

Dr Paul Sant

1. Education, employment history and committee membership

1.1 Qualifications

- 2003 PhD in Computer Science (*Algorithmics of edge colouring pairs of 3-regular Trees*). King's College London
- 1999 BSc (Hons) 1st Class, Computer and Information Systems, University of Liverpool

1.2 Teaching qualifications

- 2007 Postgraduate Certificate of Academic Practice (PGCAP)

1.3 Employment history

Current position

- Oct 2022 – present Head of Computer Science, Science School, The University of Law

Previous positions

- Oct 2018 – October 2022 Head of School – Computer Science and Technology, Faculty of Creative Arts, Technologies and Science, University of Bedfordshire
- April 2018 – Sept 2018 Acting Head of School – Computer Science and Technology, Faculty of Creative Arts, Technologies and Science, University of Bedfordshire*
- Sept 2015 – April 2018 Associate Dean (Quality and Development), Faculty of Creative Arts, Technologies and Science, University of Bedfordshire
- January 2013- August 2015 Associate Dean, University Campus Milton Keynes (a campus of The University of Bedfordshire) & Associate Dean (Creative Arts, Technologies and Science)
- August 2011 – December 2013 Principal Lecturer in Computer Science, University of Bedfordshire
- Sept 2006 - present Senior Lecturer in Computer Science, University of Bedfordshire
- Sept 2005 – Sept 2006 Lecturer in Computer Science, University of Luton
- Oct 2004 – Sept 2005 Research Fellow (postdoctoral), Department of Computer Science, University

of Liverpool

Sept 2003 – Sept 2004 Lecturer in Computer
Science, King's College
London

1.4 University committee membership

Jul 2023 - present	Academic Coach Champion (ULaw)
Jul 2023 - present	Member of the Complaints Approval Panel (ULaw)
Feb 2023 - present	Member of the Programme Approval Committee (ULaw)
Sept 2018 – October 2022	Member of Apprenticeship Improvement and Monitoring Group (AIMG)
Sept 2017 – October 2022	Member of the Apprenticeship Board (Faculty representative)
Sept 2015 – October 2022	Member of Teaching, Quality and Standards Committee (TQSC)
Sept 2009 – October 2022	Member of Faculty Academic Board (FAB)
Sept 2008 – Dec 2010 & Dec 2020 – October 2022	University Academic Board (CATS Faculty representative)
Sept 2008- October 2022†	Member of Faculty Teaching Standards Committee (FTQSC)

1.5 Professional membership

2018 - present	Member of the Institution of Engineering and Technology (IET)
2011 - present	Fellow of the Higher Education Academy (FHEA)
2010 - present	STEM Ambassador
2010 - present	Chartered Information Technology Professional (CITP)
2007 - present	Member of the British Computer Society (MBSC)
	Fellow of the British Computer Society (2010-)
2007 – present	Member of the Institute for Electronic and Electrical Engineers (MIEEE)

2. Strategic development of Computer Science at The University of Law

As of October 2022 I have been the Head of Computer Science, part of the newly developed Science School at The University of Law. My initial remit has been to establish the computer science department (including outlining the strategic vision, develop two new programmes (one postgraduate and the other undergraduate) and to build a team of academics and technical support. I have recruited two staff as part of the initial phase, and a further 15 should be recruited over the next five years. I have also recruited a technician to support the development of the infrastructure to support teaching, learning and research.

3. Strategic management of University Campus Milton Keynes and the Faculty of Creative Arts, Technology and Science

Between April and September 2018, I was appointed the Acting Head of School for Computer Science and Technology within the Faculty of Creative Arts, Technologies and Science at the University of Bedfordshire. I was appointed the permanent Head of School for Computer Science and Technology in October 2018, and I held this position until October 2022. still hold this position currently. My main responsibilities included the management of a £1 million annual budget within the School, oversight and management of 40 members of academic staff, and strategic developments, including new course developments and partnership management within the School. During my time in the role I played a strategically important part in the development of a new £42 million Science, Technology, Engineering and Mathematics (STEM) building, including the establishment of new courses in the areas of automotive and mechanical engineering which are housed in the new building.

Since 2017 I have also played a strategic role in the development of apprenticeship provision (higher and degree) within the technology area. I led the developments and establishment of apprenticeships in Data Analytics (Level 4 higher apprenticeship), Digital and Technology Solutions (Level 6 integrated degree apprenticeship) and Cybersecurity (Level 6 integrated degree apprenticeship). I am also a strategic team member managing and preparing OFSTED documentation for our apprenticeship vision, and have built up important relationships with a number of employers who now provide apprentices to these programmes.

I see my role as being a leader, but also a team-worker, ensuring that developments run smoothly, student numbers continue to increase, and that we have the correct balance of courses in the portfolio.

I am also a member of the Faculty Executive Group, making strategic decisions on the developments and direction that the Faculty will take. Higher Education is increasingly competitive, and so development operational and strategic plans at Faculty and University level are both part of my current duties.

