

Sage Days 23.5: Singular projects

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General Remarks on Collaboration

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Whether you are an undergraduate or a graduate student, whether you are a young or a well-established researcher:

You can help us and other Singular users, and we can guide you.

There is a large Singular todo list, ranging from "get started" projects via themes for master and PhD theses to advanced research projects.

Got interested? Join us.

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Vice versa, SINGULAR 's partners will benefit from collaboration.

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- 1 SINGULAR's code for polynomial factorization is also used by MACAULAY2.
- 2 SINGULAR's ties with AIMS at Cape Town will contribute to spreading computer algebra throughout Africa.

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This will be particular important for SPP1489: Quite a number of projects in this programme rely on the further development of SINGULAR and vice versa these projects will help to strengthen SINGULAR.

We believe that the further development of SAGE will also be important to SPP1489. In this context, we are interested in SAGE-SPP1489 days (say, June 2011, location to be decided).

Some Selected Projects

- 1 Gröbner Bases for Arithmetic Geometry.

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Topics include:

1 Gröbner Bases and syzygies over \mathbb{Z} and $\mathbb{Z}/m\mathbb{Z}$.

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- 2 Primary decomposition over \mathbb{Z} and $\mathbb{Z}/m\mathbb{Z}$.
- 3 SAGBI bases over \mathbb{Z} and $\mathbb{Z}/m\mathbb{Z}$.

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1 Syzygies and Free Resolutions.

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1 New heuristics and strategies in the commutative case.

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- 1 New heuristics and strategies in the commutative case.
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- 3 Specialized algorithms for the exterior resp. the Weyl algebra.
- 4 Implementations in the arithmetic case.

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1 Modular Computations.

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- 1 Absolute Polynomial Factorization and Primary Decomposition.

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Topics include:

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- 2 Adjust and implement new absolute factorization algorithms.
- 3 Absolute primary decomposition using various algorithms.

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- 2 Develop software for the computation of tropical varieties.
- 3 Implement algorithms for toric geometry.

This requires closed cooperation with POLYMAKE and GFAN.

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- 3 Implement algorithms for deRham cohomology.

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Topics include:

- 1 Link symbolic algorithms and numerical homotopy methods.
- 2 Speed up symbolic algorithms / certify numerical algorithms.

At current state this is based on a linkage of SINGULAR and BERTINI.

Further Projects

Further fundamental projects concern F4-like approaches to computing Gröbner bases, various projects related to the resolution of Singularities and computational problems in real algebraic geometry.

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Other topics range from special algorithms for monomial ideals via parametrizing rational curves to implementing Böhm's tropical mirror construction.