

Fellowships CIMPA Program (report)

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I. Informations

Name: Divya Setia

Firstname: Divya

Home Institution: IISER Berhampur

Cursus (Master, PhD, post-doc,...): Postdoctoral Research Fellow

Title of the Program: Representations, Moduli, and Duality

Location and dates of stay: Bernoulli Centre in Switzerland, July 20 - August 23, 2025

Details of expenses covered by CIMPA: Travel Expenses including Visa fees and Insurance and Per Diem.

V. Activity Report

List the series of courses, workshops and conferences you have attended and describe briefly your research work when you were there and interactions you had with other researchers. Please let us know if there will be scientific follow-ups (collaboration, invitation to conferences, post-docs,...)

I attended a summer school on recent perspectives on geometry and representation theory during the first week. The following mini-courses were covered in the summer school.

1. Derived methods in representation theory by Mauro Porta.
2. Characteristic classes of singularities and their 3d mirror symmetry by Richard Rimanyi.
3. Vertex algebras, affine Springer fibres and 4d mirror symmetry by Peng Shan.
4. S-duality in arithmetic and geometric contexts by Eric Chen.

Then two weeks were spent on discussions and collaborations. I attended various talks during those two weeks and I also gave a talk on my PhD thesis work at EPFL.

I talked about the representation theory of current Lie algebras of type A and its connections with algebraic combinatorics. The talk was focused on representations of current Lie algebras that are obtained by taking the tensor product of two level 1 Demazure modules. I proved the tensor product of two level 1 Demazure modules has a filtration where each successive quotient is isomorphic to a level 2 Demazure module and also computed the graded multiplicities of level 2 Demazure modules.

In the fourth week, I attended a workshop at the SwissMAP Research station in Les Diablerets. Certain talks were very relevant for my current research activities. The program ended with the closing conference at EPFL during the last week. I got the opportunity to discuss my research work with various speakers, participants and organizers of the program.

During the program, I was working on a project where I was trying to establish the necessary and sufficient condition for the decomposition of the tensor product of two Demazure crystals for a symmetrizable Kac-Moody Lie algebra. I discussed this project with Professor Peng Shan who was a speaker at summer school during the first week. She gave her useful insights and assured me that the results that I am trying to establish should hold. I also had a discussion with Professor Ben Davison who was one of the organizers of the program regarding Tutte polynomials and its connections with Macdonald polynomials. Overall, it was a really good experience to attend this program and learn various tools of geometric representation theory.