From September 2015 until April 2018, I was the Associate Dean (Quality and Development) within the Faculty of Creative Arts, Technologies and Science. As part of this role, I was responsible for leading the Faculties quality agenda, and oversaw periodic reviews of provision (five-yearly review) as well as around 40 new course developments. I also led the Faculties partnership agenda and worked with Schools to set up a wide range of new partnerships in the Caribbean, Sri-Lanka, Malaysia, Mauritius, Egypt and Jordan. I had overall responsibility and accountability for ensuring that all six Schools within the Faculty were maintaining standards, and for managing and controlling compliance with University regulations and the University's Quality Handbook.

On the 1st January 2013 I was appointed to the position of Associate Dean (University Campus Milton Keynes) and Faculty of Creative Arts, Technologies and Science. I held this position until 21st August 2015, at which point I returned to the Faculty of Creative Arts, Technologies and Science.

Whilst undertaking this role I had overall operational management of University Campus Milton Keynes, as well as leading on a number of important strategic management initiatives.

In addition to my role at University Campus Milton Keynes I also maintained an Associate Dean level role within the Faculty of Creative Arts, Technologies and Science. This has included integrating the developments at Milton Keynes into the Faculty, as well as working at a cross-faculty level to further embed activities within Milton Keynes into the existing faculty structures.

As part of my role I led on such elements as:

- University Campus Milton Keynes project board
- Quality Assurance and Enhancement activities for University Campus Milton Keynes
- Ensuring strategic growth and development of the Milton Keynes Campus

I have also provided line management to a number of staff based at University Campus Milton Keynes, as well as playing a role within the Faculty Executive Group for Creative Arts, Technologies and Science.

Within the duties of my wider role I have also undertaken positions within a number of University committees, including the Portfolio Strategy Planning Group, five-way meetings with Marketing, Admissions, Recruitment and Communications (MARC) and have acted on approval panels for potential partners in conjunction with the Academic Partnerships team.

A key part of my role as Associate Dean was ensuring that teaching quality and standards were maintained. This was undertaken in partnership with faculty and departmental colleagues, but operational delivery and responsibility rested with my own role on a day-day-day campus-wide basis.

During my time as Associate Dean, University Campus Milton Keynes student numbers nearly doubled, and I led the campus developments that took the campus footprint from 1200 m² in 2013 to 2500 m² in 2015, including the addition of strategically important and state-of-the-art facilities. I also worked closely with colleagues across the university to ensure that the portfolio of courses offered has expanded.

From a research and enterprise perspective, I have led an innovation bridge project, as well as leading the university's contribution to the £16 million funded MK:Smart project (£450,000 is the University of Bedfordshire share). Both initiatives have improved the university brand in Milton Keynes and have also attracted significant national and international attention.

3.1 Curriculum design, course development and teaching experience

I led the design, development and successful approval of the following courses at the University of Bedfordshire:

- * BA/BSc (Hons) Urban Planning and Design (2015 – proposal developed)
- * BSc (Hons) Data Science (2014)
- * MSc Computer Applications (June 2010)
- * MSc Computer Systems (June 2010)
- * MSc Computing and Entrepreneurship (November 2008)
- * MSc Telecommunications Management (November 2008)

- * BSc (Hons) Computing and Mathematics (November 2007)
- * BSc (Hons) Computer Security and Forensics (November 2007)

I have previously undertaken a significant role in the design, development and successful approval of the following MSc courses:

- * MSc Information Systems and eGovernment (August 2010)
- * MBA Information Technology Management

3.2 Strategic Development of overseas courses

In the Academic Year 2009/10 & 2010/11 I led the development of an initiative to deliver some of our taught MSc courses at Majan University College in Oman. The following courses were successfully approved, and the first cohort of students began studying in February 2011 (17 students). I was responsible for starting the delivery of these courses and travelled to Oman to deliver an induction session and a series of lectures from 9-12th February 2011. I continued in this capacity visited Oman on several occasions in 2012 and 2013 in order to oversee the management of the partnership as well as teaching and assessing students. The courses on offer included:

- * MSc Computer Science (Applied Computing)
- * MSc Computer Science (Computer Networking)
- * MSc Computer Science (Computer Security and Forensics)
- * MSc Computer Science (Information Management and Security)
- * MSc Computer Science (Mobile Computing)

I have taken a leading (working with an established team) role in developing the following MSc course:

- * MSc Embedded Systems Engineering (May 2011)

3.3 Periodic review (MSc taught courses)

Most recently (2021 and 2022) I successfully led the periodic review of the postgraduate and undergraduate provision at the School of Computer Science and Technology at The University of Bedfordshire.

I successfully led (April 2011) the periodic review for taught postgraduate courses within the Department of Computer Science and Technology, University of Bedfordshire. This was vitally important for the Department and working with colleges (managing the whole process and preparing documentation) I ensured the successful re-validation of our postgraduate taught provision for another periodic cycle.

