Abstract

Representation theory is a method for studying an abstract group in terms of linear transformations . With the help of representation theory we can view each element of a group as a matrix . We can approach some group theoretic problems in terms of linear algebra using inner product spaces , eigen values and diagonalizability . I have studied the representation theory of finite groups with a focus on group algebras over splitting fields. I also studied the theory of group characters, which is the essence of a representation , which play a central role in character theory .

Then I have studied the use of group representations in Private Information Retrieval (PIR), focusing on group-based and bilinear PIR protocols. These schemes allow users to retrieve data privately using algebraic techniques such as group algebras, modules, and secret sharing. A key result is a lower bound on the communication complexity of group-based PIR, derived using tools from representation theory.