

Maximal solvable subgroups

Mikko KORHONEN

Abstract. A subgroup of a group G is said to be *maximal solvable* if it is maximal among the solvable subgroups of G . In his 1870 *Traité*, Jordan gave a classification of the maximal solvable subgroups of symmetric groups. The classification reduces to the primitive case, which is equivalent to the problem of classifying maximal irreducible solvable subgroups of $\mathrm{GL}(d, p)$, where p is a prime. In $\mathrm{GL}(d, p)$, the problem is reduced to the case of primitive irreducible solvable subgroups. These subgroups are then constructed in terms of maximal irreducible solvable subgroups of general symplectic groups $\mathrm{GSp}(2k, r)$ (r prime) and orthogonal groups $\mathrm{O}^\pm(2k, 2)$.

In this talk, we discuss Jordan's classification in modern terms. More generally, we consider the complete classification of maximal irreducible solvable subgroups of classical groups such as $\mathrm{GL}(n, q)$, $\mathrm{GSp}(n, q)$, and $\mathrm{GO}(n, q)$, where q is a power of a prime. From the classification we also get a recursive construction of the maximal irreducible solvable subgroups, and this works efficiently when implemented on a CAS such as Magma or GAP. If time permits, we will also discuss the analogous problem for linear algebraic groups over algebraically closed fields.

About the speaker. Mikko Korhonen is an Assistant Professor at Tampere University (Tampere, Finland). His main research interests lie in group theory and representation theory, including simple algebraic groups, their subgroup structure, and various properties of unipotent elements. In finite group theory, he is particularly interested in groups of Lie type over finite fields and primitive permutation groups.

Previously, he held positions at the Southern University of Science and Technology in Shenzhen (2021–2025) and the University of Manchester (2019–2020). He obtained his PhD from the École Polytechnique Fédérale de Lausanne in 2018.

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MATHEMATICS RESEARCH CENTRE, TAMPERE UNIVERSITY | 33720 TAMPERE, FINLAND

E-mail: korhonen_mikko@hotmail.com