3.4 Development of overseas recruitment and collaborative provision

During my time with the Department of Computer Science and Technology I took the lead when it came to establishing new collaborative provision with overseas partners. Between 2006-13 I made a number of visits to overseas countries to discuss formal progression agreements onto both undergraduate and postgraduate courses within the Department of Computer Science and Technology. The visits included:

- Bangladesh (May 2006 & May 2007)
- Malaysia (May 2007)
- Oman (June 2009 & February 2011, February, May, Sept 2012, June 2013)

- Nigeria (May 2011)

During such visits I have represented both the Department and the University and spoken to both staff and potential students, encouraging stronger links and encouraging them to study at the University of Bedfordshire. This has had good results with a number of students enrolling on undergraduate and postgraduate courses within the Department of Computer Science and Technology, and then returning to their home country to act as student ambassadors.

I see the continuing development of overseas provision (especially in the area of Trans-National Education and within the European Union) as being an important strategic aim of the departments within the Faculty of Creative Arts, Technologies and Science, the Faculty itself and the University, and I will continue to build links with a wide variety of overseas partners.

3.5 Short course and Continuing Professional Development (CPD) course lead

I successfully developed a short course (Advanced Professional Certificate) in applied project management for delivery from July 2011. The course itself was aimed at the industrial sector and aligned well with the University's strategic aim of establishing a new postgraduate and CPD centre. As short course co-ordinator I developed the course and unit content, as well as the philosophy behind the course. This is another example of strategic leadership and is aimed at enhancing the profile of the Department of Computer Science, and more widely, the University of Bedfordshire, within the regional community.

3.6 University of Bedfordshire and 7Safe course development

In May 2007 the University approved the collaborative supported distance learning course MSc Computer Security and Forensics in conjunction with 7Safe Ltd. a forensic training company and consultancy based in Sawston, Cambridgeshire. This part-time course ran successfully during my time within the department. I played a key part in the development of this course and co-ordinated it between September 2007 and January 2013. This role involved the development of online course materials (including the development of podcasts) as well as the overall management of the course including admissions, student induction, organising staff to support the different units and working with 7Safe colleagues to ensure a strengthening of the relationship.

Students on this course performed well with many being awarded the highest awards of commendation and distinction.

3.7 Teaching Responsibilities (previous)

- MSc unit in Professional Project Management (2005-current)

Previous Teaching

- Honours year unit in IT Project Management (unit leader)
- MSc unit in Professional Project Management
- Masters unit in Information Systems Strategy (unit leader)
- Honours year dissertation supervision
- Master's thesis supervision

- Year 2 module on Algorithmic Complexity (University of Liverpool, 2004-5)
- Honours year module on Graph Theory (King's College, 2003-4)

4. Leadership and management

As of October 2022, I am the Head of Computer Science, a newly created department, at The University of Law. My initial remit has been to establish the computer science department (including outlining the strategic vision, develop two new programmes (one postgraduate and the other undergraduate) and to build a team of academics and technical support. I have recruited two staff as part of the initial phase, and a further 15 should be recruited over the next five years. I have also recruited a technician to support the development of the infrastructure to support teaching, learning and research.

Between April 2018 and October 2022 I led the School of Computer Science and Technology at The University of Bedfordshire. As part of the role I line managed 40 academic staff and a team of five technical support officers. I held overall strategic management responsibility for the School, including horizon scanning, driving up student numbers and managed an annual budget of £1 million and oversaw annual income of circa £13 million. As part of the role I successfully oversaw the re-accreditation of the computer science provision by BCS – The Chartered Institute for Information Technology and the engineering provision by the IET. I also instigated the accreditation of automotive and mechanical engineering by iMechE shortly before I left the position.

Between January 2013 and September 2015 I led the operational and strategic management of University Campus Milton Keynes. This included the management of financial, physical, human and estates portfolios and provided me with significant management and leadership experience. I took University Campus Milton Keynes from 'ground zero' towards a functioning university campus. There are still many opportunities for development but I believe that the experience that I gained, and the results that have been achieved, demonstrate my ability to successfully lead and manage important university projects and operations.

Whilst a member of the Department of Computer Science and Technology (2005-13) I was actively involved in shaping and leading many of the strategic developments within the Department, including the development of a postgraduate personal tutor system, the accreditation of undergraduate computing degrees by the British Computer Society and the development of the departmental portfolio. I was considered to be a key member of the Department and represented the department and, on occasion, my own initiatives, at all levels of management within the University. I consider myself to be a trusted and valued member of the University, and believe that my substantial strategic experience would be of continued benefit to all areas of the University.

Between 2006-13 I made important contributions to the development of departmental strategy as part of the core management team. I provided vital input to areas surrounding the strategy for postgraduate taught students (e.g. managing large cohorts, developing appropriate delivery of course content, development of new courses, personal tutoring systems). These contributions have been recognised by the team, including the Head of Department as well as by the wider university.

4.1 Management and administrative roles & responsibilities

Head of Computer Science – The University of Law (October 2022 – present)

I am currently the Head of a Computer Science at the University of Law, with a remit to establish a unique and market leading interdisciplinary provision spanning computer science, business and law.

