Amitabh Trehan

Contact Information

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Computer Science
Loughborough University
Epinal Way, Loughborough
Leicestershire, UK
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Research Interests

My broad research interests are in CS theory and algorithms, especially those arising from or applicable to real world and human engineered systems. I have specific interests in distributed algorithms, networks, graph theory, and game theory. Current work includes designing efficient distributed algorithms for robustness/self-healing/self-* properties in systems under attack from a computationally unbounded adversary, questions about algorithms in distributed and biological systems, and game theoretic and other mechanisms for evolving and dynamic networks, such as Peer-to-peer and social networks. I am also a fellow of the UK Higher Education Academy (**FHEA**).

Education

Ph.D.(with distinction), Computer Science, *University of New Mexico*, May 2010
Dissertation: "Algorithms for self-healing in networks", advised by Prof. Jared Saia
UNM Deans Dissertation Award
Nominee, Principles of Distributed Computing Doctoral Dissertation Award, 2012

M.Tech. Computer Applications (Mathematics interdisciplinary program), *Indian Institute of Technology, Delhi*, Dec 2002
Thesis: "A proposal for a phonetic based encoding for Indic scripts", advised by Profs. Sanjiva Prasad and Wagish Shukla

M.C.A. (Masters in Computer Applications), *Indira Gandhi National Open University*, Delhi, Dec 1999
Thesis: "Neural Networks and Fuzzy logic", advised by Prof. Wagish Shukla, IIT Delhi

B.Sc. Biology, *Punjab University*, June 1994

Postgraduate Certificate in Higher Education and Teaching, *Queen's University Belfast (QUB)* (leading to **Fellowship of Higher Education Academy (FHEA)**, June 2016

Professional Experience

Assistant Professor (UK: Lecturer) (Feb 2017 -), Computer Science, School of Science, *Loughborough University, Loughborough*

Assistant Professor (UK: Lecturer) (Oct 2013 - Jan2017), Computer Science, EEECS, *Queen's University, Belfast*

I-CORE Postdoctoral Research Fellow (Apr 2013 - Oct 2013), School of Engineering and Computer Science, *Hebrew University of Jerusalem* (with Prof. Danny Dolev)

Post-doctoral Fellow (October 2010 - April 2013), Information Systems, Faculty of Industrial Engineering and Management, *Technion-IIT*, Haifa, Israel (with Profs. Shay Kutten and Ron Lavi)

Post-doctoral Researcher (May - September 2010), Computer Science, *University of Victoria*, Canada. (with Prof. Valerie King)

Research Associate (June 2010), Computer Science, *Brown University* (with Prof. Gopal Pandurangan)

Research Assistant (2005-May 2010, 2004), Computer Science, *University of New Mexico*, U.S.A. (with Prof. Jared Saia, Prof. David Bader respectively)

Research Assistant (2005), UNM Biology/ T-10, theoretical biology, *Los Alamos National Lab* (with Dr. William Hlavacek)

Visiting faculty (Fall 2003): Management Studies *Indian Institute of Technology*, Roorkee, India

Project Officer (1999 - 2004): Laboratory for Informatics in the Liberal Arts *Mahatma Gandhi International Hindi University*, Delhi and Wardha, India

Faculty (1996 - 1997): *National Institute of Information Technology*. Gurgaon, India

Courses taught

Note: Only University level, full time taught courses listed

COB232: "Operating Systems, Networks and the Internet-2 (OSNI-2), B.Eng. CS, Spring 2016-17, LU

CSC2047: "Theory of Computing", B.Eng. CS, Spring and Fall, 2016-17, QUB

CSC2001:"Data Structures and Algorithms", B.Eng. CS/SE, Spring 2016-17, QUB

CSC7052: "Databases", M.Sc (Software Engineering) Fall 2014, Fall 2013-14, QUB

"Database Management Systems", M.B.A., Fall 2003, IIT Roorkee

Other Trainings

Complex Systems Summer School (CSSS), *Santa Fe Institute*, Santa Fe, 2007

Advanced Diploma in Computer Applications, *National Institute of Information Technology*, Gurgaon, India, 1994 - 1996

Awards and Honors

Visiting Professorship, University of Marseille, France, Spring/Summer 2017

Newton Fund International Collaboration Programme AMC Mobility Grant, 2016. (For a joint project with Prof. Armando Castaneda, Universidad Nacional Autonoma de Mexico), Aug-Sep 2016

Winner, Internal QUB competitions: i) EEECS International Doctoral Training Centre PhD studentship, ii) Faculty of EPS applied maths sandpit competition (PI on interdisciplinary CS-Maths-Phy-Bio proposal)

