

The SymbolicData Project. From Data Store to a Computer Algebra Social Network

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What is Computer Algebra?

The
SymbolicData
Project

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Johanning

Aim and
Scope

The
SymbolicData
Data Store

SymbolicData
meets RDF

Towards a CA
Social
Network
(CASN)

Links

1993–95 more than 200 leading edge computer algebraists compiled in a worldwide joint effort the *Computer Algebra Handbook*, a description of the CA landscape and realized for the target of CA:

Therefore computer algebra can be effectively employed for answering questions from various areas of computer science and mathematics, as well as natural sciences and engineering, provided they can be expressed in a mathematical model.

Johannes Grabmeier even coined the notion of *Computer Mathematics*.

What is Computer Algebra?

What left from such an unified view 20 years later?

A *practical incarnation* of such a vision is any of the mature General Purpose Computer Algebra Systems (or even Infrastructure), in particular the one that claims to be the worlds definitive system for modern technical computing.

Questions:

- The more powerful tools, the more specialized science?
- What's about intercommunity communication between the more and more specialized subcommunities?
- What's about *processual knowlegde* and *processual skills*, i.e., *technics*, beyond these highly specialized communities?

SymbolicData – Aim and Scope

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SymbolicData is an CA inter-community project

- to develop concepts and tools for profiling, testing and benchmarking Computer Algebra Software (CAS),
- to provide a sustainably available and semantically interlinked infrastructure for CA data,
- and aims at interlinking these and other scientific activities using modern Semantic Web concepts.

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The SD project started at the ISSAC 1998 Special session on Benchmarking.

In a *first phase* (1998–2003) we concentrated on development of tools and collected data for CA benchmarks from *Polynomial Systems Solving* and *Geometry Theorem Proving*.

In a *second phase* (2003–2009) we concentrated on consolidation of the infrastructure and extended the project's scope to G-Algebras and Integer programming. In 2005 the Web site <http://www.symbolicdata.org> sponsored by the German CA Fachgruppe went online.

SymbolicData – Aim and Scope

In a *third phase* (since 2009) we started a redesign of the data and infrastructure along rules of Linked Data and semantic, RDF-based technology and joined forces with the `normaliz` team (Relaunch of the Integer Programming part in May 2015) and the `polymake` team (first steps to integrate data about Fano and Birkhoff polytopes).

What does SymbolicData offer?

Data:

- Polynomial Systems Solving
- Geometry Theorem Proving
- Fano Polytopes (A. Paffenholz)
- Free Algebras
- G-Algebras
- Test Sets from Integer Programming (T. Römer)

Draft:

- Birkhoff Polytopes (A. Paffenholz)
- Transitive Groups (J. Klüners, G. Malle)

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Tools:

SDEval Package (Albert Heinle)

- Aim: Set up, run, log, monitor standardized Computations on SD data series in a reliable way
- Technology: Python standalone on top of the OS
- <http://symbolicdata.org/wiki/SDEval>

SDSage Package (Andreas Nareike)

- Aim: Call the new Polynomial Systems format from Sagemath
- Technology: Sagemath Python Package
- <http://symbolicdata.org/wiki/PolynomialSystems.Sage>

SymbolicData Infrastructure

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- Main repository <http://github.com/symbolicdata> and several clones (following the Integration Master Pattern)
- A project wiki at <http://symbolicdata.org>
- A mailing list
- Web access to the XML resources
- Two centrally operated Virtuoso based RDF data stores for meta informations ('Data' and 'casn')
- Organized along Linked Data Principles
- Regular dumps of RDF data in Turtle format
- Two SPARQL endpoints to query the data
- Advise for local installation of tools and data based on Virtuoso and a local Apache Web server

Towards an *E-Science World*

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SymbolicData v.3 – focus shift from the *data* to the *people and their intentions* perspective:

Why they collect and manipulate such data?

We are convinced: It is time to use the *technical means* of an semantically enriched Web 2.0

- to strengthen the *social* part of our cooperation and
- to contribute to the efforts to build up an interconnected *E-Science World*.

Towards an *E-Science World*

We observed and noticed: During the last years such efforts matured within the *Science at Large*.

- Services such as MathSciNet, arXiv.org, or EasyChair.org have been established and their usefulness is widely acknowledged.
- There are plenty of new activities, in particular by the *national libraries and organizations* (VIAF), by the *Zentralblatt Mathematik* (POS-Tagging), or by the IMU, that advances the vision of a *21st Century Global Library for Mathematics Research* (GDML).

What's about the CA *E-Science* *World*

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It is a great challenge to smaller scientific communities to adopt such developments for its own scientific communication processes and to join forces with other scientific communities to get own requirements publicly recognised.

A first step in such a direction could be a more detailed description of ongoing scientific processes using standard RDF terminology.

