

polymake **2.12 (and beyond)**
GTS 2012

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w/ Ewgenij Gawrilow and many others

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- software for research in:
 - geometric combinatorics: convex polytopes
 - algebraic geometry
 - linear/combinatorial optimization
 - ...
- open source, GNU Public License
 - supported platforms: Linux, FreeBSD, MacOS X
 - more than 100,000 uloc (**Perl**, **C++**, C, Java)
- co-authored (since 1996) w/ Evgenij Gawrilow [now TomTom]
 - contributions by many people

Algorithm Overview (Selection)

- convex polytopes, polyhedra and fans
 - convex hulls: cdd, lrs, beneath-and-beyond
 - Voronoi diagrams, Delone decompositions
 - face lattices: Kaibel–Pfetsch (including variations)
 - lattice polytopes/toric varieties
- simplicial complexes
 - simplicial (co-)homology, cup- and cap-products
 - Björner–Lutz heuristics to recognize spheres
- tropical geometry
 - tropical polytopes
 - tropical hypersurfaces
- graphs, matroids, ...

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switch to “first steps” of demo

- Hybrid design: Perl (interpreted) and C++ (compiled)
 - Perl: Server side (= organization/communication)
 - C++: Client side (= computation)
- Shell type user interface
 - (extension of) Perl as language
- Technical features include:
 - C++ template library
 - extends STL, based on template meta-programming
 - shared memory communication between client/server, transaction safe
 - whole system can be used as a C++ library (since 2.12)
- prototype: pypolymake [Burcin Erocal]
- interfaces to polymake in the making:
 - Singular, GAP, Sage

Objects and Properties

- hierarchy of **big object types** (modelling mathematical concepts)
 - e.g., polytopes, simplicial complexes, graphs, ...
 - under control of client/server system
 - with templates
- **properties** as class members (functions or data)
 - strongly typed
 - a type is a built-in Perl type, a C++ class type, or a big object type
 - immutable
- new big object types and properties to a given big object type *can be added at will*
- big object types grouped into **applications** (\approx name spaces)

switch back to demo