MATH4800 - SUGGESTED PROJECTS

FALL 2023

Project 1. $p$-adic dynamics and the Smale-Williams Solenoid

Keywords: Abelian groups, hyperbolic dynamics, strange attractors

Suggested resources:
- Intro to $p$-adic numbers
- Inverse Limits
- Hasselblatt-Katok: Section 17.1
- Fourier Analysis on Groups

Project 2. Sturmian Subshifts and coding circle rotations

Keywords: Elliptic dynamics, coding non-Markov systems, combinatorics

Suggested resources:
- Substitutions in Dynamics, Arithmetics and Combinatorics, Pytheas Fogg: Chapter II.6
- Chaotic Dynamics, Geoffrey Goodson: Chapter 19
- Hasselblatt-Katok: Sections 1.3, 1.4

Project 3. The Anosov closing lemma and structural stability

Keywords: Topological dynamics, perturbations, generic behavior

Suggested resources:
- Proof of the Anosov closing lemma
- Hasselblatt-Katok: Sections 2.3, 2.4, 18.1, 18.2
- Anosov Diffeomorphisms on Tori, John Franks

Project 4. Fourier analysis on tori, ergodicity and mixing

Keywords: Fourier series, measure-preserving dynamics

Suggested resources:
- Some basics of Fourier series
- Hasselblatt-Katok: Section 4.2
- Fourier analysis on other groups

Project 5. Entropy and the Parry measure

Keywords: Quantified chaos, dynamical invariants, precursor to thermodynamical formalism

Suggested resources:
- Hasselblatt-Katok: Sections 4.3, 4.4c
- More notes on entropy

Project 6. Ergodic sums, averages and the Birkhoff ergodic theorem

Keywords: Dynamical cocycles, statistical mechanics

Suggested resources:
- Hasselblatt-Katok: Section 4.1a,c,f
- Another proof of the Birkhoff ergodic theorem
- Deterministic Central Limit Theorems