Newton Incoming Fellowship, 2013 of the Royal Society (at Royal Holloway University of London). Highly competitive (6% - 8% success rate) with financial support of upto £126,000

Israeli Centres of Research Excellence (I-CORE) postdoctoral fellowship, 2013

Best paper at *ICDCN 2013*: "Sublinear Bounds for Randomized Leader Election"

Nominee (Ph.D. dissertation), Principles of Distributed Computing Doctoral Dissertation Award, 2012

Distinction, Ph.D., University of New Mexico, 2010

Graduate Dean's Dissertation Fellowship, University of New Mexico, 2009-2010

College Color, public speaking, DAV College, Punjab University, 1994

Funding

Selected Publications

Note: In theory conferences and journals, author names are almost always in alphabetical order. Citation count(C) is from Google Scholar (on May 10, 2017): h-index: 11, total citations= 319. Conference acceptance rates(A) where available have been used.

Journals

J1 Armando Castaneda, Danny Dolev and Amitabh Trehan, "Compact Routing Messages in Self-Healing Trees", Invited to *Theoretical Computer Science (TCS)*, 2016.

J2 Gopal Pandurangan, Peter Robinson, and Amitabh Trehan, "DEX: Self-healing Expanders", *Distributed Computing*, Vol 29, No.3, June 2016. (C: 15)

J3 Shay Kutten, Gopal Pandurangan, David Peleg, Peter Robinson, and Amitabh Trehan, "On the Complexity of Universal Leader Election", *Journal of ACM (JACM)*, Vol 62, No. 2, May 2015. (C: 13)

J4 Shay Kutten, Gopal Pandurangan, David Peleg, Peter Robinson, and Amitabh Trehan, "Sublinear Bounds for Randomized Leader Election", *Theoretical Computer Science (TCS)*, Vol 561, January 2015 (C: 17)

J5 Gopal Pandurangan and Amitabh Trehan, "Xheal: localized self-healing using expanders", *Distributed Computing*, June 2013 (Online); Springer, Vol 27, No 1, February 2014 (Published) (C: 39)

J6 Tom Hayes, Jared Saia and Amitabh Trehan, "The Forgiving Graph: A Self-Healing Distributed Data Structure", *Distributed Computing*, Springer, Vol 25, No 4, February 2012 (C: 56)

Conferences and Workshops

C1 David McBride, Sandra Scott-Hayward, Amitabh Trehan, "Resilience and Self-Healing in OpenDaylight", under submission

C2 Seth Gilbert, Gopal Pandurangan, Peter Robinson, Amitabh Trehan, "DConstructor: Network Construction with Polylogarithmic Overhead", under submission

C3 Daniel Playfair, Amitabh Trehan, Barry McLarnon, Dimitrios S. Nikolopoulos, "Big data availability: partial checkpointing for in-memory database queries", *Fourth Workshop on Scalable Cloud Data Management, IEEE Big Data* 2016.

C4 Armando Castaneda, Danny Dolev and Amitabh Trehan, "Compact Routing Messages in Self-Healing Trees", **Best paper session**, *International Conference on Distributed Computing and Networking (ICDCN)* 2016. (A: 41%)

C5 Gregory Chockler and Amitabh Trehan, "Towards Self-healing SDN", *Distributed Software Defined Networks (DSDN) workshop*, Principles of Distributed Computing (PODC), 2014

C6 Gopal Pandurangan, Peter Robinson, and Amitabh Trehan, "DEX: Self-healing Expanders", *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, 2014. (C: 15, A: 21.1%)

C7 Shay Kutten, Gopal Pandurangan, David Peleg, Peter Robinson, and Amitabh Trehan, "On the Complexity of Universal Leader Election", in *Principles of Distributed Computing (PODC)*, 2013. (C: 13, A: 25.5%)

C8 Shay Kutten, Ron Lavi and Amitabh Trehan, "Composition Games for Distributed Systems: The EU Grants Games", in *AAAI Conference on Artificial Intelligence (AAAI-13)*, 2013. **Work supported by Technion-Microsoft Electronic Commerce Research Center** (C: 5, A: 29%)

C9 Shay Kutten, Gopal Pandurangan, David Peleg, Peter Robinson, and Amitabh Trehan, "Sublinear Bounds for Randomized Leader Election", in *International Conference on Distributed Computing and Networking (ICDCN)*, 2013. **Best paper award at ICDCN 2013** (C: 17, A: 26.8%)

C10 Atish Das Sarma, Ashwin Lall, Danupon Nanangkoi, and Amitabh Trehan, "Dense Subgraphs on Dynamic Networks", in *International Symposium on Distributed Computing (DISC)*, 2012. (C:5, A: 22.7%)

