

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS

Abstract

Bachelor in Mathematics

Galois correspondence of covering spaces

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This thesis explores the interplay between algebraic and topological structures through the lens of Galois theory and covering space theory. Galois theory establishes a profound correspondence between intermediate fields of a field extension and subgroups of its Galois group. Similarly, in topology, the classification of covering spaces of a topological space corresponds to subgroups of its fundamental group.

The central aim of this thesis is to reformulate these correspondences in the language of category theory presenting a unified perspective that highlights their structural similarities. By defining appropriate categories for intermediate fields, subgroups, covering spaces, and fundamental groups, we demonstrate that both correspondences can be expressed as equivalences of categories.

Additionally, we discuss some extensions of these ideas to modern mathematical frameworks, including étale fundamental groups and their connections to algebraic geometry. Examples such as cyclotomic extensions and classical covering spaces, including the circle and torus, are provided as highlighting examples.

This thesis contributes to the broader mathematical discourse by presenting a categorical analogy