

# CONNECTIONS IN THE LMFDB

organized by  
Alina Bucur and Kiran Kedlaya

## Workshop Summary

This workshop came at an opportune time for the LMFDB, as it enabled the final push toward the version 1.1 release and also enabled us to plan for several upcoming workshops. That work was in addition to the original plan for enhancing the LMFDB by incorporating a wide variety of specific information from the literature and from the personal knowledge of participants. We discuss each of those three activities.

**Connections.** The original goal of the workshop was to incorporate random and unique information into the LMFDB. This certainly occurred during the workshop, with Noam Elkies, Brian Conrey, and Kiran Kedlaya being among the major contributors. Most of that material is stored in the form of knowls.

Connections were also made in a new and unexpected way. The team of Ralf Schmidt, Alina Bucur, Mirela Ciperiani, and David Farmer (with others joining occasionally) began mapping out the connections conjectured by the Langlands Program in a very concrete and specific manner. By “mapping out” we mean determining the connections explicitly, and also drawing a picture of the connections. To give one small example: there is a 1-1 correspondence between isogeny classes of elliptic curves/ $\mathbb{Q}$  and rational compatible systems of odd 2-dim irreducible geometric  $\ell$ -adic Galois representations with Hodge-Tate weight  $[0, 1]$  and  $\det = \omega$ . The hard part is getting all the adjectives right.

**Release 1.1.** Largely led by Drew Sutherland and the other LMFDB managing editors, the workshop provided the opportunity to finalize the work for the version 1.1 release. The background for the release was set by the refactoring of the classical modular forms and the rigorous calculation of their L-functions. In addition to putting the finishing touches on that work, and reviewing all knowls, numerous additional efforts were needed to raise the contents to the newly established standards. In addition, a new color scheme was determined! The version 1.1 release was completed after the workshop.

**Future workshops.** Primarily under the leadership of Brian Conrey, plans were made for a workshop in September (mostly intended for people who are new to the LMFDB), as well as several smaller working groups. These activities will take place at AIM and at Bristol and Warwick in the UK. Collectively, those activities should cover most of the work for the version 1.2 release.

The event was significant in yet another way. This workshop was the first large group activity for the LMFDB since the establishment of the new management structure involving managing editors and associate editors. This changed the dynamic of how the group interacts and how decisions were made, and that change was positive: one could allow enough time to ensure that all perspectives were presented, but also be efficient when making difficult decisions.