

Joel Sleeba

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Research Interests

I am broadly interested in **functional analysis** and **harmonic analysis**. I am currently working on **operator algebras**. As part of my master's thesis I have worked on **Fourier analysis**.

Education

Indian Institute of Science Education and Research

Master of Science in Mathematics, GPA: 8.38

Oct. 2021 – May 2023

Thiruvananthapuram, Kerala

Madras Christian College

Bachelor of Science in Mathematics, GPA: 8.03

June 2018 – May 2021

Chennai, Tamil Nadu

Relevant Coursework

- Functional Analysis
- Representation Theory
- Topology
- Analysis of Manifolds
- Measure Theory
- Finite Frames
- Real Analysis
- Machine Learning

Research Experience

Unitary Invariants for Representations of Operator Algebras

Sept. 2023 – Present

Reading Project

Dr. Soumyashant Nayak, ISI Bangalore

- Plans to read the article by Richard Kadison of the same name.
- Currently reviewing the representations of groups and C^* algebras as a first step to the reading project.

Introduction to C^* Algebras

June 2023 – Sept. 2023

Summer Reading Project

Dr. P Shankar, Cochin University of Science and Technology

- Understood the basics of Banach algebras including spectrum, Gelfand representations of abelian algebras, compact and Fredholm operators in Hilbert spaces.
- Learned C^* algebra theory including Gelfand transforms, functional calculus, sesquilinear forms, positive linear functionals, and GNS construction.
- Covered chapters 1-3 from *C^* Algebras and Operator Theory* by Gerald Murphy and parts of chapter 1 from *An Invitation to C^* Algebras* by William Arveson.
- This project significantly influenced me to explore further about C^* algebras and its representations.

A Study in Fourier Analysis

Jan. 2023 – May 2023

Masters Thesis

Dr. P Devaraj, IISER Thiruvananthapuram

- Explored Fourier transforms in the circle and line, ℓ^p convergence of Fourier series, Fourier Inversion, and classical Paley Wiener theorems
- Covered chapters 3, parts of chapter 4 and 10 from *Early Fourier Analysis* by Hugh L Montgomery and parts of chapter 19 from *Real and Complex Analysis* by Walter Rudin.

Summer Schools

Mathematics Training and Talent Search | Level 1 Camp

April 2021 – May 2021

- Participated in the online summer camp hosted by MTTS trust, funded by the National Board of Higher Mathematics.
- Helped revise concepts in group theory, real analysis and linear algebra.

Mathematics Training and Talent Search | Level 0 Camp

May 2020 – June 2020

- Gained a deeper understanding of topics including logic, sequence and series, vector spaces.
- The programme promoted active discussions in mathematics and gave a platform to connect with people passionate about mathematics.

Leadership / Extracurricular

Operator Algebra Reading Group

Sept. 2023 – Present

- Reading group of friends who are interested in discussions on the basics of C^* algebra and related topics.
- Hosts weekly meetups and presentations on selected topics.

Introduction to C^* algebras

Oct. 9, 2023

Student Seminar Presentation

IISER Thiruvananthapuram

- [Access the presentation slides](#)

Computability

Jan. 2022 – March 2022

Student Reading Project

Ashish Kujur, IISER Thiruvananthapuram

- Understood the notion of computable functions in unlimited register machines(URM).
- Read upto Church-Turing thesis from *Computability: An Introduction to Recursive Function Theory* by Nigel Cutland.
- An article we authored as part of the project was published in the quarterly newsletter of Club of Mathematics. [\[Link\]](#)

Pi Quiz 3.0

March 14, 2022

Host

Club of Mathematics, IISER Thiruvananthapuram

- Co-hosted the annual π day quiz organized by the maths club of IISER Thiruvananthapuram.

Online Foundation Course in Mathematics

Sept. 2021 – Oct. 2021

Mentor

MTTS Trust

- Guided pre-final year undergraduate students in the post lecture discussion sessions of the course.
- The course aimed at helping the students develop mathematical thinking by focusing on logic, sequence and limits and linear algebra.

Achievements

M.Sc Entrance Examination

2021

Rank 1, Mathematics

Pondicherry University

M.Sc Entrance Examination

2021

Rank 3, Mathematics

Hyderabad Central University

Additional Courses

CS101.2x: Object-Oriented Programming

July 2020 – Dec. 2020

Grade: A+ (Maximum possible grade)

MOOCs Course, IITBombayX

CS101.1x: Programming Basics

July 2020 – Dec. 2020

Grade: A+ (Maximum possible grade)

MOOCs Course, IITBombayX

Volunteering and Other Projects

Math Modelling

Sept. 2022 – Nov. 2022

Volunteer

The International Genetically Engineered Machine competition (iGEM), IISER Thiruvananthapuram

- Modelled the partial differential equations for the internalization of vesicles through cell membrane. [\[Link\]](#)

Web Development

Sept. 2022 – Nov. 2022

Volunteer

The International Genetically Engineered Machine competition (iGEM), IISER Thiruvananthapuram

- [Access the webpage](#)

XOR Encryptor

Jan. 2022

Developer

[Repository](#)

CSSart

May. 2020

Developer

[Website](#)

Technical Skills

Programming: Python, C, C++, Java, Bash, SQL

Markup: \LaTeX , Markdown, HTML, CSS

CAS: MATLAB, GNU Octave, Maxima, SageMath