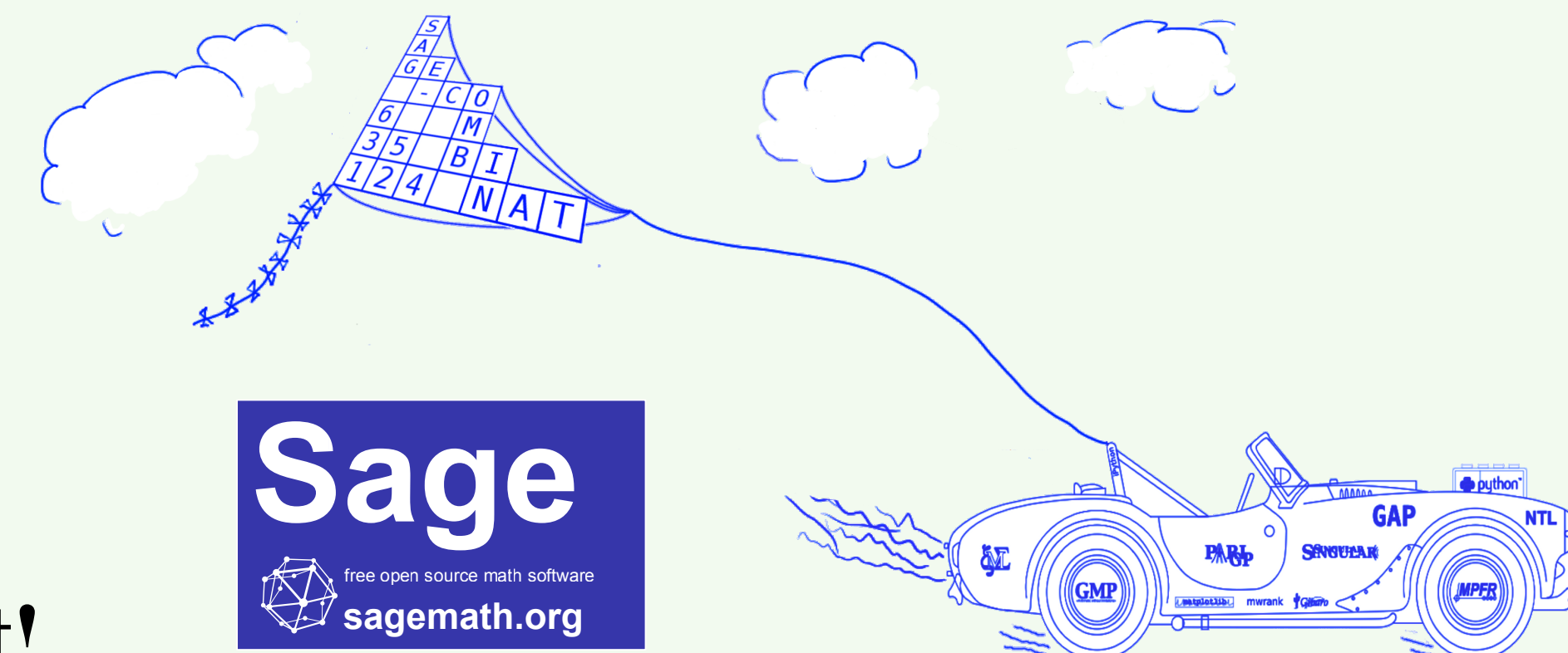




Sage-Combinat

Sharing combinatorics' software since 2000
Dedicated to Alain Lascoux



Our mission

To improve the open source mathematical system Sage as an extensible toolbox for computer exploration in (algebraic) combinatorics, and foster code sharing between researchers in this area.

Why contribute to mathematical software?

