Harnessing the power of automation and machine learning with a modular material acceleration platform – an illustrating example

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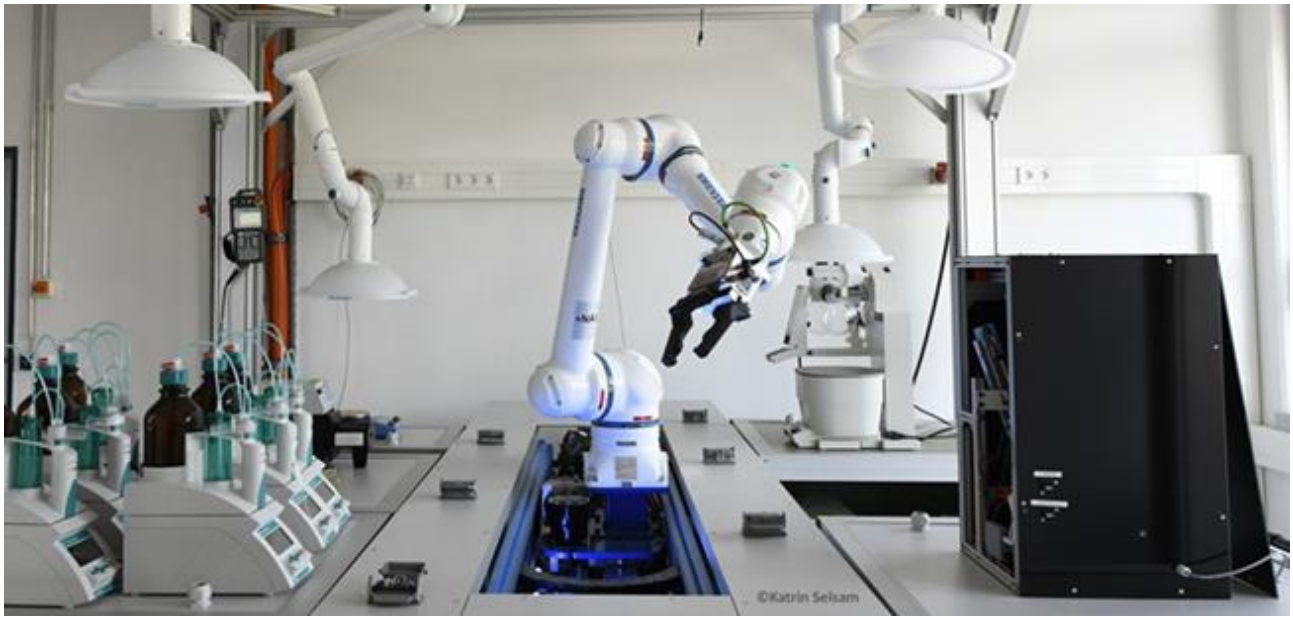
Materials research includes variation and optimization of synthesis routes including sequences of parametrized steps such as dosing, mixing, heating, transport and many others. The huge combinatorial space spanned by combinations of elementary steps and their parametrization can be overwhelming and puts a strong limitation on labor-intensive research tasks accompanied with high cost in terms of time and money for the development of new materials. Therefore, it is desirable to speed up the iterative research loop by the use of automation and robotics. In addition, utilization of modern machine learning techniques can decrease the number of iterations needed to reach optimal results. The concept of a material acceleration platform (MAP) therefore includes automated synthesis, automated analysis and automated decision-making.
In this presentation we demonstrate a minimal viable example utilizing our modular MAP developed in the context of the project BIG-MAP. We elaborate key concepts both on the hardware and software side as well as data management. Last but not least we showcase the interplay between our robotics platform and the Open-Source software stack OpenSemanticLab to orchestrate and visualize the experiments in a human friendly way.



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