Head of School – Computer Science and Technology (April 2018 – October 2022)

I was responsible for the strategic and operational leadership of the School of Computer Science and Technology at the University of Bedfordshire. I oversaw and line manage 40 members of academic staff, as well as managing the Schools budget. I had responsibility for student number growth, strategic visioning of new courses and also ensuring that the School was able to adapt to both internal and external environments.

Associate Dean (Quality and Development) (21015-18) – CATS

I was responsible for the management and development of quality related matters for the Faculty of Creative Arts, Technologies and Science. I lead course development teams and advise on development of new course ideas. I also lead the Faculty's degree apprenticeship initiative in the area of STEM.

Associate Dean – UCMK & CATS (2013-15): I was the operational lead for University Campus Milton Keynes (UCMK) as well as contributing actively to the management of the CATS faculty. I am also involved in a number of university committees including the Portfolio Strategy and Planning Group and Faculty Executive Group.

Principal Lecturer in Computer Science (2011-2022): I led strategic developments as well as supporting the Head of Department. I also represented the university on a number of committees and was actively engaged with course approval and quality assurance within the department. I also acted as an external panel member on a number of course approval panels as well as making a valued contribution to the Faculty via the Faculty Teaching Quality and Standards Committee and the Faculty Academic Board.

Acting Head of Department – various (2009-13): When the Head of Department was away I was an Acting Head of Department, ensuring that departmental activities run smoothly. This has involved working closely with the Associate Dean and Dean of the CATS Faculty, and has allowed me to become involved in some of the wider management activities of the University.

Academic Director (new title) – October 2009 to January 2013: Responsible for managing the suite postgraduate taught programmes delivered within the Department of Computer Science and Technology at the University of Bedfordshire. The role also includes the strategic development of future postgraduate taught programmes.

Postgraduate Field Chair (July 2007- October 2009): Responsible for managing the suite postgraduate taught programmes delivered within the Department of Computer Science and Technology at the University of Bedfordshire. The role also includes the strategic development of future postgraduate taught programmes.

Partner College Liaison (September 2006 – September 2007): Responsible for managing the departments relationship with various partner colleges (Barnfield College, Bedford College, Dunstable College and Milton Keynes College) and ensuring that students and staff at the colleges are working effectively and efficiently in line with University of Bedfordshire requirements.

5. Research and Enterprise

My current research interests lie within the area of cyber security, and in particular the intersection with artificial intelligence.

My immediate past area of research interest lies within the area of Big Data. I am currently leading the university's contribution to a £16 million Higher Education Funding Council for England (HEFCE) project. This involves active research into Big Data applications for smart cities.

Previously my two main areas of interest were combinatorics and graph theory. I also have an interest in Bioinformatics. My main research contribution in the area of graph theory has been on the graph theoretic problem of *Colouring Pairs of Binary Trees*. Working with Alan Gibbons we have produced some efficient algorithms for this problem that have led to some significant results within the field of graph theory.

In the area of Bioinformatics my main interests were in algorithmic issues related to bio-inspired models of computing. Research in this area has been undertaken in co-operation with colleagues at the University of Leiden (Netherlands), University of Liverpool (UK), and the University of Exeter (UK).

As well as the two main areas above my most recent research interests lie in the wider area of algorithmics and its applications to practical problems. As part of this my most research publications have involved optimisation models for network security and the development of light weight, but robust, trust models for distributed systems (e.g. Grid).

In particular, I have used this expertise most recently to lead the University's contribution to a £16 million Higher Education Funding Council for England (HEFCE) project called MK:Smart (<http://www.mksmart.org>). This has allowed me to contribute actively to the field of Big Data, as well as developing ideas and concepts as part of establishing an innovation cluster at University Campus Milton Keynes.

I have a successful record of PhD completions (two as Director of Studies and one as a second supervisor) as well as being actively involved in PhD supervision - I currently have four PhD students, all of whom have successfully passed the RS4 stage.

5.1 Research visits

7 - 21 August 2003: Visiting researcher at the DIMACS institute, Rutgers University, New Jersey, United States. During this visit I spent time working with Dr Graham Cormode and Dr Muthu Muthukrishnan. The work focused on attacking graph problems within the new and exciting area of Data Streaming. Further research in this area continues to provide an exciting avenue of research (Big Data-related).

1 February 2001 - 31 March 2001: Leiden Institute for Advanced Computer

Science, University of Leiden. During this visit I spent time working with Professor Grzegorz Rozenberg, Dr Hendrik Jan Hoogeboom and Pierluigi Frisco, mainly on bio-inspired models of computing.

5.2 Publications

Mahmud, A.S.M, **Sant P.** (2023) A renewable energy grid daily pricing model for consumers, accepted for publication on the Proceedings of the 11th International Conference on Smart Energy Grid Engineering (2023).

Ahmad, M.N., deAlwis, C., Shukla, M. & **Sant, P.** (2023) Privacy Preserving Patient-Centric Electronic Health Records Exchange using Blockchain, Artificial intelligence, Big data, blockchain and 5G for digital transformation of the healthcare industry: A movement towards more resilient and inclusive societies (Book Chapter), Artificial intelligence, Big data, blockchain and 5G for the digital transformation of the healthcare industry, 1st Edition, Patricia Ordonez de Pablos & Xi Zhang (Editors), ISBN: 9780443215988.

