

HiGHS Newsletter 24.1



Welcome to the second HiGHS newsletter

As well as a report on the first HiGHS workshop (and dates for the next one!) this issue includes a progress report on the new interior point solver and other new developments.

HiGHS Workshop 24



The first HiGHS workshop took place on 26-28 June, and was attended by 46 people. Of these, there were 27 representatives from 19 companies that use or distribute HiGHS, including MathWorks, Microsoft, Octopus Energy and Tesco, and smaller companies, some of which are major players in the optimization modelling and software industries. Also attending were five academics from Åbo Akademi University, the Technical University Berlin, and the Universities of Antwerp, Edinburgh, and Glasgow, and 14 students from the Universities of Edinburgh, Oxford, Strathclyde, and Surrey, as well as HiGHS PhD student-in-waiting, Yanyu Zhou, from ENSTA (Paris).

Beginning on the afternoon of 26 June with a two-hour tutorial on HiGHS given by Julian

Hall, followed by an informal social gathering at the Pear Tree, the workshop proper took place on 27 and 28 June. After a presentation by Julian on the past, present and future of HiGHS, Jacek Gondzio gave a talk on the relationship between the simplex and interior point methods, and Filippo Zanetti reported on the progress he has made on developing the new interior point solver for HiGHS. Ryan O'Neil then gave an extended talk showcasing the role that HiGHS plays in NextMv's DecisionOps. Of the 17 talks that followed, 12 were by representatives of companies using HiGHS in the fields of computing, modelling, optimization, logistics, and management/investment for energy and water systems. Five talks covered the use of HiGHS in academic work in optimization, genetics, medicine, and energy systems.

Scotts Kitchen hosted the workshop dinner and, after the workshop finished, there was an informal wind-down back at the Pear Tree.

The second HiGHS workshop will be 26-27 June 2025, following EURO 2025 in Leeds.

News

In January, Ivet Galabova's contract with the University as Integration and Development manager for HiGHS was made open-ended, securing her essential role into the future. In the MathWorks 2024a release, HiGHS became the simplex and MIP solver in the Optimization Toolbox. Funding from Kraken (Octopus Energy

Group) will support a four-year PhD in the area of MIP and/or decomposition methods, applied to models in the energy industry.

Development

Filippo's work on the new interior point (IPM) solver is currently the major area of development in HiGHS. The performance of an IPM solver is determined by the efficiency with which it solves the quasi-definite augmented systems of equations or positive definite normal equations when identifying the Newton direction. Based on the hyper-graph partitioning analysis provided by Metis (which, fortunately, is MIT-licensed) Filippo has implemented the sophisticated sparse matrix elimination operations and analysis of the elimination tree that will enable multi-threading to be exploited.

The identification of irreducible infeasibility systems by HiGHS is on the wish list of many users, and Julian has started work on a prototype implementation that should be available by the end of August.

Expected major new funding will enable Julian to focus on enhancing the MIP solver over the next 12 months, with the priorities being parallel tree search, and facilities to add lazy constraints and user cuts.

HiGHS on tour!



Immediately after the HiGHS workshop, Julian, Ivet and Filippo headed to Copenhagen for EURO 2024—the Operational Research conference, not the football championships! There, Julian gave an update on HiGHS, with a particular focus on the new interior point solver,

Filippo gave a presentation on his PhD work, and Ivet fielded all the technical questions that Julian couldn't answer! The next stop for team HiGHS will be Montréal at the end of July, for JuMP-dev and the 25th International Symposium on Mathematical Programming.

EMD International

The HiGHS workshop offered an opportunity to bring together two players in a rather neat use case story. EMD International is a Danish company that produces digital twins to aid management and investment of local energy systems.



When EMD's Anders N. Andersen contacted Ivet in May, he observed that HiGHS was the open-source solver of choice for their energyPRO software. On asking how many customers they have, it transpired that energyPRO is currently a fairly integral part of various processes within the University of Edinburgh's Estates Department. Hence, closing the circle, the University of Edinburgh is making practical use of HiGHS! In October, Julian and Ivet will visit EMD in Aalborg to advise their software team on how to make the best use of HiGHS.

Discord!

To maintain discussions begun at the workshop, and to foster the HiGHS community in general, we have now created a Discord server.