Towards a CA Social Network (CASN)

With version 3 SymbolicData started to address the technical aspects of such cooperational needs in more detail, developed a vision of a *Computer Algebra Social Network* (CASN), and started to realize it.

Our main approach: Maintain (more) valuable background information, i.e., information that people care about.

- Find out the stakeholders and the places where such information is spread today.
Usually it is *streamed*, not *stored*.
- Try to semantically annotate that information.
- Build views (web sites) that harvest such information.

A Road Map Proposal

What's about you?

The main problem: Turn passive users into active ones.

We propose as road map:

① Identify stakeholders.

The SD People Database contains 812 foaf:Person instances (i.e., passive users) from different sources, in particular from Conference Announcements (board members and invited speakers).

② Convince you to join efforts to build such a new Tower of Babel.

Discuss, identify and shape appropriate ontologies as a commonly agreed way to structure information.

A Road Map Proposal

- 3 Collect RDF data of such types, link to other sources along the Linked Data Principles.

A very first prototype is used to collect such information and to display it within the Wordpress based site of the German Fachgruppe.

- 4 The stakeholders realize, that this is a techno-social, and even more a social than a technical process that requires efforts, resources and permanent discussion, e.g., on the mailing list of the SD Project.
- 5 The CASN germ matures thanks to common efforts.

What is already done?

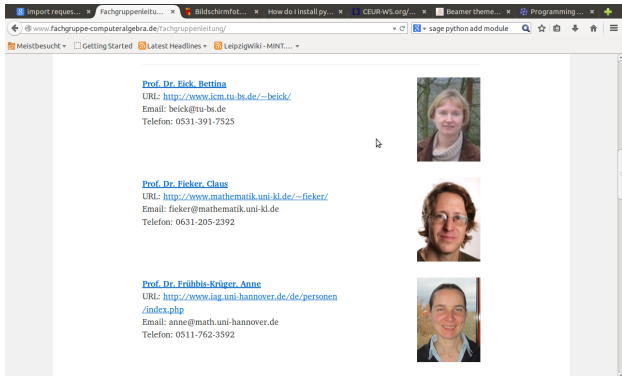
<http://symbolicdata.org/Data/People/>

- Basic information about People – 812 instances foaf:Person instances (i.e., passive users) from different sources, in particular from Conference Announcements (board members and invited speakers).
- 34 Personal Profiles, e.g., used to display people from the CAFG Board within the Wordpress based CAFG site.
- 347 matches with the Zentralblatt author's database.

What is already done?

The CAFG Board within the Wordpress based CAFG site, extracted from the Personal Profile Documents of the different members at

<http://www.fachgruppe-computeralgebra.de/FOAF-Profiles/>.



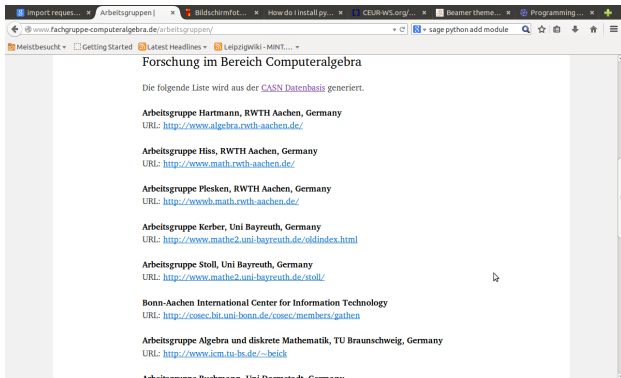
The screenshot shows a web browser window with several tabs. The active tab is titled "www.fachgruppe-computeralgebra.de/fachgruppenleitung/". The browser address bar shows the URL "http://www.fachgruppe-computeralgebra.de/fachgruppenleitung/". The page content displays three FOAF profiles, each consisting of a name, a URL, an email address, and a telephone number, followed by a portrait photograph.

- Prof. Dr. Fleck, Bettina**
URL: <http://www.icm.tu-bs.de/~beick/>
Email: beick@tu-bs.de
Telefon: 0531-391-7525
- Prof. Dr. Fieker, Claus**
URL: <http://www.mathematik.uni-kl.de/~fieber/>
Email: fieber@mathematik.uni-kl.de
Telefon: 0631-205-2392
- Prof. Dr. Frihbis-Krüger, Anne**
URL: <http://www.iag.uni-hannover.de/de/personen/index.php>
Email: anne@math.uni-hannover.de
Telefon: 0511-762-3592

What is already done?

<http://symbolicdata.org/casn/WorkingGroups/>

Standard information about CA Working Groups – 17 Instances of RDF type foaf:Group and sd:WorkingGroup from the old CAFG site. Used to display that within the Wordpress based CAFG site.