Kareem, A, Liu, H & **Sant, P.** (2022), Review of Pneumonia Image Detection: A Machine Learning Approach, , Human Centric Intelligence Systems (Journal), Volume 2 (issues 1-2), pages 31-43.

Bin Sulaiman, R., Schetinin, V., & **Sant, P.** (2022) Review of Machine Learning Approach for Credit Card Fraud Detection, Human Centric Intelligence Systems (Journal), Volume 2 (issues 1-2), pages 55-68.

Malik, N.A. Ajmal, T., **Sant, P.**, Ur Rehman, M (2020):
A Compact Size Implantable Antenna for Bio-medical Applications. UCET 2020: *volumes 1-4*

Malik, N.A., Ajmal, T., **Sant, P.**, Ur Rehman, M. (2020):
A Tri-band Implantable Antenna for Biotelemetry Applications. UCET 2020: *volumes 1-4*

Okai, E., Feng, X., **Sant, P.** (2019):
Security and Forensics Challenges to The MK Smart Project. SmartWorld/SCALCOM/UIC/ATC/CBDCom/IOP/SCI 2019: pages, 1666-1670

Okai, E., Feng, X., **Sant, P.** (2018) Smart Cities Survey. HPCC/SmartCity/DSS 2018: *pages 1726-1730*

Mahmud, A.S.M, Sant, P. Tariq, F. & Jazani, D. (2017)
A Real-Time monthly DR Price system for the Smart Energy Grid. EAI Endorsed Trans. Energy Web 4(13): e3

Alqahtani, H.S &, **Sant, P.** (2016) A multi-cloud approach for secure data storage on smart device. DICTAP 2016: 63-69

Mahmud, A.S.M, **Sant, P.**, Tariq, F. & Jazani, D. (2016)
Empirical analysis of real time pricing mechanisms for demand side management: contemporary review. FGCT 2016: 11-16

Hooper, M. & **Sant, P.** : Understanding the Mobile User's Purchase-Decision Involvement, *International Journal of New Computer Architectures and their Applications (IJNCAA)*, Special Issue, Volume 5, Issue 3, 2015.

Hooper, M. & **Sant, P.** : Message Perception within Context-Aware Recommender Systems, In *Proceedings of the Third International Conference on E-Technologies and Business on the Web (EBW2015)*, The Society of Digital Information and Wireless Communication, 2015.

Hooper, M. & **Sant, P.** : The influence of Environment Contexts On Purchase-Decision Involvement, In *Proceedings of the Third International Conference on E-Technologies and Business on the Web (EBW2015)*, The Society of Digital Information and Wireless Communication, 2015.

Oriwoh, E., Jazani, D. , Epiphaniou, G. & **Sant, P.** (2013) Internet of Things Forensics: Challenges and approaches. *CollaborateCom 2013*: 608-615

Oriwoh, E., **Sant, P.** & Epiphaniou, G. (2013) Guidelines for Internet of Things Deployment Approaches - The Thing Commandments. *EUSPN/ICTH 2013*: 122-131

Oriwoh, E. & **Sant, P.** (2013) The Forensics Edge Management System: A Concept and Design. *UIC/ATC 2013*: 544-550

Epiphaniou, G. , Maple, C. , **Sant, P.**, Safdar, G.A., (2012) Effects of iterative block ciphers on quality of experience for Internet Protocol Security enabled voice over IP calls. *IET Information Security* 6(3): 141-148.

Sant, P. & Hewling, (2011) M. Digital Forensics: The need for Integration. *Proceedings of 6th International Workshop on Digital Forensics and Incident Analysis (WFDIA 2011)*, Kingston University, UK, 7-8 July 2011.

Brown, A., **Sant, P.**, French, T., Bessis, N. & Maple, C. (2010) Modelling Self-led Trust Value Management in Grid and Service Oriented Infrastructures: A Graph Theoretic Social Network Mediated Approach. *International Journal of Systems and Service-Oriented Engineering (IJSSOE)* 1(4), pages 1-18.

Sotiriadis, S., Bessis, N., **Sant, P.** & Maple, C. (2010) A mobile agent strategy for grid interoperable virtual organisations. *Proceedings of the International Association for Development of the Information Society Conference 2010 (IADIS 2010)*, 26-31 July 2010.

Sotiriadis, S., Bessis, N., **Sant, P.** & Maple, C. (2010) Encoding minimum requirements of inter-connected grid virtual organisations using genetic algorithms. *Proceedings of the International Association for Development of the Information Society Conference 2010 (IADIS 2010)*, 26-31 July 2010.

Sotiriadis, S., Bessis, N., Huang, Y., **Sant, P.** & Maple, C. (2010) Towards decentralized grid agent models for continuous resource discovery of interoperable grid virtual organisations. *Proceedings of the Third International Conference on the Applications of Digital Information and Web Technologies (ICADIWT 2010)*, Istanbul (Turkey), 12-14 July 2010.

