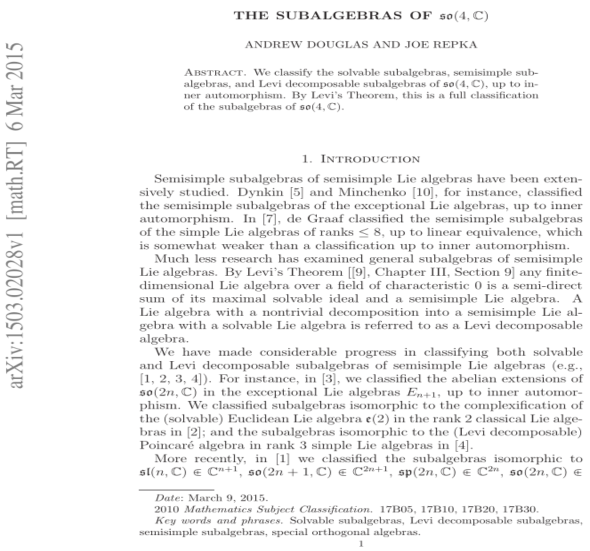
Nilpotent Orbits In Semisimple Lie Algebras



arXiv:1503.02028v1 [math.RT] 6 Mar 2015

THE SUBALGEBRAS OF $\mathfrak{so}(4, \mathbb{C})$

ANDREW DOUGLAS AND JOE REPKA

Abstract. We classify the solvable subalgebras, semisimple subalgebras, and Levi decomposable subalgebras of $\mathfrak{so}(4, \mathbb{C})$, up to inner automorphism. By Levi's Theorem, this is a full classification of the subalgebras of $\mathfrak{so}(4, \mathbb{C})$.

1. Introduction

Semisimple subalgebras of semisimple Lie algebras have been extensively studied. Dynkin [5] and Minchenko [10], for instance, classified the semisimple subalgebras of the exceptional Lie algebras, up to inner automorphism. In [7], de Graaf classified the semisimple subalgebras of the simple Lie algebras of ranks ≤ 8, up to linear equivalence, which is somewhat weaker than a classification up to inner automorphism.

Much less research has examined general subalgebras of semisimple Lie algebras. By Levi's Theorem [[9], Chapter III, Section 9] any finite-dimensional Lie algebra over a field of characteristic 0 is a semi-direct sum of its maximal solvable ideal and a semisimple Lie algebra. A Lie algebra with a nontrivial decomposition into a semisimple Lie algebra with a solvable Lie algebra is referred to as a Levi decomposable algebra.

We have made considerable progress in classifying both solvable and Levi decomposable subalgebras of semisimple Lie algebras (e.g., [1, 2, 3, 4]). For instance, in [3], we classified the abelian extensions of $\mathfrak{so}(2n, \mathbb{C})$ in the exceptional Lie algebras E_{n+1}, up to inner automorphism. We classified subalgebras isomorphic to the complexification of the (solvable) Euclidean Lie algebra $\mathfrak{e}(2)$ in the rank 2 classical Lie algebras in [2]; and the subalgebras isomorphic to the (Levi decomposable) Poincaré algebra in rank 3 simple Lie algebras in [4].

More recently, in [1] we classified the subalgebras isomorphic to $\mathfrak{sl}(n, \mathbb{C}) \in \mathbb{C}^{n+1}$, $\mathfrak{so}(2n+1, \mathbb{C}) \in \mathbb{C}^{2n+1}$, $\mathfrak{sp}(2n, \mathbb{C}) \in \mathbb{C}^{2n}$, $\mathfrak{so}(2n, \mathbb{C}) \in$

Date: March 9, 2015.

2010 Mathematics Subject Classification. 17B05, 17B10, 17B20, 17B30.

Key words and phrases. Solvable subalgebras, Levi decomposable subalgebras, semisimple subalgebras, special orthogonal algebras.

1

Nilpotent Orbits In Semisimple Lie Algebra: An Introduction. David.H. Collingwood, William.M. McGovern. Hardback $Abstract: We formulate and prove that there are "abundant" in nilpotent orbits in real semisimple Lie algebras, in the following sense.Conjugacy classes of nilpotent elements in complex semisimple Lie algebras are classified using the Bala-Carter theory. In this theory, nilpotent orbits in g are.Nilpotent orbits in semisimple Lie algebras /. David H. Collingwood, William M. McGovern. imprint. New York: Van Nostrand Reinhold, c description.In mathematics, nilpotent orbits are generalizations of nilpotent matrices that play an important role in representation theory of real and complex semisimple Lie groups and semisimple Lie algebras.In this section, we outline our strategy for classifying nilpotent orbits in a complex semisimple Lie algebra. We will use three main tools. A correspondence.A JosephA characteristic variety for the primitive spectrum of a semisimple Lie algebra. Non-Commutative Harmonic Analysis, Lecture Notes in Mathematics, Vol.For this post, I am mostly following Section in Collingwood and McGovern, Nilpotent Orbits in Semisimple Lie Algebras, but I am trying to.By the Jacobson-Morozov theorem a nilpotent element of a semisimple Lie algebra can be embedded (as nilpositive element) in an sl2-triple.Featured Authors. Nilpotent Orbits In Semisimple Lie Algebra: An Introduction (Hardback) book cover MAT MATHEMATICS / Algebra / General.Author: Collingwood, David H. [Browse]; Format: Book; Language: English; Published/?Created: New York: Van Nostrand Reinhold, c Description: xiii .We consider nilpotent coadjoint orbits in complex simple Lie algebras and we . Poisson structure to any adjoint orbit in a semi-simple Lie algebra is polynomial.David H. Collingwood, William M. McGovern,. Nilpotent orbits in semisimple Lie algebras. Alessandra Pantano. Oliver Club Talk, Cornell.