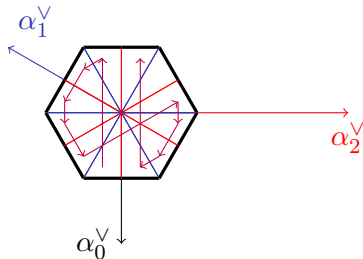# Sage-Combinat roadmap

Nicolas M. Thiéry

Sage Days 20.5, Fields Institute
March 2010

It all started there

*-Combinat: 1
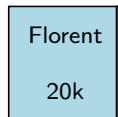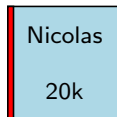
*-Combinat: 1+1 =

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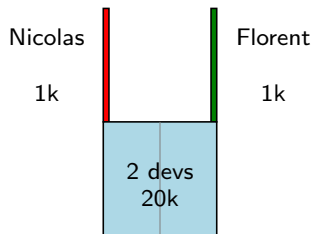
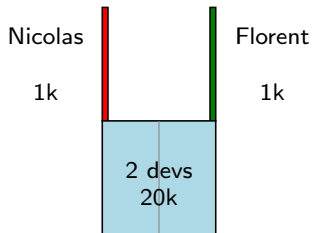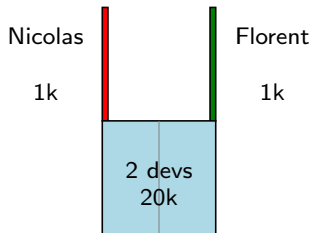# *-Combinat: 1+1 = 1.1

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- 95% of development effort are generic

*-Combinat: $1+1 = 1.1$

- 95% of development effort are generic
- Opportunity for sharing and mutualisation

∗-Combinat in a nutshell

Mission statement: **To improve Sage as an extensible toolbox for computer exploration in combinatorics, and foster code sharing among researchers in this area**

∗-Combinat in a nutshell

- 50+ research articles
- Sponsors: ANR, PEPS, NSF, Google Summer of Code
- MuPAD: 115k lines of MuPAD, 15k lines of C++, 32k lines of tests, 600 pages of doc
- Sage: 300 tickets / 100k lines integrated in Sage
- A community:

Nicolas Borie, Daniel Bump, Jason Bandlow, **Adrien Boussicault**, **Frédéric Chapoton**, Vincent Delecroix, Paul-Olivier Dehaye, **Tom Denton**, François Descouens, Dan Drake, Teresa Gomez Diaz, **Valentin Feray**, Mike Hansen, Ralf Hemmecke, **Florent Hivert**, Brant Jones, Sébastien Labbé, Yann Laigle-Chapuy, Éric Laugerotte, Patrick Lemeur, Andrew Mathas, Xavier Molinero, Gregg Musiker, **Jean-Christophe Novelli**, Janvier Nzeutchap, Steven Pon, Franco Saliola, **Anne Schilling**, Mark Shimozono, **Nicolas M. Thiéry**, Justin Walker, Qiang Wang, Mike Zabrocki, ...   And you ?

To program or not to program?

A typical computation in algebraic combinatorics involves

- A bit of standard combinatorics
- A bit of standard linear algebra
- A bit of standard group theory
- A bit of standard computer algebra
- A bit of standard ...

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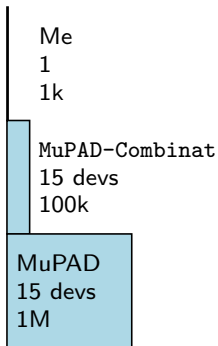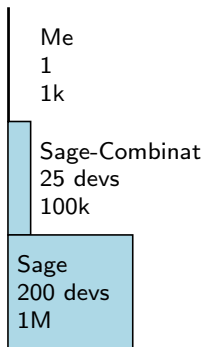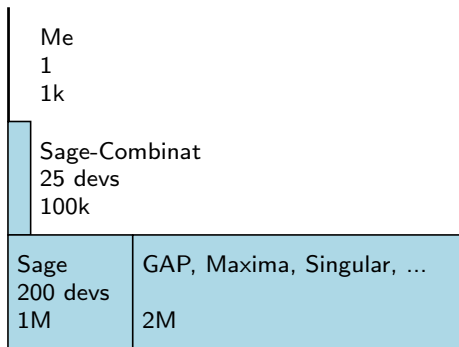But can I?