Epiphaniou, G., Maple, C., **Sant, P.** & Reeve, M. (2010) Affects of Queuing Mechanisms on RTP Traffic: Comparative Analysis of Jitter, End-to-End Delay and

Packet Loss. *Proceedings of the sixth annual conference on Access, Reliability and Security* (ARES 2010), pages 33-40, 2010.

Sotiriadis, S., Bessis, N., Huang, Y., **Sant, P.** & Maple, C. (2010) Defining Minimum Requirements of Inter-collaborated Nodes by Measuring the Weight of Node Interactions. *Proceedings of the international conference on Complex, Intelligent and Software Intensive Systems (CISIS 2010)*, pages 291-298.

Gibbons, A. and **Sant, P.** (2008) Crochemore Sets, London Algorithmics 2008: Theory and Practice (A Volume Dedicated to Maxime Crochemore on his 60th Birthday), Texts in Algorithmics, Volume 11, Joseph Chan, Jacqueline W. Daykin and M. Sohel Rahman (ed.), pages 72-80.

Gasieniec, L., Li, C.Y., **Sant, P.** and Wong, P. W. H. (2007) Randomized probe selection algorithm for microarray design. *Journal of Theoretical Biology*, volume 248, issue 3, pages 512-521.

Gibbons, A. and **Sant, P.** (2007) Binary Trees, Towers and Colouring. *Proceedings of the International Workshop on Combinatorial Algorithm (IWOCA 2007)*, Newcastle, Australia, 2007.

Gibbons, A. and **Sant, P.** (2007) Trees, Towers and Colourings. *Proceedings of the Algorithms and Complexity in Durham workshop (ACID 2007)*, University of Durham (UK).

Gasieniec, L., Li, C. Y., **Sant, P.**, Wong, P. W. H. (2006) Efficient Probe Selection in Microarray Design. *Proceedings of the IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB 2006)*, pages 247-254.

Sant, P. and Maple, C. (2006) A Graph Theoretic Framework for Trust – From Local to Global. *Proceedings of Information Visualization 2006 (IV06)*, IEEE, pages 497-503.

Gasieniec, L., Kolpakov, R., Potapov, I. and **Sant, P.** (2005) Real-Time Traversal in Grammar-based Compressed Files. *Proceedings of the Data Compression Conference 2005 (DCC2005)*, page 458.

Gibbons, A. and **Sant, P.** (2004) Rotation sequences and edge-colouring binary tree pairs. *Theoretical Computer Science*, 326, pages 409-418.

Gibbons, A. and **Sant, P.** (2004) Stringology and the Four colour Theorem of Planar Maps. *Texts in Algorithmics, volume 2: String Algorithmics*, King's College Publications, 2004.

Amos, M. and **Sant, P.** (2004) Models for recombination in Ciliates. Book Chapter in *Computation in Cells and Tissues: Perspectives and Tools of Thought*, Springer Series in Natural Computation.

Gibbons, A. and **Sant, P.** (2002) Edge-Colouring Pairs of Binary Trees: Towards a concise proof of the Four Colour Problem of Planar Maps. *Lecture Notes in Computer Science*, Volume 2420, pages 25-39. K. Diks and W. Rytter (Eds.), 2002.

Sant, P. and Gibbons, A. (2004) Towards a concise proof of the Four Colour Theorem of Planar Maps. *Bulletin of EATCS*, Volume 78, page 264, 2002.

Frisco, P., Hoogeboom, H. J. and **Sant, P.** (2002) A direct construction of a Universal P System. *Fundamenta Informaticae*, Volume 49(1-3), pages 103-122.

5.3 Presentations

Sant, P., Colouring Pairs of Binary Trees and the Four Colour Problem – Results and Achievements. DIMAP seminar, University of Warwick, UK, May 2010.

Sotiriadis, S., Bessis, N., Huang, Y., **Sant, P.** & Maple, C. Defining Minimum Requirements of Inter-collaborated Nodes by Measuring the Weight of Node Interactions. CISIS 2010, Poland, February 2010.

Epiphaniou, G., Maple, C., **Sant, P.** & Reeve, M. Affects of Queuing Mechanisms on RTP Traffic: Comparative Analysis of Jitter, End-to-End Delay and Packet Loss. ARES 2010, February 2010.

Sant, P., An Algorithmic and Graph Theoretic viewpoint of Security. Presented at the British Colloquium for Theoretical Computer Science (BCTCS) 2006, University of Warwick, UK, April 2009.

Gibbons, A. and **Sant, P.**, Binary Trees, Towers and Colouring, IWOCA 2007, Victoria, Australia, August 2007.

Sant, P. and Gibbons, A., Combinatorics of colouring 3-regular trees. Presented at the British Colloquium for Theoretical Computer Science (BCTCS) 2006, University of Wales, Swansea, April 2006.

