Professor Dave Cliff
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Summary

- My recent research has been focused on Ultra-Large-Scale Complex Software-Intensive Socio-Technical Systems in general, and Large Scale Complex IT Systems (LSCITS) in particular.
- Before I got involved in LSCITS research, I spent roughly 17 years doing research in complex adaptive systems of one type or another. I worked on modelling neuronal processing of visual information in airborne insects (hoverflies, actually); on using artificial evolution to generate designs for sensory-motor morphology and neuronal controllers for autonomous mobile robots (so-called "evolutionary robotics"); on competitive co-evolutionary dynamics in predator-prey "arms races"; on autonomous adaptive algorithmic trading strategies for double-acution markets; on automated crowd-responsive dance-music disk-jockeys and real-time music-production systems; and on automated design of market mechanisms.
- Futurology and horizon-scanning: I've done a fair amount of consulting work on this, primarily for the UK Government's *Foresight* unit in the Office of Science and Technology; also some work for the Department of Children Schools and Families (DCSF) via the *Beyond Current Horizons* programme that DCSF commissioned from Futurelab. Some outputs from those activities are listed under "Publications", below.
- Throughout my career I've done a fair amount of "public engagement" activities. In 1993 I was chosen to give the Isambard Kingdom Brunel Award Lecture at the annual summer meeting of the British Association for the Advancement of Science (now known as the British Science Association). After that, I was a "Schools' Science Lecturer" several times at the Royal Institution of Great Britain. I've been an invited speaker at the Cheltenham Science Festival three times, and I've done an awful lot of media interviews, both print and broadcast. Currently I am the only Computer Scientist employed by GSCE Science Live to talk to large audiences (several hundred at a time) of GCSE-level students about just how much fun science (and engineering) can be. I've done similar work for Maths Inspiration too. Trying to get schoolkids switched on to science and engineering is something that I really enjoy doing. In 2013 I co-wrote and presented a one-hour TV documentary "*The Joy of Logic"* which was made by Wingspan Productions for BBC, and was first broadcast in December 2013. The programme was nominated/shortlisted for several awards including a Grierson Award and continues to be shown occasionally by the BBC.

Biography

Prior to joining the University of Bristol in 2007, I'd held faculty posts at the University of Sussex School of Cognitive and Computing Sciences, at the MIT Artificial Intelligence Laboratory, and at the University of Southampton School of Electronics and Computer Science. I'd also spent roughly half my career working as a researcher in industry: initially for Hewlett-Packard Labs, where I ended up as a Department Scientist; and latterly for Deutsche Bank London, where I was a Director/Trader in their Foreign Exchange Complex Risk Group.

From October 2005 to April 2014 I was Director of the UK Research and Training Initiative in the Science and Engineering of Large-Scale Complex IT Systems (LSCITS). This was funded by GBP10M of UK public funds (from EPSRC), with significant support from partners in industry and the UK public sector.

Most of my personal research work in the ten years before I got involved in LSCITS was centered on adaptive automated trading systems for various types of markets, and on automated design of market mechanisms. I started doing this in 1995, for market-based control of ultra-large-scale data-centres. In 2001 a team at IBM showed my "ZIP" trading software beating human traders, which got the attention of various companies in the global financial markets.

Expertise

My primary area of expertise is computer systems for trading in financial markets. In 1996 I designed an automated trading system that is adaptive (learns from experience); in 2001 a team of researchers at IBM showed that my algorithm beats human traders. My research has concentrated on automated trading systems since 1996. More generally, I can comment and advise on issues artificial intelligence, cognitive science, ultra-large-scale socio-technical systems, complex systems, and complexity science.

I've recently served as lead expert witness for the claimants in a major civil case heard in the Chancery Division of the High Court at London; and as lead expert witness for the prosecution in a major criminal case heard at Southwark Crown Court in London.

- large-scale complex IT systems
- financial markets
- automated trading
- complex systems
- evolutionary systems
- cognitive systems
- artificial intelligence

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In 2013-14 I led the design and development of Bristol's University Research Institute in data science, the Jean Golding Institute. In 2015 I was appointed as Head of the School of Computer Science, Electrical and Electronic Engineering, and Engineering Maths (SCEEM); I stood down from this post to take on the role of Academic Director for the University's new Temple Quarter Enterprise Campus (TQEC), a GBP350M new-build project, scheduled to open in 2022. I was TQEC Academic Director for two years, for the phase or initiation and mobilisation; that role was dissolved as the project moved into its implementation and execution phase, and academic leadership passed to the University's newly-created role of Deputy Vice Chancellor for TQEC.

Teaching

Currently I teach on two masters-level units in the Department of Computer Science: each run for one 12-week semester and most year attract btwen 75-100 students.