C11 Ashwin Lall, Danupon Nanangkoi, Atish Das Sarma, and Amitabh Trehan, "Brief Announcement: Distributed Algorithms for finding Dense Subgraphs", in *Principles of Distributed Computing (PODC)*, 2012. (C:1, A: 43%)

C12 Atish Das Sarma and Amitabh Trehan, "Edge-preserving self-healing: keeping network backbones densely connected", in *Workshop on Network Science for Communication Networks (NetSCiCom 2012)*, IEEE InfoComm, 2012 (C:14)

C13 Gopal Pandurangan and Amitabh Trehan, "Xheal: localized self-healing using expanders", in *Principles of Distributed Computing (PODC)*, 2011. (C: 39, A: 26.4%)

C14 Valerie King, Steven Lonargan, Jared Saia and Amitabh Trehan, "Load balanced Scalable Byzantine Agreement through Quorum Building, with Full Information", in *International Conference on Distributed Computing and Networking (ICDCN)*, 2011. (C: 40, A: 22.1%)

C15 Tom Hayes, Jared Saia and Amitabh Trehan, "The Forgiving Graph: A Self-Healing Distributed Data Structure", in *Principles of Distributed Computing (PODC)*, 2009. (C: 56, A: 24.5%)

C16 Tom Hayes, Navin Rustagi, Jared Saia and Amitabh Trehan, "The Forgiving Tree: A Self-Healing Distributed Data Structure", in *Principles of Distributed Computing (PODC)*, 2008. (C: 33, A: 45%)

C17 Jared Saia and Amitabh Trehan, "Picking up the Pieces: Self-Healing in Reconfigurable Networks", in *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, 2008. (C: 44, A: 25.6%)

C18 Wagish Shukla and Amitabh Trehan, "Typesetting in Devanagari, Persian and Arabic: A beginner's experience" *T_EX Users Group (TUG)*, 2002.

Dissertation and Thesis

D1 "Algorithms for Self-healing in Networks", Ph.D. Dissertation, University of New Mexico, 2010. (C:22)

D2 "A Proposal for a Phonetic Based Encoding for Indic Scripts", M.Tech. Thesis, Mathematics, Indian Institute of Technology, Delhi, India, 2002.

D3 "Neural Networks and Fuzzy Logic", M.C.A. Thesis, Indira Gandhi National Open University, Delhi, 1999.

Books and Book Chapters

B1 Amitabh Trehan, "Algorithms for self-healing in networks", ISBN 9781243761774, Proquest, Umi Dissertation Publishing, 2011 (C:22)

B2 Amitabh Trehan, "Self-healing systems and virtual structures", at *http://arxiv.org/abs/1202.2466* (C: 4)

B3 Amitabh Trehan, "Input/Output Technologies", chapter in course text book (Computer Science), Indira Gandhi National Open University, 2003.

Students Supervised

Daniel Playfair, Ph.D. (co-supervised with Dimitris Nikolopoulos), QUB, Oct 2013 - present

Shaul Cemel, M.S. (with Shay Kutten) Technion, Jan 2012 - Nov 2015

Project/Thesis Supervision: Seven B.Eng., Six MSc students, QUB, 2014-16

Vivek Goyal, Summer Intern (with Jared Saia), UNM, May- July, 2009

Departmental Service

Founder and Organiser: CDSSAS seminar series, 2016; *QUB-TCS-Algo-Maths* and *QUB-GameTheory-SocialComputing* seminar series.

School Champion/Partner for India (research and education), EEECS internationalisation committee: To lead initiatives on improving the School recruitment and internationalisation in India.

Examinations Officer CS/EEE (Support): To support examinations across CS and EEE departments.

Cluster Leader of Graduate Education: Leader for cluster (High Performance and Distributed Computing) initiatives on graduate education

Leader of cluster UG/PG curriculum reorganisation: QUB is changing to a major academic year restructuring for 2016-17. My role is to coordinate development of a cutting-edge curriculum.

Member, EEECS Investors in People (IiP) Business Improvement Team: EEECS is the first school in QUB to achieve the *Investors in People* status. Also, member of the *Knowledge Sharing subgroup*.

Member, EEECS Research Society: The Research Society leads many initiatives and events bringing researchers and students together.