Sant, P. (Joint work with Gibbons, A.). Classes of the Colouring Pairs of Binary Trees problem that can be solved in linear-time. Presented at the 19th British Combinatorial Conference, University of Wales, Bangor, July 2003.

Sant, P. (Joint work with Gibbons, A.). Edge Colouring Pairs of 3-regular trees and the Four Colour Theorem of Planar Maps. Presented at the 14th Postgraduate Combinatorics Conference (PCC), Department of Mathematics, University of Nottingham, March 2003.

Sant, P. and Gibbons, A., Towards a concise proof of the four colour theorem. Presented at the British Colloquium of Theoretical Computer Science (BCTCS18), HP Laboratories, Bristol, April 2002. Abstract of the talk appears in the Bulletin of the European Association of Theoretical Computer Science (EATCS). Page 264, 78, October 2002.

Sant, P. 3-edge colouring Pairs of Trees. King's College Research Day, October 15 2002.

Sant, P., Frisco, P. and Hoogeboom, H. J. A direct construction of a universal P system. 17 British Colloquium on Theoretical Computer Science, University of Glasgow, April 2001.

5.4 Grants and proposals

Gov.UK Higher Technical Education provider growth fund, Development of three HTQs in construction and technology, September 2021 – June 2022, £300,000

Innovate UK, Knowledge Transfer Partnership, July 2017 – July 2019, £130,000

HEFCE funded degree apprenticeship award – *Development of new degree apprenticeship standards and initiatives in the area of STEM (July 2017) £141,000*

EU TAIS project (consultancy for TES Ltd) – Intelligent Traffic Management. Grant awarded (August 2015). Awaiting formal contract signing (£1 million total awarded, £75,000 consultancy provided by University of Bedfordshire).

Innovation Bridge Project in conjunction with TES Limited – Smart parking solutions. April-May 2015 (£1000).

HEFCE project – MK Smart – establishing an innovation cluster at University Campus Milton Keynes, January 2016 – June 2017 (£450,000)

Innovation Voucher in conjunction with Acuigen Limited – A feasibility report for the development of a mobile “App” for market Analysis, **East of England Development Agency**, February 2011 (£3,000).

Graph Theoretic Approaches to Information Security (**Grant number: NAL32748**), Newly Appointed Lecturers in Science Grant Scheme, **Nuffield Foundation**, 2006-2009 (£4,000).

5.5 Journal and conference reviewing

Journal editor

January 2009 - present	Member of the editorial board for the International Journal of Distributed Systems and Technologies (IJDST)
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Journal reviewer

May 2011 - present	Modelling and Simulation in Engineering
March 2010 - present	Computers in Industry
June 2011 - present	Journal of Computer Applications in Technology
November 2009 - present	The Computer Journal
March 2009 - present	International Journal of Identification, Modelling and Control
January 2009 - present	International Journal of Distributed Systems and Technologies
September 2005 - present	Journal of Discrete Algorithms

Conference reviewer

June 2011-13	3PGCIC
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May 2011-present	DEPEND 2011
April 2011-13	EIDWT-2011
March 2011-present	INTERNET 2011
March 2009	AMCIS
January 2009	ECIS 2009

5.6 Conference organisation

Co-organiser (with Dr Raphael Clifford, University of Bristol) of the Bristol Algorithms Days 2007 (BAD'07)

Co-organiser (with Dr Raphael Clifford, University of Bristol) of the Bristol Algorithms Days 2008 (BAD'08)

5.7 Programme Committee membership

INTERNET2012-present (Programme Committee Member)

INTERNET 2011-present (Track Chair and reviewer)

MOSN 2011 (Programme Committee member and reviewer)

DEPEND 2011 (Programme Committee member and reviewer)

5.8 Research supervision

MPhil - completions

Director of studies (Emanuel Thomas) – completed December 2010

PhD – completions

Director of studies (Nabeel Malik), 2021

Director of studies (ASM Mahmud) - 2019

Director of studies (Hassan Al-qahtani) – 2019

Director of studies (Mark Hooper) – 2018

Director of studies (Saeed Al-Almarri) – 2017

Director of studies (Thaier Hamid) completed 2015

Director of studies (Moniphia Hewling) completed 2014

Second supervisor (Gregory Epiphanou) – completed April 2011

PhD supervision

Director of studies (Faris Abomehla)

Director of studies (Mohammad Ahmad)

Advisor (Ahmad Kanbour)

5.9 Research degree examining

PhD (Joshua Alcock), August 2022

PhD (Thomas Carroll), November 2019

PhD (Ashley Farrugia), September 2016

PhD (Muhammad Kamran Abassi), March 2015

PhD (Hataichanok Saevanee), February 2014

PhD (Yueqiao Li), December 2009

MSc by research (Tao Cao), December 2009
MSc by research (Marcia Gibson), 2007
MSc by research (Sean Pollonais), 2007

6. Internal and External advisory (curriculum design and course validation)

6.1 Internal Validation panel member

I am an active panel member for University validation and periodic review events. Since 2007 I have been involved in validation events both within the University (including the periodic review of Law, postgraduate provision within the postgraduate medical school and, most recently, a postgraduate certificate in Management) and with overseas collaborators (Lim Kok Wing and Kaplan) in Malaysia and Singapore.