- **Internet Economics and Financial Technology.** I have been Unit Director for this unit (previously known as *Algorithmic and Economic Aspects of the Internet*) on and off since 2007, and usually teach roughly 50% of it. To teach about automated trading in financial markets, we needed a simple stock exchange simulator for the students to play with, which led me to create *The Bristol Stock Exchange* which was released as open-source on GitHub in 2012.
- **Cloud Computing:** I first introduced cloud computing content to the UoB Computer Science curriculum when I joined the University in 2007. Since then the amount of cloud content grew, and in 2013 I designed and delivered this self-contained 10-credit-point masters unit; I have remained strongly involved in its design and delivery ever since, and remain the Unit Director (lecturer-in-charge).

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Memberships

Organisations

Other sites

- [Computerscience](#)

Research Groups

- [Intelligent Systems](#)
- [Collective Dynamics](#)

CDTs

- [IDC in Systems](#)
- [Bristol Centre for Complexity Sciences (BCCS)](#)

Recent publications

- Cliff, D, 2019, ['An Open-Source Limit-Order-Book Exchange for Teaching and Research'](#). in: Suresh Sundaram (eds) *2018 IEEE Symposium Series on Computational Intelligence (SSCI 2018): Proceedings of a meeting held 18-21 November 2018, Bangalore, India*. Institute of Electrical and Electronics Engineers (IEEE), pp. 1853-1860

- Calvez, Al & Cliff, D, 2019, ['Deep Learning can Replicate Adaptive Traders in a Limit-Order-Book Financial Market'](#). in: Suresh Sundaram (eds) *2018 IEEE Symposium Series on Computational Intelligence (SSCI 2018): Proceedings of a meeting held 18-21 November 2018, Bangalore, India*. Institute of Electrical and Electronics Engineers (IEEE), pp. 1876-1883

- Cliff, D, 2019, ['Exhaustive Testing of Trader-agents in Realistically Dynamic Continuous Double Auction Markets: AA Does Not Dominate'](#). in: Ana Rocha, Luc Steels, Jaap van den Herik (eds) *Proceedings of the 11th International Conference on Autonomous Agents and Artificial Intelligence (ICAART 2019)*. SciTePress, Prague, pp. 224-236

- Dassani, V, Bird, J & Cliff, D, 2019, ['Automated Composition of Picture-Synched Music Soundtracks for Movies'](#). in: *Proceedings of the 16th ACM SIGGRAPH European Conference on Visual Media Production*. Association for Computing Machinery (ACM)

- Cliff, D, 2019, ['Simulation-Based Evaluation of Automated Trading Strategies: a Manifesto for Modern Methods'](#). in: Michael Affenzeller, Agostino G Bruzzone, Francesco Longo, Guilherme Pereira (eds) *The 31st European Modeling & Simulation Symposium*. DIME University of Genoa

- Snashall, D & Cliff, D, 2019, ['Adaptive-Aggressive Traders Don't Dominate'](#). in: Jaap van Herik, Ana Paula Rocha, Luc Steels (eds) *Agents and Artificial Intelligence: Selected papers from ICAART2019*. Springer Berlin Heidelberg

- Church, G & Cliff, D, 2019, ['A Simulator for Studying Automated Block Trading on a Coupled Dark/Lit Financial Exchange with Reputation Tracking'](#). in: M Affenzeller, A Bruzzone, F Longo, G Pereira (eds) *Proceedings of the 31st European Modelling and Simulation Symposium (EMSS2019)*. DIME University of Genoa, Lisbon, Portugal, pp. 284-293

- Miles, B & Cliff, D, 2019, ['A Cloud-Native Globally Distributed Financial Exchange Simulator for Studying Real-World Trading-Latency Issues at Planetary Scale'](#). in: M Affenzeller, A Bruzzone, F Longo, G Pereira (eds) *Proceedings of the 31st European Modelling and Simulation Symposium*. DIME University of Genoa, Lisbon, Portugal, pp. 294-303

- Birbeck, E & Cliff, D, 2019, ['Using Stock Prices as Ground Truth in Sentiment Analysis to Generate Profitable Trading Signals'](#). in: Suresh Sundaram (eds) *2018 IEEE Symposium Series on Computational Intelligence (SSCI 2018): Proceedings of a meeting held 18-21 November 2018, Bangalore, India.*. Institute of Electrical and Electronics Engineers (IEEE), pp. 1868-1875

- Cartlidge, J & Cliff, D, 2018, ['Modelling complex financial markets using real-time human-agent trading experiments'](#). in: Shu-Heng Chen, Ying-Fang Kao, Ragupathy Venkatachalam, Ye-Rong Du (eds) *Complex Systems Modeling and Simulation in Economics and Finance*. Springer International Publishing AG, pp. 35-69

[View complete publications list](#) in the University of Bristol publications system

Courses

Professor Cliff currently teaches 2 courses: