

April 4: Matvei Libine (Indiana University Bloomington), “Quaternionic analysis and representation theory.”

In the first part of the talk I will give a brief introduction to quaternionic analysis.

The second part of the talk is based on a recent paper “Split Quaternionic Analysis and Separation of the Series for $SL(2, \mathbb{R})$ and $SL(2, \mathbb{C})/SL(2, \mathbb{R})$ ” joint with Igor Frenkel (submitted).

I will describe our new developments of quaternionic analysis using representation theory of various real forms of the conformal group. We show that the counterparts of Cauchy and Poisson formulas solve the problem of separation of the discrete and continuous series for $SL(2, \mathbb{R})$ and the imaginary Lobachevski space $SL(2, \mathbb{C})/SL(2, \mathbb{R})$. We also obtain a surprising formula for the Plancherel measure on $SL(2, \mathbb{R})$ in terms of the Poisson integral on the split quaternions.

Along the way we discover another connection between quaternionic analysis and mathematical physics. We show that the massless singular functions of four-dimensional quantum field theory are nothing but the kernels of projectors onto the discrete and continuous series on the imaginary Lobachevski space.