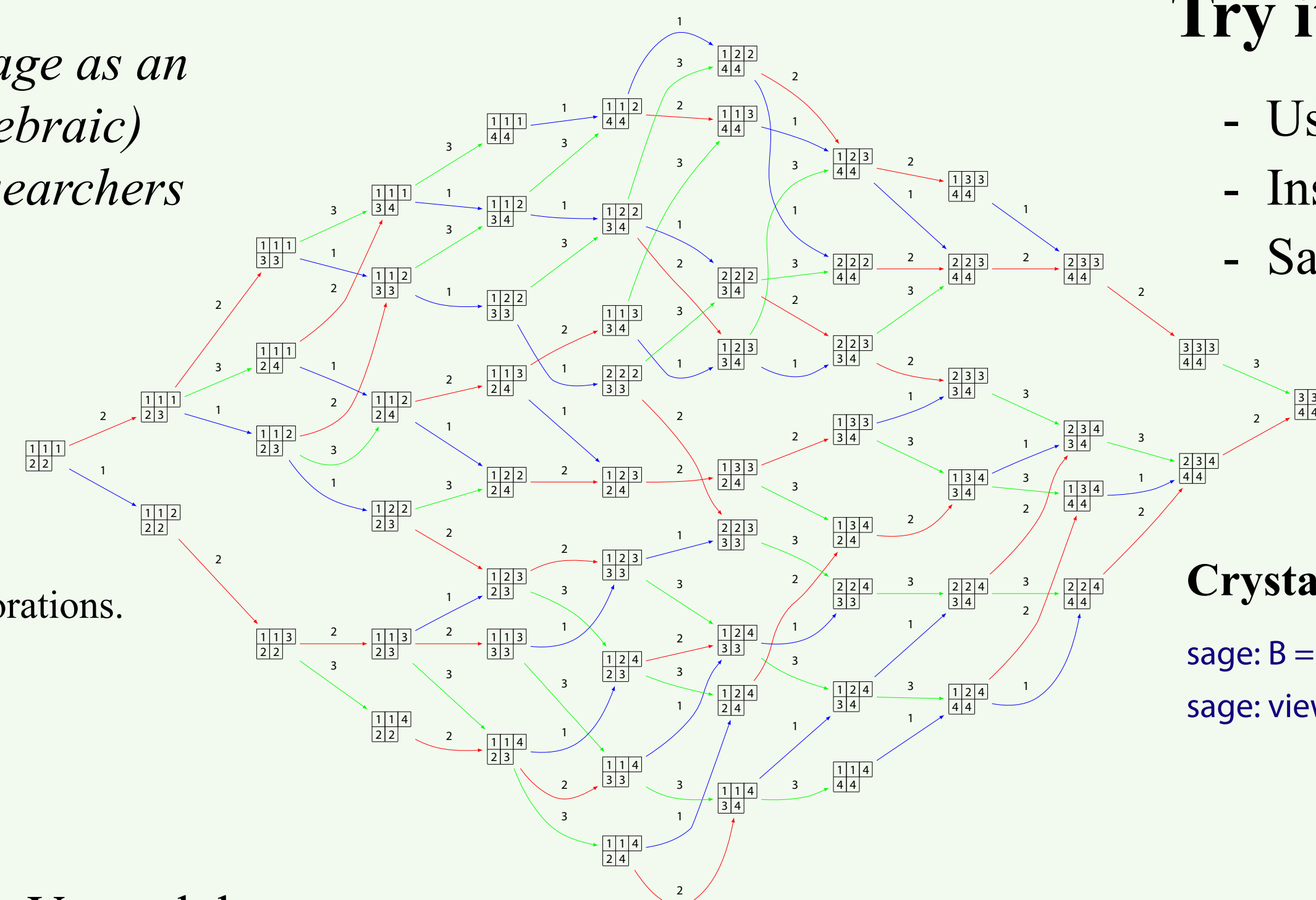
- **Computer exploration:** research benefits greatly from computer aided exploration, which requires flexible and powerful tools.
- **Pooling and networking:** sharing code with a broader community increases productivity, facilitates communication, and fosters collaborations.
- **Dissemination:** sharing code increases our visibility, spreads our research results to other scientific areas, and benefits education.

Sage-Combinat facts

- 2000: merge of the projects ACE, μ -EC, CS, PerMuVar and the combinatorics' library of MuPAD: mupad-combinat.sf.net
- 2008: migration to Sage
- Sage: 300 tickets (+200 in progress), 250kl. of code+doc+tests
- Sponsors: NSF, ANR, CNRS, Google Summer of Code, and many universities and institutions around the world
- +100 research papers
- An international community including +40 researchers from Barcelona, Bordeaux, Davis, Hannover, Lyon, Marne-la-Vallée, Marseille, Minneapolis, Montpellier, Montreal, Orsay, Paris, Philadelphia, Rouen, Seattle, Stanford, Sydney, Toronto, Zurich, ...



Sage Days 40, Minneapolis, July 2012.



Try it!

- Use Sage online: sagenb.sagemath.org
- Install Sage: sagemath.org
- Sage-Combinat: combinat.sagemath.org

Crystal graphs (with GRAPHVIZ and dot2tex)

sage: B = CrystalOfTableaux(['A', 3], shape=[3, 2])
sage: view(B)

Operads

sage: PL=PreLieOperad(FractionField(PolynomialRing(QQ, 'q')))
sage: -Omega_q_generic(4, produit_std, PL.one('a'))[-1]

$$\frac{\frac{1}{6}q^2 - \frac{1}{6}q}{q^5 + 2q^4 + 3q^3 + 3q^2 + 2q + 1} \begin{array}{c} a \\ / \quad \backslash \\ b \quad c \end{array} + \frac{q^2}{q^5 + 2q^4 + 3q^3 + 3q^2 + 2q + 1} \begin{array}{c} a \\ / \quad \backslash \\ b \quad c \\ | \quad | \\ d \quad d \end{array} + \frac{\frac{1}{2}q}{q^4 + q^3 + 2q^2 + q + 1} \begin{array}{c} a \\ | \\ b \\ / \quad \backslash \\ c \quad d \end{array} + \frac{1}{q^3 + q^2 + q + 1} \begin{array}{c} a \\ | \\ b \\ | \\ c \\ | \\ d \end{array}$$

State of the art

- **Combinatorics:** words, permutations, tableaux, trees, species, graphs, posets, ...
- **Algebraic combinatorics:** symmetric functions and generalisations, Schubert polynomials, Kazhdan-Lusztig polynomials, Hecke algebras, Loday-Ronco algebra, Steenrod algebra, Hopf algebras, Cluster algebras, operads, invariants of permutation groups, ...
- **Combinatorial representation theory:** root systems, Coxeter groups, (affine) Weyl groups, Weyl characters, tensor product and branching rules for Lie group representations, (affine) crystals, Demazure operators, semigroups, finite dimensional algebras, ...
- **Software included:** SYMMETRICA, LRCALC, COXETER3, CHEVIE, SEMIGROUPE, GRAPHVIZ, dot2tex, ...

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