MARK TERENCE BURTON CARROLL, B.A. (HONS), M.A. (CANTAB), MBCS, CITP *mtbc@bcs.org*

For many years, I have worked as a software engineer specializing in difficult problems in technical fields. I research the application domain and requirements then use my broad experience to devise, implement, document, and test a sound, reliable software solution, independently or within a team. I hold Professional Membership of the British Computer Society through which I qualified as a Chartered Information Technology Professional in 2007.

Web Application Backend Development using Rust, 7/2022 to present

Principal Engineer, *Blockchain Technology Partners*, Scotland

Added and documented features, and fixed bugs, in a web application for asset provenance in various domains. Developed in Rust using async-graphql, diesel, insta, poem, serde, tokio, with JSON-LD, GraphQL, PostgreSQL, blockchain. Created and maintained Docker files. Deployed application with Docker Compose, Helm, Kind, and Amazon EKS, reviewed changes to Helm charts. Maintained GitHub workflows and Jenkins pipelines. Used daily scrum to review progress on JIRA tickets. Met daily with CPTO, mentored junior staff, provided information and support to internal colleagues and overseas customers. Created UML class, sequence, activity diagrams. Worked with external collaborators and improved their technical documentation.

Development and Evaluation of Scientific Software, 11/2020 to 6/2022

Research Software Engineer, *Oak Ridge National Laboratory*, Tennessee

Worked on Java-based web portal employing Spring Boot, Vaadin, and Selenium. Reviewed and costed stories, and used daily scrum to review progress on GitHub issues. Implemented ray tracing using Python with numba and numpy. Evaluated debuggers and CPU/GPU profilers for concurrent C/C++ applications on HPC systems. Collaborated with internal groups and external businesses. Authored and presented both conference posters and technical talks, using Beamer and TikZ. Similarly, used LaTeX in contributing to papers, proposals, and technical reports.

Image Management Application Development, 10/2012 to 10/2020

Software Developer, *School of Life Sciences, University of Dundee*, Scotland

Development of server-client system for secure, collaborative management of images and metadata, written in Python and Java with Hibernate and Spring. Used pytest, Robot Framework, and TestNG for testing, Sphinx for documentation, XML and PostgreSQL to store metadata. Presented work at meetings and conferences, ran hybrid meetings, trained colleagues, provided end-user support. Frequently assisted colleagues with Git, HQL and SQL. Tasks included:

- devising means to execute data updates modeled as state transitions in a directed graph
- creating a command-line client for resumable download of image pixel data and metadata
- investigating and fixing several security vulnerabilities, and enhancing access control system
- performance measurement and improvement using profiling, caches and parallelization
- management of Linux systems on OpenStack and VMware, directly and via Ansible
- development of database upgrade scripts and tests using SQL and PL/pgSQL.

Web Application Development using J2EE, 6/2010 to 8/2012

Software Engineer, *Cambridge Research Laboratory, Vecna Medical*, Massachusetts

Full-stack software design and development using Oracle, PostgreSQL, PL/(pg)SQL, Java, JDBC, Hibernate, Lucene, Jasypt, Joda, Spring, Struts, JSTL, JavaScript (Prototype, jQuery), SiteMesh, Tiles. Used Tomcat for servlet container, Git and Subversion for version control, Maven for build management. Documentation produced with LaTeX and TikZ. Tasks included:

- internationalization of hospital infection surveillance software: language, time zone, etc.
- Payment Card Industry compliance: server-side interface and documentation
- construction of an Ubuntu-based PXE boot image for self-service touchscreen kiosks
- fixing bugs in various web applications from SQL all the way up to JavaScript.

Led R&D on Department of Defense Software Projects, 1/2000 to 3/2010

Software Engineer, System Administrator, *Aetion Technologies*, Ohio

Applied knowledge-based reasoning to solve Defense problems for the Federal Government. Wrote most of the funded proposals, typically acted as project lead, hired and managed other engineers, wrote technical reports and papers, assisted with business operations. Met with customers, studied background materials, wrote parsers to ingest data. Devised approaches centred on automated and assisted inference, modeling and planning. Set up and managed Linux servers and desktop machines. Mostly developed in Haskell with some Java and Perl 5.

Application domains included source reliability, network disruption, investment portfolios, geocoding, molecular docking, drug screening, manufacturability, aircraft maintenance, tactical enemy intent inference, sonar multi-pathing, multi-modality sensor fusion, abductive inference.

Scientific Programming for Research Groups, 7/1996 to 12/1999

Projects based at *The Ohio State University* and the *European Bioinformatics Institute*:

Used Common Lisp to represent and query genomic data in knowledge bases. Created frame representation for genes, proteins, complexes, biological function. Used Perl 5 for taxonomy inference from co-occurrence of terms in database records. Used Modula-3 and C to implement robust, distributed simulation framework for engineering design optimization, which included a simulator for composable models, featuring solving of conditional equations. Gained SQL experience with Sybase. Maintained HP-UX and IRIX workstations, and supported their users.

Education

1996 – U. S. Graduate Record Examination: scores in the general test, each out of 800:
Verbal: **610** (top 15%); Quantitative: **800** (top 2%); Analytical: **800** (top 1%)

1996 – B.A. (Hons) 2.ii, Computer Science, King's College, University of Cambridge

1993 – A-Level: Pure Mathematics (A), Applied Mathematics (A), Physics (A), Chemistry (B)