References

[AC] Allcock, D. and Carbone, L. *Finite presentation of hyperbolic Kac–Moody groups over rings*, J. Algebra 445, 232–243, (2016), arXiv:1409.5918

[BC] Bao, L. and Carbone, L. *Kac–Moody groups and automorphic forms in low dimensional supergravity theories*, Submitted to Contemporary Math, Conference on Lie Algebras, Vertex Operator Algebras, and Related topics, edited by K. Barron, E. Jurisich, H. Li, A. Milas and K. C.Misra, (2016), arXiv:1602.02319

[Bou1] Bourbaki, N. *Lie groups and Lie algebras. Chapters 1–3*, Translated from the French. Reprint of the 1989 English translation. Elements of Mathematics (Berlin). Springer-Verlag, Berlin, 1998.

[Bou2] Bourbaki, N. *Lie groups and Lie algebras*, Chapters 4–6. Translated from the 1968 French original by Andrew Pressley. Elements of Mathematics (Berlin). Springer-Verlag, Berlin, 2002.

[Bou3] Bourbaki, N. *Lie groups and Lie algebras. Chapters 7–9*. Translated from the 1975 and 1982 French originals by Andrew Pressley. Elements of Mathematics (Berlin). Springer-Verlag, Berlin, 2005.

[C] Cartier, P. Hyperalgébres et groupes de Lie formels, Séminaire 'Sophus Lie' 2e: 1955/56, (1957).

[CG] Carbone, L. and Garland, H., *Existence of lattices in Kac–Moody groups over finite fields*, Communications in Contemporary, Math, Vol 5, No.5, 813–867, (2003)

[CW] Carbone, L. and Wagner, F. *Uniqueness of representation–theoretic hyperbolic Kac–Moody groups over* $\mathbb{Z}$, Submitted to Contemporary Math, Conference on Lie Algebras, Vertex Operator Algebras, and Related topics, edited by K. Barron, E. Jurisich, H. Li, A. Milas and K. C.Misra, (2016), arXiv:1512.04623

[CCKMM] Carbone, L., Coulson, B., Kanade, S., McRae, R. H. and Murray, S. H. *Structure constants for Kac–Moody algebras*, In preparation (2017)

[CKMS] Carbone, L., Kownacki, M., Murray, S. H. and Srinivasan, S. *Structure constants for rank 2 Kac–Moody algebras*, Preprint, (2017)

[CL] Carbone, L. and Liu, D. *Infinite dimensional Chevalley groups and Kac–Moody groups over* $\mathbb{Z}$, Preprint (2017)

[CCCMNNP] Carbone, L, Chung, S, Cobbs, C, McRae, R, Nandi, D, Naqvi, Y, and Penta, D *Classification of hyperbolic Dynkin diagrams, root lengths and Weyl group orbits*, J. Phys. A: Math. Theor. 43 155209 (2010)

[Ca] Carter, R. W. *Simple groups of Lie type*. Pure and Applied Mathematics, Vol. 28. John Wiley and Sons, London-New York-Sydney, (1972). viii+331 pp.

[CSM] Carter, R. Segal, G. Macdonald, I. *Lectures on Lie groups and Lie algebras*, London Mathematical Society Student Texts, 32. Cambridge University Press, Cambridge, (1995).

[Ch] Chevalley, C. *Sur certains groupes simples*, (French) Tôhoku Math. J. (2) 7 (1955), 14–66.

[CHM] Arjeh M. Cohen, Sergei Haller, and Scott H. Murray, *Computing in unipotent and reductive algebraic groups*, LMS J. Comput. Math. 11 (2008), pp. 343–366.

[CMT] Cohen, A. M., Murray, S. H., and Taylor, D. E. *Computing in groups of Lie type*, Mathematics of computation, Volume 73, Number 247, Pages 1477–1498, (2003)

[dG] de Graaf, W. *Lie Algebras: Theory and Algorithms*, Volume 56, North Holland Mathematical Library. Elsevier Science, (2000).

[Do] Donaldson, S. *Lectures on Lie groups and geometry*, (2011)

[FF] A. Feingold and I. Frenkel, *A hyperbolic Kac–Moody algebra and the theory of Siegel modular forms of genus* 2, Math. Ann. **263** (1983), no. 1, 87–144.

[FLM] Frenkel, I., Lepowsky J. and Meurman, A. *Vertex operator algebras and the Monster*, Pure and Appl. Math., 134, Academic Press, New York (1988).

[GP]   Gilkey, P. B. and Seitz, G. M., *Some representations of exceptional Lie algebras*, Geometries and groups (Noordwijkerhout, 1986), Geom. Dedicata 25 (1988), no. 1-3, 407–416

[GM]   Goldman, W. and Margulis, G. *Flat Lorentz 3–manifolds and cocompact Fuchsian groups*, Crystallographic groups and their generalizations (Kortrijk, 1999), 135–145, Contemp. Math., 262, Amer. Math. Soc., Providence, RI, (2000), arXiv:math/0005292v1

[GW]   Gubay, F. and West, P. C. *Higher derivative type II string effective actions, automorphic forms and E_n*, arXiv:1111.0464v1.

[HRT]   Howlett, R. B., Rylands, L. J., and Taylor, D. E. *Matrix generators for exceptional groups of Lie type*, J. Symbolic Comput. 31 (2001), no. 4, 429–445

[HT]   C. M. Hull and P. K. Townsend, *Unity of superstring dualities*, Nucl. Phys. B **438** (1995) 109, hep-th/9410167.

[Hu]   Humphreys, J. E. *Introduction to Lie algebras and representation theory*. Second printing, revised. Graduate Texts in Mathematics, 9. Springer-Verlag, New York-Berlin, (1978). xii+171 pp

[Ka]   Victor G. Kac, *Infinite dimensional Lie algebras*, Third ed., Cambridge University Press, Cambridge, (1990).

[KP]   Kac, V. and Peterson, D., *Defining relations of certain infinite-dimensional groups*, Astérisque Numéro Hors Série (1985), 165–208.

[Ku]   Kumar, S., *Kac-Moody Groups, Their Flag Varieties and Representation Theory*, Birkhauser, Boston Progress in Mathematics Series, 204, (2002)

[Ki]   Kirillov, A., Jr. *An introduction to Lie groups and Lie algebras*, Cambridge Studies in Advanced Mathematics, 113. Cambridge University Press, Cambridge, (2008). xii+222 pp. ISBN: 978-0-521-88969-8

[Ko]   Kostant, B., *Groups over $\mathbb{Z}$*, 1966 Algebraic Groups and Discontinuous Subgroups (Proc. Sympos. Pure Math., Boulder, Colo., (1965)) pp. 90–98 Amer. Math. Soc., Providence, R.I.

[Mi]   Mitzman, D., *Integral bases for affine Lie algebras and their universal enveloping algebras*, Contemporary Mathematics, 40. American Mathematical Society, Providence, RI, (1985). vii+159 pp. ISBN: 0-8218-5043-1

[M]   Mathieu, O. *Sur la construction de groupes associés aux algébres de Kac-Moody.* (French) [On the construction of groups associated with Kac-Moody algebras] C. R. Acad. Sci. Paris Sér. I Math. 299 (1984), no. 6, 161–164

[M1]   Moody, R. V. , *Lie algebras associated with generalized cartan matrices*, Bull. Amer. Math. Soc., 73 (1967) 217-221

[M2]   Moody, R. V. *A new class of Lie algebras*, J. Algebra 10 (1968) 211–230

[MP]   Moody, R. V. and Pianzola, A. *Lie algebras with triangular decompositions*, Canadian Mathematical Society. A Wiley-Interscience Publication. John Wiley and Sons, Inc., New York, (1995).

[Mo]   Morita, J. *Commutator relations in Kac-Moody groups*, Proc. Japan Acad., Series A **63** (1987) 21–22

[R]   Rylands, L. J. *Fast calculation of structure constants*, Preprint, (2000)

[S]   Soulé, *An introduction to arithmetic groups*, Proceedings of 'Frontiers in Number Theory, Physics and Geometry', Les Houches, March 9–21, (2003), arXiv:math/0403390v1.

[St]   Steinberg, R., *Lectures on Chevalley groups*, Notes prepared by John Faulkner and Robert Wilson, Yale University, (1967)

[St2]   Steinberg, R. *Générateurs, relations et revêtements de groupes algébriques*, (French) 1962 Colloq. Théorie des Groupes Algébriques (Bruxelles, 1962) pp. 113–127 Librairie Universitaire, Louvain; Gauthier-Villars, Paris

[Ti1]   Tits, J., *Resume de Cours - Theorie des Groupes*, Annuaire du College de France, (1980-1981), 75–87

[Ti2]   Tits, J., *Uniqueness and presentation of Kac–Moody groups over fields*, Journal of Algebra, 105, (1987), 542–573

[Ti3]   Tits, J. *Sur les constantes de structure et le thòréme d'existence des algébres de Lie semi-simples* (French) Inst. Hautes Études Sci. Publ. Math. No. 31 (1966) 21–58.

[V1]   Vavilov, N. A. *Do it yourself structure constants for Lie algebras of types E_ℓ.* Zap. Nauchn. Sem. S.-Peterburg. Otdel. Mat. Inst. Steklov. (POMI) 281 (2001), Vopr. Teor. Predst. Algebr. i Grupp. 8, 60–104, 281; translation in J. Math. Sci. (N. Y.) 120 (2004), no. 4, 1513–1548

[V2]   Vavilov, N. A. *How is one to view the signs of structure constants?* (Russian) Algebra i Analiz 19 (2007), no. 4, 34–68; translation in St. Petersburg Math. J. 19 (2008), no. 4, 519–543

[VP]   Vavilov, N. and Plotkin, E. *Chevalley groups over commutative rings. I. Elementary calculations*, Acta Appl. Math. 45 (1996), no. 1, 73–113.

[Wa]   Wallach, N. The classical groups, Lecture notes.