Professional Service

Program Committee member, International Conference on Distributed Computing and Networking (ICDCN) 2017, ICDCN 2016, 14th International Symposium on Pervasive Systems, Algorithms, and Networks (I-SPAN) 2017, Workshop on Foundations of Mobile Computing (FOMC) 2013, 2014

Chief Organiser, 32nd British Colloquium of Theoretical Computer Science (BCTCS) 2016

Publicity Chair, Workshop on Foundations of Mobile Computing (FOMC) 2014

Organizing Committee member, TEX Users Group (TUG2002) Conference, 2002

Board member, TEX users group, India. (Head of Delhi chapter) (2002 -)

Chief organizer: "Caturanga 2002", Trivandrum, India, "Caturanga 2001", Pune, India. (International conferences on interdisciplinary research).

Fellow: UK Higher Education Academy, *Member*: ACM, IEEE, SIAM, BCS

I have reviewed manuscripts for the following conferences/journals: *Theoretical Computer Science(2016), Distributed Computing (2014, 2013), Journal of Self-Computing(2013), IEEE IPDPS (2017,2010),ICALP(2016), SODA(2016, 2012), IEEE ICDCN (2017,2016, 2011, 2009), SPAA (2015, 2011, 2010, 2009), FOMC(2014, 2013), SRDS (2013), STOC(2012), DISC (2011), OPODIS (2013, 2010), SAGT(2011), CCC (2010), IEEE Globecom (2009)*

Examiner/Course Writer: BCA/ADCA courses, Indira Gandhi National Open University, 2003

Invited Presentations (Besides Conference Presentations)

"COSHER: Compact Self-healing Algorithms", Computer Science Seminar, Loughborough University, March 2017.

"Compact Routing Messages in Self-Healing Trees", *Highlights of Algorithms (HALG 2016)*, Paris, June 2016, Indian Institute of Science Bangalore (IISc), Chennai Mathematical Institute (CMI), Indian Institute of Technology Madras (IITM), K R Mangalam University, Jan 2016; Computer Science, University of Liverpool, Nov 2015.

Resilient Low Memory Networks: Self-healing plus Compact Routing, **Keynote talk**, CONFLUENCE 2016, Amity University, Noida, India.

"Algorithms for Self-healing Networks: Forgiving Graph and Xheal",*Institute of Maths, UNAM, Mexico, Aug 2016, Haifa University CS Colloquim* June 2012, University of New Mexico CS Colloquim April 2012; Indraprastha Institute of Information Technology (IIITD), Indian Institute of Technology Ropar(IITRpr), Indian Institute of Technology Delhi (IITD), Chennai Mathematical Institute (CMI), Indian Institute of Technology Madras (IITM), National University of Singapore (NUS), March 2012; Ben Gurion University, Beer-Sheva, Israel, Jan. 2012; Technion, *Computer Science Theory Seminar*, Dec. 2011.

"Distributed Computing under the Forgiving Tree", QUB-TCS-Algo-Maths Seminar, Aug 2015.

"Composition Games for distributed systems: EU Grant games", March 2015; *QUMS Economics Seminar*, Queen's University Belfast, March 2014; *HPDC Seminar*, Queen's University Belfast, March 2014; *Computer Science Seminar*, University of Victoria, July 2013; *DANSS Seminar*, Computer Science, HUJI, May 2013; *Technion-Microsoft EC center*, Technion, May 2012; University of New Mexico CS Theory Group Seminar, April 2012; *Electronic Commerce Seminar*, Technion, faculty of IE & M, Jan. 2012.

"Elections 2013: Sublinear and Universal Leader Elections", *CE Club Seminar*, Technion, Jan 2014.

"Networks that fix themselves aka Self-healing networks", *HPDC Seminar*, Queen's University Belfast, Dec 2013; *Theory Seminar*, Miscrosoft Research, Mountain view, CA, July 2013; *DANSS Seminar*, Computer Science, HUJI, May 2013; *Foundations of Computer Science seminar*, Weizmann Institute of Science, March 2013; *Computer Science Seminar*, Royal Holloway College, University of London, March 2013; Tata Institute of Fundamental Research, Mumbai, Nov 2012; Tel Aviv University Algorithms seminar, Oct, 2012.

"Algorithms for self-healing in networks", University of Victoria, June 2010.

"The Forgiving Tree: towards self-healing networks", Universitá di Roma Sapienza, March 2009, University College, London, SSE Seminar, Dec 2008.

Press Coverage

"Researchers work towards self healing computer networks', in *UNM Today*, print ed., Aug 2008.

Other Activities

Radio show host, "The International Hour", Technion Radio, Oct 2011- Feb 2012

President, UNM Cricket Club: Got the University to build a cricket pitch and provide cricket facilities by engaging the university administration at the highest level.

President, India Students Association at UNM: Organized a performance by Indian rock band 'Indian Ocean' in three weeks from conception, fund raising to execution.

Interests in Sports (Cricket (league player), Tennis etc); Creative writing (published poetry), Photography and Music.