

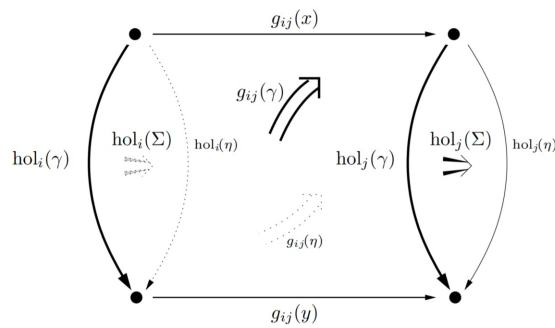
# MEGL Project Proposal: The Riemann-Hilbert correspondence.

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The Riemann Hilbert correspondence states that for a nice enough space  $X$  (e.g. a smooth manifold), there is an equivalence of categories between the category of vector bundles over  $X$  with flat connection, and the category of local systems on  $X$  (with values in vector spaces). Local systems are locally constant sheaves of vector spaces, and are equivalent to functors out of the fundamental groupoid into the category of vector spaces. The student researcher will first learn what all this means, and then write up a detailed proof of this correspondence. Time permitting, they will explore a 2-categorical generalization replacing the role of the category of vector spaces with the 2-category of 2-vector spaces, which show up in the study of extended topological field theories, and relate this to the notion of principal bundles with flat connection for Lie 2-groups.

Applicants should be familiar with category theory, topology, differential geometry, and homotopy theory / algebraic topology.



(Diagram from [1].)

## References

- [1] BAEZ, J. C., AND SCHREIBER, U. Higher gauge theory. In *Categories in algebra, geometry and mathematical physics*, vol. 431 of *Contemp. Math.* Amer. Math. Soc., Providence, RI, 2007, pp. 7–30.