The screenshot shows a web browser window with the URL www.fachgruppe-computeralgebra.de/arbeitsgruppen/. The page title is "Forschung im Bereich Computeralgebra". The content lists several working groups, each with a name and a URL. The visible entries are:

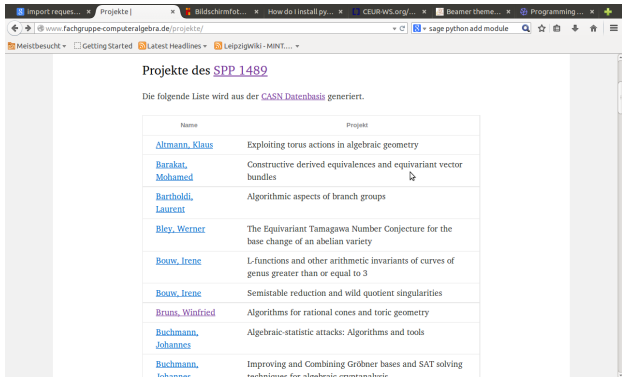
- Arbeitsgruppe Hartmann, RWTH Aachen, Germany
URL: <http://www.algebra.rwth-aachen.de/>
- Arbeitsgruppe Hiss, RWTH Aachen, Germany
URL: <http://www.math.rwth-aachen.de/>
- Arbeitsgruppe Plesken, RWTH Aachen, Germany
URL: <http://wwwb.math.rwth-aachen.de/>
- Arbeitsgruppe Kerber, Uni Bayreuth, Germany
URL: <http://www.mathe2.uni-bayreuth.de/oldindex.html>
- Arbeitsgruppe Stoll, Uni Bayreuth, Germany
URL: <http://www.mathe2.uni-bayreuth.de/stoll/>
- Bonn-Aachen International Center for Information Technology
URL: <http://cosec.bit.uni-bonn.de/cosec/members/gathen>
- Arbeitsgruppe Algebra und diskrete Mathematik, TU Braunschweig, Germany
URL: <http://www.icm.tu-bs.de/~beick>

At the bottom of the page, the text "Arbeitsgruppe Ruchmann, Uni Darmstadt, Germany" is partially visible.

What is already done?

<http://symbolicdata.org/casn/SPP-Projekte/>

Standard information about CA Projects – 60 instances of RDF type `sd:Project`, compiled from the list of projects within the SPP 1489 priority program.



The screenshot shows a web browser window with the URL `www.fachgruppe-computeralgebra.de/projekte/`. The page title is "Projekte des SPP 1489". Below the title, it says "Die folgende Liste wird aus der CASN Datenbasis generiert." There is a table with two columns: "Name" and "Projekt". The table lists ten projects with their names and descriptions.

Name	Projekt
Altmann, Klaus	Exploiting torus actions in algebraic geometry
Barakat, Mohamed	Constructive derived equivalences and equivariant vector bundles
Bartholdi, Laurent	Algorithmic aspects of branch groups
Bley, Werner	The Equivariant Tamagawa Number Conjecture for the base change of an abelian variety
Bouw, Irene	L-functions and other arithmetic invariants of curves of genus greater than or equal to 3
Bouw, Irene	Semistable reduction and wild quotient singularities
Bruns, Winfried	Algorithms for rational cones and toric geometry
Buchmann, Johannes	Algebraic-statistic attacks: Algorithms and tools
Buchmann, Johannes	Improving and Combining Gröbner bases and SAT solving techniques for algebraic cvrntanalysis

What is already done?

<http://symbolicdata.org/casn/UpcomingConferences/>

Information about CA conferences – 17 instances of `sd:UpcomingConference` and 72 instances of `sd:PastConference`, compiled from different sources. Used as input for the printed version of the CA Rundbrief.

Tagungsankündigungen bei SymbolicData

Diese Informationen werden über den [SymbolicData](#) Sparql-Endpunkt aus den SymbolicData Tagungsinformationen inferiert. Der Link in der Überschrift der jeweiligen Tagung verweist auf den Eintrag in der SymbolicData Datenbank.

[Workshop in tropical topics and related areas](#)

Vom 26.06.2014 bis 27.06.2014 in Uni Saarbruecken, Germany.

There will be a workshop in tropical topics and related areas in Saarbruecken, June 26-27. Speakers include Andreas Gross, Milena Hering, Michael Joswig and Iliia Zharkov.

URL der Tagung: <http://www.math.uni-sb.de/wiki/doku.php?id=ag.seite:markwig.conferences:dibb>

[CICM 2014 - Conferences on Intelligent Computer Mathematics](#)

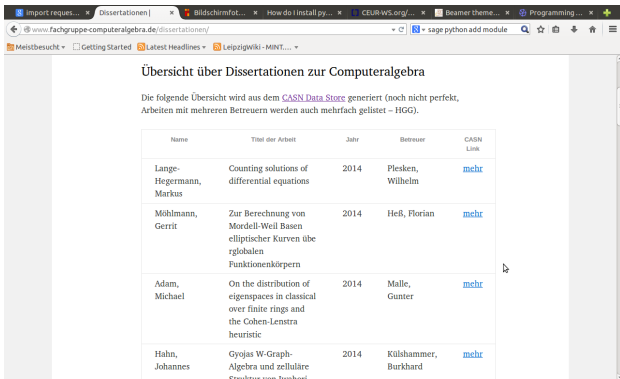
Vom 07.07.2014 bis 11.07.2014 in University of Coimbra, Portugal.

