大规模 MIMO 系统中基于机器学习的物理层窃听检测技术

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摘 要：无线通信中物理层的安全问题至关重要.有效的物理层安全机制可以为无线通信提供有效的保密机制，为后期保密通信降低系统复杂度.本文提出了一种基于 k-means 聚类分析技术的主动窃听用户检测方法.该方法无需设计导频序列以及估计合法用户信道统计信息.通过构造一段只有合法用户信息的序列来获取所需聚类信息，进而对基站接收的信号进行窃听检测.仿真结果表明，相较于现有的传统窃听检测方案，本文提出的基于机器学习的方法在性能上有显著的提升.

关键词： 物理层安全机制；窃听检测；大规模天线阵列；k-means

Physical layer eavesdropping detection technology based on

machine learning in large-scale MIMO system

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Abstract：The security of physical layer is very important in wireless communication.Effective physical layer security mechanism can provide effective security mechanism for wireless communication and reduce system complexity for later secure communication.This paper proposes an active eavesdropping user detection method based on k-means clustering analysis technology.This method does not need to design pilot sequences and estimate legitimate user channel statistics.The required clustering information is obtained by constructing a sequence with only legitimate user information， and then eavesdropping detection is performed on the signals received by the base station.Simulation results show that compared with the traditional eavesdropping detection scheme， the machine learning-based method proposed in this paper has a significant improvement in performance.

Key words： physical layer security；detection of eavesdropping；Massive MIMO；k-means

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