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FAKULTÄT FÜR MATHEMATIK
Dekan Univ.-Prof. Dr. Radu Ioan Boţ

Einladung zur öffentlichen Defensio

Mina MONADJEM

Thema der Dissertation

Post-Lie algebra structures and decompositions of Lie algebras

Abstract:
In this thesis we study decompositions of Lie algebras, the existence of post-Lie algebra structures and their connection. Post-Lie algebra structures (PA-structures) appear in various areas of mathematics, such as crystallographic groups and affine structures on Lie groups. We consider the existence of post-Lie algebra structures depending on the algebraic properties of the Lie algebras. This will be done by examining decomposition questions. By a decomposition we mean a Lie algebra $\mathfrak{g}$ that can be written as a vector space sum of two of its subalgebras, i.e. $\mathfrak{g} = \mathfrak{a} + \mathfrak{b}$ where $\mathfrak{a}$ and $\mathfrak{b}$ are subalgebras of $\mathfrak{g}$. We want to determine properties of $\mathfrak{g}$ depending on the algebraic properties of $\mathfrak{a}$ and $\mathfrak{b}$. We show that a Lie algebra that is a direct vector space sum of two semisimple subalgebras is semisimple. We will use this result to make statements about post-Lie algebra structures on semisimple Lie algebras. In particular, we show that for a post-Lie algebra structure on $(\mathfrak{g}, \mathfrak{n})$ where $\mathfrak{g}$ is semisimple, we have that $\mathfrak{g}$ and $\mathfrak{n}$ are isomorphic, so we have rigidity in this case. Moreover we want to generalize results about post-Lie algebra structures on semisimple Lie algebras to perfect Lie algebras. We show based on lower dimensional perfect Lie algebras, which pairs admit a post-Lie algebra structure. We see that there exist pairs of Lie algebras $(\mathfrak{g}, \mathfrak{n})$ where $\mathfrak{g}$ is perfect and $\mathfrak{n}$ is reductive non-semisimple that admit a post-Lie algebra structure. In addition, we give an existence table, which shows for which pairs $(\mathfrak{g}, \mathfrak{n})$ there exists a post-Lie algebra structure. Furthermore, we investigate commutative PA-structures and generalize some existing results to new classes of PA-structures, namely λ-SPA-structures.

Prüfungssenat

Univ.-Prof. Mag. Dr. Andreas Cap
(Vorsitz, Universität Wien)

Assoz. Prof. Dr. Dietrich Burde, Privatdoz.
(Universität Wien)

Prof. Dr. Salvatore Siciliano
(Università del Salento)

Prof. Dr. Abdenacer Makhlouf
(Université de Haute-Alsace)

Zeit und Ort

Freitag, 27. September 2024, 16:00 Uhr

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