Personal Details

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Career History

2009 – present:	Senior Lecturer (Associate Professor) at the School of Computer Science, University of Birmingham, UK
2012 – 2013:	Visiting Scientist, Google Inc., Mountain View, USA
2002 – 2009:	Lecturer at the School of Computer Science, University of Birmingham, UK
2000 – 2001:	Deputy project manager of the OMEGA project, Universität des Saarlandes, Germany; August to December 2000 acting project manager
1997 – 2001:	Researcher at the Dept. of Computer Science, Universität des Saarlandes, Germany
1997:	Researcher at the German Research Institute for Artificial Intelligence (DFKI), Saarbrücken, Germany
1995 – 1996:	Research assistant at the Dept. of Computer Science, Universität des Saarlandes, Germany

Fellowships

2007–2008:	Medici Fellowship on Commercialisation
2002–2004:	EU Marie-Curie Individual Fellowship

I am an alumni of the Studienstiftung des deutschen Volkes.

Education

Nov. 2001:	Dr-Ing. (PhD), Dept. of Computer Science, Universität des Saarlandes, Germany Thesis: OANTS — A Blackboard Architecture for the Integration of Reasoning Techniques into Proof Planning
March 1997:	Dipl.-Math. (Research MSc): Mathematics (main subject) and Computer Science (subsidiary subject) Thesis: "Einbau eines Computeralgebrasystems in eine logische Beweisumgebung"
1994 – 1997:	Graduate studies in Mathematics and Computer Science, Universität des Saarlandes, Germany
1993 – 1994:	Graduate studies in Mathematics, Computer Science, and Philosophy, University of Texas at Austin, USA
June 1993:	Undergraduate degree 'Vordiplom': Mathematics (main subject) and Computer Science (subsidiary subject)
1990 – 1993:	Undergraduate studies in Mathematics, Computer Science, and Philosophy, Universität Würzburg, Germany

Research

My research interests span a wide range of topics from computational mathematics, classical AI to image recognition and accessibility. In particular, I have been working on:

- **Scientific Document Analysis:** Mathematical OCR, Formula Recognition, Diagram Recognition, Semantic Document Analysis, Handwritten Documents
- **Accessibility:** Accessibility of scientific content such as formulas and diagrams
- **Computer Algebra:** Symbolic Computation with Underspecified Matrices and correctness of Computer Algebra Algorithms
- **Abstract Algebra:** Non-associative algebra, automatic enumeration techniques, example construction
- **Logic and Automated Reasoning:** Integration of Reasoning Techniques, Automatic Mathematical discovery, Logical represenation of intuitive objects

I have founded the Scientific Document Analysis Group in the School of Computer Science at the University of Birmingham: http://www.cs.bham.ac.uk/go/sdag/.

Projects

Current Projects

- **ChemAccess:** Accessible Chemical Diagrams
- **Accessible Online Mathematics:** Work with the ChromeVox Team, Google;
- **MaxTract:** Mathematical Formula Extraction from PDF documents
- **MolRec:** Chemical Molecule Recognition from scanned images
- **EuDML:** European Digital Mathematics library

Consultancy

- Consultant to Benetech and the American Mathematical Society on maths accessibility

Former Projects

- **Omega:** A higher order logical reasoning system based on AI planning and intelligent system combiation
- **Calculemus:** Combination of automated reasoning and symbolic computations systems
- **Ωants:** Agent based automated theorem proving

Grants

Principal Investigator

- Google: Glass for Accessibility Awards
- SBRI Ready Steady STEM grant
- JISC Rapid Innovation Grant
- EU CIP-ICT Grant on the European Digital Mathematics Library
- Royal Society International Joint Project with Japan
- EPSRC Grant CICM
- London Mathematical Society Studentships Grant
- SSAISB Studentships Grant
- British-Council collaboration with Netherlands
- Nuffield Undergraduate Research Bursary

Co-Investigator

- EPSRC grant for collaboration with Japan
- EU ISP Network MKM
- EU IHP Network Calculemus (both Saarbrücken and Birmingham)

