

1 Introduction

Algebraic Statistics is a subject that combines ideas from algebra (like equations and shapes defined by equations) with statistics (which deals with data and probabilities). It helps us understand statistical models using tools from algebra, which can make complex relationships easier to see and work with.

This project focuses on learning the main ideas in Algebraic Statistics, such as ideals in polynomial rings and affine varieties, and how these ideas can be used in statistics. We look at how equations can describe statistical models and how geometry can help us solve problems in statistics. Some of the important topics we cover include the Zariski topology, Hilbert's Nullstellensatz, and Gröbner bases.

By studying these topics, we learn how to connect algebra with statistics in a useful way. This report includes definitions, theorems, and examples that show how algebra can help us understand and solve real problems in statistics.