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 Eductaion and Research   **Oct. 2021 – May 2023**
Master of Science in Mathematics, GPA: 8.38   *Thiruvananthapuram, Kerala*

Madras Christian College   **June 2018 – May 2021**
Bachelor of Science in Mathematics, GPA: 8.03   *Chennai, Tamil Nadu*

Relevant Coursework

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

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 *Willian 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 Presenatation   *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 unlimitied 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