Fellowships/Personal

- Visiting Scientist, Google Inc.
- Medici Fellowship
- EU Marie-Curie Individual Fellowship
- PhD Grant from Studienstiftung des deutschen Volkes
- DAAD Overseas Research Grant
- Several Travel Grants from EPSRC, Royal Academy of Engineering, British Council, AISB, DAAD

Conferences

Chair

- Conferences on Intelligent Computer Mathematics 2015, Track chair for Digital Maths Libraries
- Conferences on Intelligent Computer Mathematics 2012, Track chair for Systems and Projects
- Conferences on Intelligent Computer Mathematics 2010, Doctoral Programme chair
- Application of Computer Algebra 2010, Special Session chair
- Asian Symposium on Computational Mathematics 2009, Special Session chair
- Conferences on Intelligent Computer Mathematics 2008, General chair
- Artificial Intelligence and Symbolic Computation 2008, Programme chair
- Calculemus 2002, Programme chair

Organisation

- Member of Steering Committee, Conferences on Intelligent Computer Mathematics
- Trustee for the Calculemus Symposium
- Member of the Organising Committee of the UK Automated Reasoning Workshop
- Member of IFCoLog Advisory Board
- Trustee for the Conference on Mathematical Knowledge Management
- I have served on the programme committee of over 20 internationl conferences or workshops.

Editorship

- Member of the Editorial Board of the International Journal of Computational Mathematics
- Member of the Editorial Board of the Journal of Applied Logic
- Member of the Editorial Board of the Journal of Algorithms in Cognition, Informatics and Logic
- Guest editor of Annals in Mathematics and Artificial Intelligence 56(1) 2009
- Guest editor of the Journal of Symbolic Computation 39(5) 2005
- Co-Editor of *Distributed Constraint Problem Solving and Reasoning in Multi-Agent Systems*, IOS Press 2004
- Editor/Co-Editor of of a number of conference proceedings for Springer's LNCS/LNAI series

PhD Supervision

Current: Randa Almomen, Osama Taleb, Behrang Sabeghi Saroui, Nourah Shenaiber
Previously: Fubiao Xia, Quratul-ain Mahesar, Noureddin Sadawi, Josef Baker, Martin Pollet

Managerial Experience

Administrative

- Member of the academic management team of the School of Computer Science:
  Responsibility for the provision and coordination of the School's undergraduate programmes as Director of Undergraduate Studies, since Autumn 2013.
- Head of the Welfare Team of the School of Computer Science:
  Managing a team of 3 deputy welfare tutors and 1 clerical staff for the provision of welfare of all students in the School as Senior Welfare Tutor, 2008-2012.
- Member of the management team of the School of Computer Science:
  Contributing to daily management of the School and policy decisions as member of the Advisory Committee, 2008-2010.

Scientific

- I am heading the chemAccess project, an SBRI project for Alta Innovations, managing a team of 3 academics and 5 student developers.
- I have founded and am heading the Scientific Document Analysis group `http://www.cs.bham.ac.uk/go/sdag/` with three academics and a varying number research associates and PhD students, molding the scientific direction of the group and administering its project portfolio.
- I was Deputy and acting project manager of the OMEGA project at the University of Saarbrücken, Germany: 2000 – 2001, managing a team of 11 academics at post-graduate, post-doc and post-habitilation level and administering the teams project portfolio.

Publications

I have more than 80 refereed international publications including 14 journal articles. The following is a list of publications in the last 5 years. For more details see also `http://www.cs.bham.ac.uk/~vxs`.

Publications in last 5 years

Edited Works

[1] J. Jeuring, J. A. Campbell, J. Carette, G. Dos Reis, P. Sojka, M. Wenzel, and , editors. *Intelligent Computer Mathematics — Joint Proceedings of AISC 2012, Calculemus 2012, DML 2012, MKM 2012 and Systems and Projects*, volume 7362 of *LNCS*, Bremen, Germany, 8–13 July 2012. Springer Verlag, Berlin, Germany.

[2] J. Calmet and , editors. *Special Issue on Artificial Intelligence and Symbolic Computation*, volume 56(1) of *Annals of Mathematics and Artificial Intelligence*. Springer Verlag, Berlin, Germany, 2009.