As computers and communications technology advance, greater opportunities arise for

What is already done?

<http://symbolicdata.org/casn/Dissertationen/>

Information about dissertations in CA – 29 instances of RDF type `bibo:Thesis`, compiled from the CA Rundbrief.



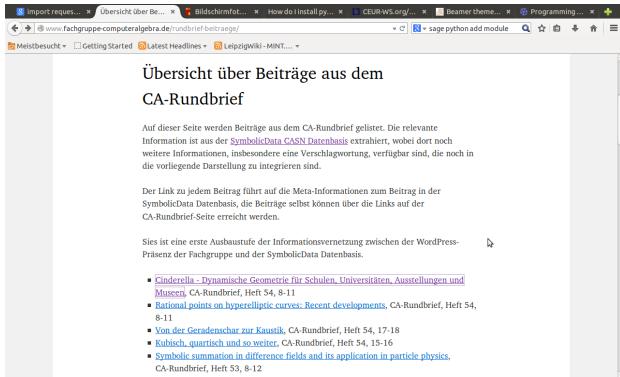
The screenshot shows a web browser window with the URL www.fachgruppe-computeralgebra.de/dissertationen/. The page title is "Übersicht über Dissertationen zur Computeralgebra". Below the title, there is a note: "Die folgende Übersicht wird aus dem [CASN Data Store](#) generiert (noch nicht perfekt, Arbeiten mit mehreren Betreuern werden auch mehrfach gelistet – HGG)." Below this note is a table with five rows of dissertation information.

Name	Titel der Arbeit	Jahr	Betreuer	CASN Link
Lange-Hegermann, Markus	Counting solutions of differential equations	2014	Plesken, Wilhelm	mehr
Möhlmann, Gerrit	Zur Berechnung von Mordell-Weil Basen elliptischer Kurven über globalen Funktionenkörpern	2014	Heß, Florian	mehr
Adam, Michael	On the distribution of eigenspaces in classical over finite rings and the Cohen-Lenstra heuristic	2014	Malle, Gunter	mehr
Hahn, Johannes	Gyojas W-Graph-Algebra und zelluläre Struktur von Twisted...	2014	Külshammer, Burkhard	mehr

What is already done?

<http://symbolicdata.org/casn/CAR-Beitraege/>

Information about articles in the CA Rundbrief – 75 instances of RDF type `sd:Reference` to be displayed at the website of the German Fachgruppe.



Übersicht über Beiträge aus dem
CA-Rundbrief

Auf dieser Seite werden Beiträge aus dem CA-Rundbrief gelistet. Die relevante Information ist aus der [SymbolicData CASN Datenbasis](#) extrahiert, wobei dort noch weitere Informationen, insbesondere eine Verschlagwortung, verfügbar sind, die noch in die vorliegende Darstellung zu integrieren sind.

Der Link zu jedem Beitrag führt auf die Meta-Informationen zum Beitrag in der SymbolicData Datenbasis, die Beiträge selbst können über die Links auf der CA-Rundbrief-Seite erreicht werden.

Sies ist eine erste Ausbaustufe der Informationsvernetzung zwischen der WordPress-Präsenz der Fachgruppe und der SymbolicData Datenbasis.

- [Cinderella - Dynamische Geometrie für Schulen, Universitäten, Ausstellungen und Museen](#), CA-Rundbrief, Heft 54, 8-11
- [Rational points on hyperelliptic curves: Recent developments](#), CA-Rundbrief, Heft 54, 8-11
- [Von der Geradenschär zur Kaustik](#), CA-Rundbrief, Heft 54, 17-18
- [Kubisch, quartisch und so weiter](#), CA-Rundbrief, Heft 54, 15-16
- [Symbolic summation in difference fields and its application in particle physics](#), CA-Rundbrief, Heft 53, 8-12

Links

- <http://wiki.symbolicdata.org> – the SD Wiki
- <http://symbolicdata.org/XMLResources> – the SD XML Resources
- <http://symbolicdata.org/RDFData> – the SD RDF Data Turtle Files
- <http://symbolicdata.org/Data> – the SD OntoWiki view on the basic RDF data
- <http://symbolicdata.org/casn> – the SD OntoWiki view on the CASN RDF data
- <https://github.com/symbolicdata> – the SD Repository at github