Charlie A. Johnson

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PROFILE

MSc Computer Science student (University of Birmingham) with a background in formal modelling of complex systems under uncertainty. Research interests span temporal coherence in distributed systems, coordination feasibility under latency constraints, gradient encoding in supervisory interfaces, and geometric/topological data analysis. Comfortable working with formal definitions, threshold conditions, partial order relations, and algorithmic implementations.

CURRENT RESEARCH THREADS

Work is organised across three connected threads:

Temporal Systems

Interval-based representations of event time under clock drift and intermittency; safe partial ordering; auditability under timestamp collapse. Applied to long-horizon, unmanned, and polar sensing deployments.

Coordination & Feasibility

Set-theoretic modelling of feasible action sets (ECB framework); latency threshold exclusion; non-compensability proofs; applied to remote work policy and ecosystem persistence.

Human Oversight & Gradient Encoding

Continuous bounded state encoding in supervisory systems (GEHOS); phase legibility as an ambient coordination signal; boundary condition taxonomy and pre-registered falsification criteria across five empirical pillars.

RESEARCH INTERESTS

Topological and geometric data analysis; manifold-based representations; probabilistic inference; information-theoretic modelling; temporal uncertainty propagation; partial orders in distributed systems; human oversight system design; gradient encoding in supervisory interfaces; coordination feasibility under latency constraints; modular construction systems.

EDUCATION

University of Birmingham 2025 – Present

MSc Computer Science (in progress) · United Kingdom

- Focus: software architecture, data systems, AI/ML foundations (taught MSc).
- Emphasis: analytical reasoning, modelling under uncertainty, and written technical communication.

EXPERIENCE

Independent Researcher 2025 – Present

Formal modelling of temporal and coordination systems · United Kingdom

- Developed interval-based representations of event time under clock drift and intermittency; modelled temporal uncertainty as bounded intervals with preserved provenance.
- Defined safe partial ordering conditions for events ($A^+ < B^-$) to prevent false causal inference under timestamp collapse.

- Formalised Effective Capital Blueprint (ECB) as a set-valued mapping ECB(C, L, θ) and derived threshold exclusion conditions (non-compensability under latency).
- Derived latency elasticity classification (Type I–III) and specified an implementable procedure for empirical threshold detection and action feasibility classification.
- Designed multi-pillar experimental research programme (GEHOS) with pre-registered falsification criteria, boundary condition taxonomy, and power analyses across five empirical studies.
- Developed phase legibility framework linking gradient-encoded temporal signals to reduced coordination friction; specified minimal falsifiable experimental design.

Aurelle
2021 – Present

Systems Modelling Lead — Scalable Infrastructure · United States (On-site)

- Modelled decision flows and constraint propagation in high-variance operational systems spanning finance, supply chain, and cross-functional execution.
- Designed measurement frameworks for leading-indicator detection under incomplete information; reduced ambiguity in operational inference.
- Implemented structured data models and automation pipelines to formalise system behaviour and preserve system invariants under change.

KPMG
2018 – 2020

Systems Engineering Associate — Regulated Financial Systems · United States (On-site)

- Translated regulatory requirements into system/data changes across core banking environments; supported audits, dependency mapping, and change-control planning.
- Contributed to modernisation recommendations with production safety constraints and staged rollout planning.

Siemens
2016 – 2018

Systems Engineering Intern — Internal Tools & Automation · United States (On-site)

- Built internal tools spanning product rules, automation, and sales-support workflows; reduced configuration ambiguity via standardised nomenclature and structured data models.
- Developed systems-thinking foundation: how design decisions propagate across hardware, software, and commercial layers.

SELECTED TECHNICAL PAPERS

Temporal Coherence in Long-Horizon Sensor Systems · 2026

Interval event-time representation and uncertainty propagation under intermittency

- Formalised event time as a bounded interval $t \in [t - \varepsilon, t + \varepsilon]$ with explicit provenance; separated event/record/ingest time to preserve auditability.
- Derived safe partial-ordering rule for temporal precedence ($A^+ < B^-$) and specified invariants for non-destructive correction.

Temporal Failure Modes in Arctic Sensing Systems · 2026

Companion note identifying polar deployments as the canonical stress-test for timestamp collapse

- Explains why the Arctic exposes temporal coherence failure earliest by removing the assumptions (frequent sync, human continuity, short feedback loops) that normally conceal it.
- Links silent timestamp collapse to downstream loss of auditability, causal reasoning, and decision defensibility as autonomy scales.

Latency and the Effective Capital Blueprint (ECB) · 2026

Set-theoretic modelling of feasibility under coordination delay

- Defined $ECB(C, L, \theta) \subseteq X$ as a set-valued feasibility mapping; proved capital saturation and latency-threshold exclusion for coordination-critical actions.
- Introduced latency elasticity $\hat{\varepsilon}_x$ and an implementable algorithm for Type I–III action classification with complexity notes.

The Remote Work Paradox · 2026

Applied ECB framework: Type I/II/III work taxonomy and non-compensability under remote latency

- Derived a practical taxonomy of work types based on iteration intensity and feedback-loop tightness; specified conditions under which capital cannot compensate for coordination latency.
- Identified predictable failure modes in blanket remote-first and naive hybrid policies; provided actionable classification procedure for organisations.

Phase Legibility as Infrastructure · 2026

Continuous gradient phase encoding and bounded testable hypotheses for coordination

- Defined phase $\varphi = (t - t_0)/(T - t_0)$ and proposed a bounded mediation hypothesis ($L \rightarrow E \rightarrow C$) linking gradient encoding to reduced coordination friction.
- Specified falsifiable experimental predictions and minimal test design for discrete-state vs gradient displays in shared environments.

Gradient Encoding in Human Oversight Systems (GEHOS v3) · 2026

Research umbrella: continuous bounded state encoding across supervisory, trust calibration, and coherence pillars

- Formalised a four-dimensional construct decomposition (signal topology, perceptual channel, temporal dynamics, information structure) with explicit boundary conditions.
- Designed five-pillar experimental programme with pre-registered falsification criteria, power analyses, and competing-hypothesis tests; total estimated timeline 24–30 months.

MSS-RSC: Modular Stone Standard for Robotic Construction · 2026

Open mechanical interface protocol for compression-dominant modular stone assemblies

- Defined four interface classes (kinematic seating, shear-transfer keys, dowel indexing, controlled bedding) with dimensional tolerances, performance equations, and verification procedures.
- Specified digital-to-physical workflow with Monte Carlo tolerance propagation; preliminary FEA validation demonstrates stress uniformity within 8% and shear capacity at 1.52× design load.

TECHNICAL & MATHEMATICAL SKILLS

Mathematical

Set-valued mappings; threshold analysis; partial orders; interval arithmetic; probabilistic reasoning; elasticity estimation; formal invariant specification; control-theoretic delay constraints.

Programming

Python (NumPy, SciPy, Pandas); algorithmic implementation; statistical modelling; data pipelines; structured data modelling.

Conceptual

Modelling under uncertainty; feasibility-set analysis; system-level invariants; high-dimensional constraint reasoning; experimental design and pre-registration.

ADDITIONAL INFORMATION

Languages: English (native)