (New Zealand)
Butcher-Kalman lecturer
4/12/2018—6/12/2018
Blocking sets in finite projective planes
6. Groups and Geometry, Auckland (New Zealand)
16/01/2019—18/01/2019
A geometric view on rank-metric codes
7. Finite Geometry and Friends, a Brussels Summer School, Brussels (Belgium)
17/06/2019—21/06/2019
Linear sets (Six hours of lectures)
8. NZ Number Theory Workshop 2019, Christchurch (New Zealand)
26/08/2019
On the product of elements with prescribed trace
9. Finite Geometry: a workshop in honour of Tim Penttila, Adelaide (Australia)
16/12/2019—17/12/2019
 \mathbb{F}_2 -linear sets, translation hyperovals and KM-arcs

10. NZMRI Summer meeting 2021, Napier (New Zealand)
11/1/2021–16/1/2021
Codes from finite projective planes (2 hours of lectures)
 11. CANT 2021 (Combinatorial and additive number theory)
Online conference organised by City University of New York
24-28/5/2021
The product of elements with prescribed trace
 12. NZMS mini-colloquium *In lieu of postponed NZMS colloquium*, Christchurch+online
7/12/2021
Menelaos strikes again
 13. ILAS (24th conference of the International Linear Algebra Society), invited talk in min-
isymposium *Coding Theory and Linear Algebra over Finite Fields*.
20–24/06/2022
The dual code of points and lines in a projective plane
 14. Finite Geometries (Sixth Irsee Conference), Irsee, 28/08/2022-03/09/2022 (postponed in
2020 and 2021)
Quasi-polar spaces.
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Teaching

- At Ghent University (2006-2010): exercises courses in Coding Theory (Master), Projective Geometry (Bach2), and general mathematics for non-math majors (Bach1)
 - At Free University of Brussels (2010-2012): Extension to Linear algebra (Bach1, 6 students), Advanced Analysis (Bach2, 35 students)
 - At Ghent University (2012-2016): Coding Theory (Master, 10 students), Linear Algebra and Geometry (Bach1, 90 students)
 - At University of Canterbury, I have taught into the following courses throughout the years
 - Discrete Mathematics I (Bach1, \pm 450 students)
 - Discrete Mathematics II (Bach2, \pm 75 students)
 - Multivariable Calculus (Bach2, \pm 110 students)
 - Linear Algebra for Engineers (Bach2, \pm 180 students)
 - Coding Theory and Cryptography (Bach3, \pm 35 students)
 - Geometry (Honours cours, \pm 4 students)
 - **Online development** for Linear Algebra for Engineers (Bach1)
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Presentations at international conferences

1. Workshop on Coding and Cryptography, Versailles (France)
16/04/2007-20/04/2007.
Small weight codewords in codes arising from Desarguesian projective planes.
2. Fifth International Workshop on optimal codes and related topics, Balchik (Bulgaria)
16/06/2007-22/06/2007
Small weight codewords in codes arising from Desarguesian projective spaces.
3. Kolloquium über Kombinatorik, Magdeburg (Germany)
16/11/2007-17/11/2007
Small weight codewords in the (dual) code of points and k -spaces of $\text{PG}(n, q)$.
4. Combinatorics 2008, Costermano (Italy)
22/06/2008-28/06/2008
Partial covers of $\text{PG}(n, q)$.
5. Geometric and Algebraic Combinatorics 4, Oisterwijk (The Netherlands)
17/08/2008-22/08/2008
Small minimal blocking sets in $\text{PG}(n, p^3)$.
6. Pre-ICM International Convention on Mathematical Sciences, Delhi (India)
18/12/2008-20/12/2008
An introduction to finite geometry.
7. Galois geometries and their applications, Ghent (Belgium)
25/05/2009-29/05/2009
The dual code of $\mathcal{Q}(4, q)$ and $\mathcal{Q}^+(5, q)$.
8. Diamant-Eidma Symposium, Heeze (The Netherlands)
27/05/2009-29/05/2009
The intersection of a subline and a linear set.
9. FQ9, International conference on finite fields and their applications, Dublin (Ireland)
13/07/2009-17/07/2009
The intersection of a subline and an \mathbb{F}_q -linear set.
10. An International Conference on Designs, Codes & Geometries (in honor of Gary Ebert),
Lewes (Delaware, USA)
29/03/2010-01/04/2010
On the equivalence of linear sets in a projective space.
11. Algebraic Combinatorics and Applications (ALCOMA 10), Thurnau (Germany)
11/04/2010-18/04/2010
On the equivalence of linear sets in a projective space.
12. Fourth Pythagorean Conference, Corfu (Greece)
30/05/2010-04/06/2010
On the linearity of higher-dimensional blocking sets.