Articles in Journals

[3] M. Shah, A. Ali, and . Nuclei and commutants of c-loops. *Quasigroups and Related Systems*, 21, 2013. In print.

[4] Xiaoyan Lin, Liangcai Gao, Zhi Tang, Josef Baker, and Volker Sorge. Mathematical formula identification and performance evaluation in pdf documents. *International Journal on Document Analysis and Recognition*, pages 1–17, 2013.

[5] M. Shah, , and A. Ali. A study of ag-groups as a parallelogram space. *Commentationes Mathematicae Universitatis Carolinae*, 2013. In review.

[6] R. Almomen, A. Sexton, and . Abstracting symbolic matrices. *Annals in Mathematics and Artificial Intelligence*, 64(4):343–368, 2012.

[7] C. Kennedy, G. Theodoropoulos, , E. Ferrari, P. Lee, and C. Skelcher. Data driven simulation to support model building in the social sciences. *Journal of Algorithms and Computational Technology*, 5(4):561–581, December 2011.

[8] M. Shah, C. Gretton, and . AG-groups by enumeration and Smaradache AG-groups. *International Mathematical Forum*, 6(62):3079 – 3086, 2011.

Refereed Proceedings

[9] Volker Sorge, Charles Chen, T.V. Raman, and David Tseng. Towards making mathematics a first class citizen in general screen readers. In *11th Web for All Conference*, Seoul, Korea, 6–9 April 2014. ACM.

[10] Behrang Sabeghi Saroui and Volker Sorge. Recognition of handwritten mathematical characters on whiteboards using colour images. In *11th IAPR International Workshop on Document Analysis Systems, Extended Abstracts*, Tours, France, April 7–10 2014. ACM Press.

[11] X. Lin, L. Gao, Z. Tang, J. Baker, M. Alkalai, and . A text line detection method for mathematical formula recognition. In *International Conference on Document Analysis and Recognition, ICDAR 2013*, Washington, DC, USA, 25–28 August 2013. IEEE Computer Society Press. Submitted.

[12] M. Alkalai, J. Baker, X. Lin, and . Improving formula analysis with line and mathematics identification. In *International Conference on Document Analysis and Recognition, ICDAR 2013*, Washington, DC, USA, 25–28 August 2013. IEEE Computer Society Press. Submitted.

[13] O. Al-Hassani, Q. Mahesar, C. Sacerdoti Coen, and . A Term Rewriting System for Kuratowski's Closure-Complement Problem. In Ashish Tiwari, editor, *23rd International Conference on Rewriting Techniques and Applications (RTA'12)*, volume 15 of *Leibniz International Proceedings in Informatics (LIPIcs)*, Dagstuhl, Germany, 2012. Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik.

[14] Q. Mahesar and V. Sorge. Algebraic theory exploration: A comparison of technologies. In *Proceedings of the 14th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing*, pages 70–77, Timisoara, Romania, September 26–29 2012. IEEE Computer Society Press.

[15] N. Sadawi, A. Sexton, and . MolRec at CLEF 2012 — overview and analysis of results. In *The Third Conference and Labs of the Evaluation Forum Proceedings (CLEF 2012)*, Rome, Italy, Sep. 2012. Conference and Labs of the Evaluation Forum (CLEF). `http://www.clef2012.org/`.

[16] N. Sadawi, A. Sexton, and . Chemical structure recognition: A rule based approach. In Christian Viard-Gaudin and Richard Zanibbi, editors, *19th Document Recognition and Retrieval Conference (DRR 2012)*. SPIE, January 2012.

[17] M. Alkalai and . Issues in mathematical table recognition. In Petr Sojka, editor, *Towards a Digital Mathematics Library, DML 2012*, October 2012.

[18] J. Baker, A. Sexton, and . Maxtract: Converting pdf to latex, mathml and text. In Jeuring et al., Proceedings of Intelligent Computer Mathematics, volume 7362 of *LNCS*, pages 422–426. Springer Verlag, Berlin, Germany, 2012.

