

# BSc Thesis Summary

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## Numerical Calculation of Lyapunov Exponents for Random Matrix

### Products

#### A Dynamical Systems and Chaos Theory Approach

The concept of Lyapunov exponents holds significant importance in the fields of fractal geometry and dynamical system theory. Numerous studies have explored their diverse applications, ranging from analyzing the stability behavior of systems to estimating the fractal dimension of specific limit sets. One notable area where the estimation of Lyapunov exponents becomes crucial is in the analysis of random products of matrices. This thesis focuses on studying the computation of Lyapunov exponents using a numerical approach grounded in dynamical system theory.

**Key words:** limit sets, Poincaré maps, stability type, variational equation, strange attractor

The main objective of this research is to emphasize the importance of Lyapunov exponents through the lens of dynamical systems theory. Chapter 2 provides an introduction to dynamical systems, followed by the study of limit sets in Chapter 3 and stability analysis in Chapter 4. Subsequently, we delve into efficient computational methods for estimating Lyapunov exponents of various dynamical systems in Chapter 5 based on the algorithm presented in Parker and Chua: Practical Numerical Algorithms for Chaotic Systems.