13. Finite Geometries (Third Irsee conference), Irsee (Germany)
19/06/2011-25/06/2011
On the linearity of some higher-dimensional blocking sets
14. FQ10, International conference on finite fields and their applications, Ghent (Belgium)
11/07/2011-15/07/2011
Stopping sets, sets without tangents, and exterior sets to a conic
15. Geometric and Algebraic Combinatorics 5, Oisterwijk (The Netherlands)
15/08/2011-19/08/2011
On scattered linear sets and pseudo-reguli
16. Algebraic Combinatorics: In Memory of Bob Liebler, Fort Collins (Colorado, USA)
04/11/2011- 06/11/2011
On the linearity of some higher-dimensional blocking sets
17. Incidence Geometry and Buildings, Ghent (Belgium)
06/02/2012-10/02/2012
Extending pseudo-ovals in odd characteristic.
18. Giornate di Geometria, Vicenza (Italy)
13/02/2012-14/02/2012
Scattered linear sets and pseudoreguli.
19. Combinatorics 2012, Perugia (Italy)
9/09/2012–15/09/2012
Large pseudo-arcs in odd characteristic
20. Conference on finite geometries (in honor of F. De Clerck), Ferrara (Italy)
17/09/2012–18/09/2012
The isomorphism problem for linear representations
21. Finite Geometries (fourth Irsee conference), Irsee (Germany)
15/09/2014–19/09/2014
Arcs of type $(0, 2, t)$ of size $q + t$ in Desarguesian projective planes
22. Combinatorics 2016, Maratea (Italy)
29/05/2016–04/06/2016
Point sets in $PG(2, q)$ such that every line meets in 0, 2, or t points.
23. Finite Geometries (fifth Irsee conference), Irsee (Germany)
11/09/2017–15/09/2017
On the weight distribution of linear sets
24. 41ACCMCC, Australasian Conference on Combinatorial Mathematics and Combinatorial Computing, Rotorua (New Zealand)
10/12/2018–14/12/2018
The number of directions determined by a function over a finite field
25. 42ACCMCC, Australasian Conference on Combinatorial Mathematics and Combinatorial Computing, Sydney (Australia)
9/12/2018–13/12/2018
On the (non)-existence of certain disjoint linear sets

Seminar talks

1. Seminar Incidence Geometry, Ghent University, Ghent (Belgium)
11/05/2007
Small weight codewords in the LDPC codes arising from $T_2^(K)$.*
2. Seminar, Veliko Tarnovo University, Veliko Tarnovo (Bulgaria)
07/05/2008
Blocking sets and linear codes.
3. Seminar, Bulgarian Academy of Sciences, Sofia (Bulgaria)
12/05/2008
Blocking sets and linear codes.
4. Seminar Incidence Geometry, Ghent University, Ghent (Belgium)
23/05/2008
The code of points and k -spaces of $PG(n, q)$.
5. Seminar, University 'Federico II', Naples (Italy)
17/02/2009
The linearity conjecture for k -blocking sets in $PG(n, q^3)$: Part 2: A proof for q prime.
6. Seminar Incidence Geometry, Ghent University, Ghent (Belgium)
06/03/2009
The linearity conjecture for k -blocking sets in $PG(n, q^3)$: Part 2: A proof for q prime.
7. Seminar, Technische Universiteit Eindhoven, Eindhoven (The Netherlands)
25/03/2009
The linearity conjecture for k -blocking sets in $PG(n, q^3)$: Part 2: A proof for q prime.
8. Seminar, Technische Universiteit Eindhoven, Eindhoven (The Netherlands)
18/11/2009
Linear codes from projective spaces.
9. Seminar Incidence Geometry, Ghent University, Ghent (Belgium)
18/12/2009
Linear (blocking) sets.
10. Seminar CAMP, Vrije Universiteit Brussel, Brussels (Belgium)
29/11/2010
An introduction to finite geometry and linear codes
11. Finite Geometry Seminar, Eötvös Loránd University, Budapest (Hungary)
10/12/2010
Stopping sets in LDPC codes and sets without tangents in finite projective planes
12. Seminar, Università degli Studi di Padova, Vicenza (Italia)
16/03/2011
LDPC codes from finite geometries

13. Joint Seminar Incidence geometry UGent-VUB-ULB, VUB, Brussels (Belgium)
06/05/2011
On the linearity of some higher-dimensional blocking sets
14. Seminar, Università degli Studi di Padova, Vicenza (Italia)
18/05/2011
The linearity of some higher-dimensional blocking sets
15. Seminar, University of Wyoming, Laramie (Wyoming, USA)
14/11/2011
Sets without tangents and exterior sets to a conic.
16. Seminar, Università degli Studi di Padova, Vicenza (Italy)
02/04/2012
Extending pseudo-arcs in odd characteristic.
17. Seminar, University 'Federico II', Naples (Italy)
15/05/2012
Extending pseudo-arcs in odd characteristic.
18. Seminar, Università degli Studi di Padova, Vicenza (Italy)
11/03/2014
Pseudo-hyperovals
19. Joint Seminar Incidence Geometry, UGent-VUB-ULB, ULB, Brussels (Belgium)
17/11/2016
KM-arcs
20. CoGeNt seminar, University of Canterbury, Christchurch (New Zealand)
02/05/2017
The number of directions determined by a function over a finite field
21. Otago Mathematics Seminar, University of Otago, Dunedin (New Zealand)
16/04/2019
The geometry behind MRD codes.
22. CMSA (Combinatorial Mathematics Society of Australiasia) online Seminar
9/9/2020
Sets with few intersection numbers in finite planes
23. Seminar (School of Mathematics and Statistics), University of Canterbury, Christchurch (New Zealand)
24/09/2020
The duck test in finite planes
24. Combinatorics Seminar, University of Western Australia, Perth (Australia)
11/11/2022
Quasi-quadrics in finite projective spaces