Louis Forster

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EDUCATION

MEng Computer Science with Innovation from University of Bristol 2022 - 2026

- First Class (Current Avg. 81%). Modules: Data Science (92%), Machine Learning (87%). Linear Algebra (82%), Computer Vision (78%).
- Academic Expertise (Applied Theory):
  - Computer Vision: Implemented multi-view 3D reconstruction via epipolar geometry. Engineered custom detection pipelines with a hand-written 3D Hough accumulator and NMS in Python using NumPy.
  - Implemented HMM-based state inference and Bayesian regression with posterior uncertainty estimation (PyMC).

Balcarras Academy - A Levels 2020 - 2022

- 4 A*s: CS, Maths, Physics, EPQ. Awards: UKMT Silver (x5), Grey Kangaroo Qualifier.

WORK EXPERIENCE

Visual Computing Research Intern - Bristol Vision Institute [Repo] Jun - Jul 2025

- Fine-tuned optical flow models (RAFT, DPFlow) on Sintel under synthetic noise augmentation using Python, PyTorch, and the university HPC SLURM-scheduled A100s.
- Adapted the hybrid CNN-RNN deep architecture by re-engineering the recurrent feedback loop to support bidirectional warping, incorporating forward-backward flow consistency checks and adaptive occlusion masking.
- Resolved critical tensor-shape mismatches in PTLFlow by intercepting ConvGRU passes required by the new tensor layout introduced by bidirectional warping.
- Stabilised the self-supervised training pipeline, achieving 29.22 dB PSNR (+0.13), 0.863 SSIM (+0.010), and 0.334 LPIPS (-9.2%) on BVI-RLV, **surpassing prior state-of-the-art.**

Teaching Assistant - University of Bristol Sep 2023 - Apr 2025

- Teaching Assistant for up to 200 undergraduates across Linear Algebra, C, Discrete Mathematics, and Data Science.

Software Engineer Intern - Scribblepad Press Jul - Sep 2024

- Managed web deployment and site optimisation. Increased organic traffic by 119%.

PROJECTS

Treyspace (GraphRAG Whiteboard) [Repo] treyspace.app

- Architected a GraphRAG system mapping spatial whiteboard elements to connected graph nodes, enabling LLMs to retrieve context via graph traversals. Deployed on GCP using Docker, supporting 27 beta users with 5,000+ AI interactions and 13M tokens processed in production.
- Engineered a collaborative Node.js backend with optimistic concurrency control using Redis locks and a custom version-vector scheme for state reconciliation.
- Built an MCP-based TypeScript tool-execution layer enabling AI agents to query a graph–vector database with connection pooling.
- Engineered a low-level Node.js SSE proxy with explicit buffer flushing to minimise time-to-first-token.

AI Research Workflow Tool [Repo]

- Built a full-stack research tool in TypeScript React that compiles natural language queries into executable agentic workflows (Semantic Scholar search, claim extraction, contradiction checking) using React Flow for finding accurate research on a topic. LLM generates multi-step pipelines; backend orchestrates tool execution with branching.

NanoGPT Implementation [Repo]

- Trained a 50M-parameter transformer language model on A100 compute using PyTorch. Performed supervised fine-tuning on the UK Hansard corpus to adapt the model for parliamentary-style text generation.

TECHNICAL SKILLS

Languages	Python (PyTorch), C, Rust, TypeScript (React), NodeJS, SQL, Triton
ML / Vision	Transformers, Neural Networks, Optical Flow, OpenCV, Bayesian Inference (PyMC), HMMs
Infrastructure	SLURM (HPC), Docker, GCP/Azure, Git, GitHub Actions, Redis, PostgreSQL, Linux