∗-Combinat

Me
1
1k

∗-Combinat
15 devs
100k

MuPAD–Combinat: limits of the model

Me
1
1k

MuPAD-Combinat
15 devs
100k

MuPAD
15 devs
1M

Me
1
1k

Sage-Combinat
25 devs
100k

Sage
200 devs
1M

Me
1
1k

Sage-Combinat
25 devs
100k

Sage	GAP, Maxima, Singular, ...
200 devs	
1M	2M

Me
1
1k

Sage-Combinat
25 devs
100k

Sage
200 devs
1M

GAP, Maxima, Singular, ...

2M

SciPi, NumPi, Scientific Python, Atlas, Linbox, GMP, Matplotlib, JMOL, JSMath, ...
1k devs
10M

Me
1
1k

Sage-Combinat
25 devs
100k

Sage
200 devs
1M

GAP, Maxima, Singular, ...
2M

SciPi, NumPi, Scientific Python, Atlas, Linbox, GMP, Matplotlib, JMOL, JSMath, ...
1k devs
10M

Python, IPython, Firefox, Ajax, OpenGL, ...
1M devs

On the shoulders of a giant

Me
1
1k

Sage-Combinat
25 devs
100k

Sage
200 devs
1M

GAP, Maxima, Singular, ...
2M

SciPi, NumPi, Scientific Python, Atlas, Linbox, GMP, Matplotlib, JMOL, JSMath, ...
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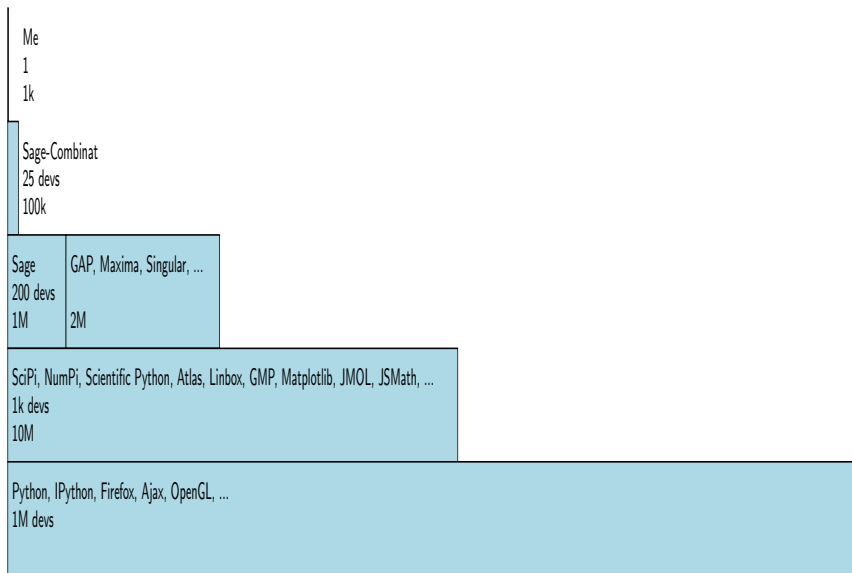1M devs

Sage as a database of mathematical knowledge and algorithms

Example

The product in a quotient of algebras

We are lucky: the hierarchy of classes is backed up by centuries of mathematical practice (category hierarchy)

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Example

Changes of basis in Non Commutative Symmetric Functions

Want to join?

combinat.sagemath.org