[19] A. Distler, M. Shah, and . Enumeration of ag-groupoids. In James H. Davenport, William M. Farmer, Josef Urban, and Florian Rabe, editors, *Intelligent Computer Mathematics — Joint Proceedings of Calculemus 2011 and MKM 2011*, volume 6824 of *LNAI*, pages 1–14, Bertinoro, Italy, July 18-23 2011. Springer Verlag, Berlin, Germany.

[20] N. Sadawi, A. Sexton, and . Performance of MolRec at TREC 2011 — overview and analysis of results. In E.M̃. Voorhees and Lori P. Buckland, editors, *The Twentieth Text REtrieval Conference Proceedings (TREC 2011)*, Gaithersburg, USA, Nov. 2011. National Institute of Standards and Technology (NIST). `http://trec.nist.gov/`.

[21] J. Baker, A. Sexton, , and M. Suzuki. Comparing approaches to mathematical document analysis from PDF. In *International Conference on Document Analysis and Recognition, ICDAR 2011*, pages 463–467, Beijing, China, 18–21 September 2011. IEEE Computer Society Press, Los Alamitos, CA, USA.

[22] J. Baker, A. Sexton, and . Towards reverse engineering of PDF documents. In Petr Sojka and Thierry Bouche, editors, *Towards a Digital Mathematics Library, DML 2011*, pages 65–75, Bertinoro, Italy, July 2011. Masaryk University Press. ISBN 978-80-210-5542-1.

[23] A. Sexton, , and M. Suzuki. Designing a semantic ground truth for mathematical formulas. In Petr Sojka, editor, *Workshop on Digital Mathematical Libraries*, Paris, France, July 7–8 2010. Masaryk University Publications.

[24] J. Baker, A. Sexton, and . Faithful mathematical formula recognition from pdf documents. In *9th IAPR International Workshop on Document Analysis Systems, Extended Abstracts*, pages 485–492, Boston, USA, June 9–11 2010. ACM Press.

[25] J. Carette, A. Sexton, , and S.M. Watt. Symbolic domain decomposition. In Serge Autexier, Jacques Calmet, David Delahaye, Patrick D.F. Ion, Laurence Rideau, Renaud Rioboo, and Alan P. Sexton, editors, *Intelligent Computer Mathematics — Joint Proceedings of AISC 2010, Calculemus 2010 and MKM 2010*, volume 6167 of *LNAI*, pages 172–188, Paris, France, July 5–10 2010. Springer Verlag, Berlin, Germany.

[26] C. Kennedy, , and G. Theodoropoulos. Detecting rule inconsistencies in symbiotic simulations. In *Proceedings of the Operational Research Society Simulation Workshop 2010 (SW10)*, pages 11–16. The OR Society, March 23–24 2010.

[27] J. Baker, A. Sexton, and . A linear grammar approach to mathematical formula recognition from PDF. In J. Carette, L. Dixon, C. Sacerdotti-Coen, and S. Watt, editors. *Intelligent Computer Mathematics — Joint Proceedings of Calculemus 2009 and MKM 2009*, LNAI 5625, Springer Verlag, Berlin, Germany, 2009.

[28] A. Sexton, , and S.M. Watt. Computing with abstract matrix structures. In Erich Kaltofen, editor, *Proc. of the 2009 International Symposium on Symbolic and Algebraic Computation (ISSAC'2009)*, Seoul, South Korea, July 28–31 2009. ACM Press, Berkeley, CA, USA.

[29] A. Sexton, , and S.M. Watt. Reasoning with generic cases in the arithmetic of abstract matrices. In J. Carette, L. Dixon, C. Sacerdotti-Coen, and S. Watt, editors. *Intelligent Computer Mathematics — Joint Proceedings of Calculemus 2009 and MKM 2009*, LNAI 5625, Springer Verlag, Berlin, Germany, 2009.

[30] J. Baker, A. Sexton, and . An online repository of mathematical samples. In Petr Sojka, editor, *Workshop on Digital Mathematical Libraries*, Grand Bend, Canada, July 8–9 2009. Masaryk University Publications.