6.2 External advisory (curriculum design and course validation)

December 2021 External panel member for apprenticeship validation

April 2021 External Panel Member for course validation

April 2011 External panel member for course validation (Foundation Degree),
University of Teeside

March 2010 External panel member of course approval team for a franchise between
STI Limited (Malta) and the University of Middlesex

6.3 External examining

September 2020 – present: External Examiner, Middlesex University

March 2015 – December 2019: External Examiner, University of Plymouth.

September 2014 – September 2015: Chair of Postgraduate Scheme Board (internal)

7. Student recruitment and enhancing the student experience

7.1 Open day development and organisation

The Open Days held by the University are one of the most important events that we hold. Between 2006-present I have been the key member in charge of open day development. Starting in late 2006 I took the initiative to re-organise the open day format so that it could become a more interactive and enjoyable experience for potential students and their parents. This included moving the open day activities from the A000 rooms to our own Departmental computing laboratories so that students and parents could see what life would be like within the Department. I also encouraged the participation of current students during the open day events as students what to know what it is like from a student perspective. In addition I incorporated videos and podcasts into the beginning of the event, all focused around the current trends in computing, as well as setting up demonstrations from areas such as robotics, computer animation and motion capture, engineering and computer networking. I have also encouraged active participation in the events by both staff

and potential students so that a more mutually beneficial relationship is established – this has led to direct recruitment of students in some cases.

The feedback has, and continues to be, very positive, and the overall experience for potential students and their parents is much improved.

7.2 Taster day development

As part of a departmental initiative I have been an active member of the group of staff who run taster day sessions with local schools and partner colleges. My role has involved both organisational and participatory elements. I have given a number of talks to students regarding cyber-security, mobile applications and the future of computing.

7.3 National student survey: Enhancing student experience

I am an active and passionate supporter of improving the student experience. Leading and working with colleagues I am currently working towards the roll-out of activities at University Campus Milton Keynes relating to the first cohort of students to undertake the National Student Survey at UCMK in 2016.

Historically, I designed and developed the National Student Survey strategy and activities for 2010/11. This involved a series of face-to-face discussions with students to talk about the student survey, and to stress the importance of the survey, both to the students, and to the University.

The initiatives developed helped to secure a 13% increase in student participation in the survey (up from 55% in 2009/10 to 68% in 2010/11), and more generally it helped to encourage an open forum in which we could discuss areas of good practice, as well as areas for development.

8. Outreach activities - working with professional bodies and organisations

8.1 Course Accreditation (British Computer Society)

I led the departmental initiative to obtain British Computer Society accreditation (Chartered IT Professional status) for five undergraduate courses:

- * BSc (Hons) Artificial Intelligence and Robotics
- * BSc (Hons) Computer Games Development
- * BSc (Hons) Computer Networking
- * BSc (Hons) Computer Science
- * BSc (Hons) Computer Security and Forensics

This is a nationally, and internationally, recognised symbol of excellence and the panel have recommended accreditation at Chartered IT Professional level for a period of five years from 2009.

8.2 Women in IT initiative

Working with the Faculty (Creative Arts Technologies and Science) and the Equality and Diversity department I was responsible for organising the first Women in IT conference at the University of Bedfordshire. This initiative was supported by the

British Computer Society's BCSWomen group and was a great success. It is planned for our initiative to be linked in with national initiatives run by organisations such as the BCS and IEEE (see here for a review of the event: <http://www.beds.ac.uk/news/2010/may/100520-it>)

8.3 STEM ambassador

I am currently an active UK STEM Ambassador and regular undertake STEM visits, organise activities and input into career's days.

I previously worked with the Bedfordshire and South East initiative (currently run by the Britten Partnership) as a Science, Technology, Engineering and Mathematics Ambassador. This allows me to make an impact in the wider community, and to work with school children to encourage them to take up careers in STEM areas, and to be part of the next generation of entrepreneurs and to continue the success of the ever-increasing use of technology in our society.

8.4 IEEE student branch counsellor

An important aspect of University Education is preparing our graduates for employment. As the student branch counsellor for the IEEE student branch I was the leading member in establishing the Student Branch. I am actively engaged with the student branch attending committee meetings and helping students to organise a wide range of activities, including: seminars, social evenings, trips to places such as Bletchley Park and establishing relationships with other UK student branches.

Again, this provides me with management experience, but it also provides the student members with networking opportunities and a chance to meet with like-minded people.

9. Referees

Professor Jan Domin (most recent external line manager)

Executive Dean
Faculty of Creative Arts, Technologies and Science
University of Bedfordshire
University Square
Luton
LU1 3JU

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Phone: +44 (0) 1582 489 134

Professor Martyn Amos – Professor of Computer and Information Sciences

Department of Computer and Information Sciences
Ellison Building
Northumbria University
Newcastle Upon Tyne
NE1 18ST

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Phone: +44 (0)191 243 7655

Further references are available upon request.