YEAR 3 MASTER'S STUDENT AT WARWICK UNIVERSITY, MATHEMATICS & PHYSICS (23-27)

ALFIE KUNZ

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EDUCATION

2023 – 2027 **UNIVERSITY OF WARWICK:** Full-Time Student of Mathematics & Physics (MMathPhys)

- Overall Year 1 Grade of 88.0% ('Top 5' in the Cohort). Overall Year 2 Grade of 85.4% (final placement pending).
- Years 1-2 Module breadth: Mathematical Analysis, Applied Modelling and Algebra, Mathematics of Asymptotics, Physics of Quantum Mechanics, Applied Mathematics, Fluids and Electrodynamics, Computational Modelling, Programming, and Algorithms.
- 3rd Year Specialism through modules such as Computational Modelling, Mathematical Modelling of PDEs, Fluid Dynamics, Neural Computing.

2016 – 2023 **BECKFOOT SCHOOL:** A-Level & GCSE Student

- A-Level Grades: A*A*A*A*A for Mathematics, Further Mathematics, Physics, Computer Science, EPQ (Astrophysics-based: "How Does a Neutron Star Remain a Stable Entity?"). #1 in Cohort. GCSE Grades: Ten Grade 9s, as well as a Distinction in Music BTEC.
- Highlights & Achievements: Founder & Treasurer of the School Chess Club, featured Alumni for Open Days & Showcases,

PROFILE

Proactive computational researcher, ranked in the 'Top 5' of my university cohort, specialising in fluid dynamics, numerical simulations, and emergent behaviours in biophysics. Proven success in translating cutting-edge mathematical theory into commercial-grade, high-performance software. Inventive science communicator, puzzle designer, and believer in the idea that the most complex behaviours stem from elegantly simple rules.

KEY SKILLS

- Programming: C#, Python, VB.NET, HLSL.
- Tools & Frameworks: Unity Engine, WinForms, Git, LaTeX, Tikz, Visual Studio.
- Core Competencies: High Performance Computing, (GPU) Agent-based Modelling Mathematical Modelling, Machine Learning (NNs), Fluid Dynamics, Technical Writing.

OTHER AWARDS

- 4-time Distinction & Gold Award Achiever in 'Bebras' Computing Challenge (top 10% nationally); 2-time Distinction holder in 'TCS Oxford Computing Challenge'.
- Two-time Winner of 'Beckfoot Young Musician of the Year' and performer at weddings; 16 years of self-taught piano.

PROJECTS

2025 – 2026 **APIC Computational Fluid Dynamics (CFD) Research Project & Simulation** (C#, HLSL, Python, Unity)
University of Warwick (Associated with Prof Radu Cimpeanu, under the MA369 Essay Module)

- Self-directed original CFD research, applying cutting-edge technologies in novel scenarios to investigate high-performance, momentum-conserving vortices. Identified a novel Reynolds Number value of 5420 – justifies the report as a worthwhile contribution to the industry.
- Independent derivation and implementation of a real-time Eulerian-Lagrangian APIC system (C#, Unity), using techniques such as Conjugate Gradient Method with MICT-0 Preconditioning, and GPU parallelism. Optimised rendering via Instanced Procedural Drawing (HLSL).
- Automated post-processing, data analysis, and visualisation pipelines in Python.
- Authored a rigorous, well-referenced technical essay on my contributions to the field, using LaTeX and Tikz figures. Demonstrated strong scientific communication by presenting my findings to two specialist Warwick professors (with no prior exposure to the implementation).

2022 – Now **Chess Artificial Intelligence & Interface** (VB.NET, WinForms)
Beckfoot School A-Level Project (+ Self-Motivated Continuation)

- Architected a commercial-quality Chess AI project, which boasts an 'International Master' ELO of ~2850 (as of v10.0). Designed a sophisticated chess-playing interface to support the AI (for example, through a hand-crafted opening book from millions of games) and user interactions.
- Robustly engineered and optimised a custom NegaMax heuristic AI algorithm, using techniques such as Alpha-Beta Pruning, Zobrist Hashing, Iterative Deepening, and Dynamic Aspiration Windows.
- Evaluated against other variations & models (by integrating models into a sophisticated, custom-made sui-style benchmarking system).
- Awarded 100% on the initial A-Level CS NEA; recognised by the project supervisor as the 'best he had seen' in his years of teaching.

2023 – 2024 **Machine Learning & Biophysical Modelling Experiments** (C#, HLSL, VB.NET)
Independent Research Projects

- **Emergence from Evolving Slime Trails**: Conducted biophysical research on agent-based transport networks (parallelised on the GPU as a compute shader), and their physical evolution into emergent ecosystems. Self-taught C# and HLSL, under the Unity Game Engine.
- **Doodle & Digit Recognising Neural Network (NN)**: Designed a NN algorithm to recognise hand-drawn digits / doodles (achieving ~98% on the MNIST dataset, within 2 minutes of training), employing high-level ML concepts such as back propagation, regularisation, and overfitting. Recent exploration of Graph-NNs and Physics-Informed-NNs to implement into my recent CFD project (ie: for weather monitoring).

EXPERIENCE & VOLUNTARY WORK

2021 – 2022 – 2025 **Teaching Assistant & GCSE Tutor:** Beckfoot School

- Mentored lower ability Year 11 students in mathematics & science, involving one-on-one interpersonal support with strong client communication, and the development of personalised revision plans, to tackle 'maths anxiety' and providing inspirational 'lightbulb' moments.
- Shadowed staff, and worked with diverse students, to discern the strengths of approachability and patience in tackling knowledge gaps.
- Designed and independently delivered an A-level maths lesson on series convergence (extending the spec to introduce Ramanujan summation and Zeno paradoxes) – achieving strong student engagement, and reinforcing my ideals of inspiration via creative teaching.
- Reflected heavily on my own performance by proactively seeking and implementing feedback from experienced staff.

2024 – 2025 **Physics Student Ambassador:** University of Warwick

- Led and assisted Live Chat events, Q&A panels, and Department & Campus Tours, for prospective students. Rapport-building and accommodation of different perspectives (developed through training workshops) to provide an exciting, interactive insight into university life.

2023 – 2024

Retail Sales Associate: Whittakers Schoolwear, Shipley

- Rapidly adapted to a high-intensity retail environment during peak summer season, whilst maintaining professionalism and composure. Expanded responsibilities to encompass till operations, database operations, online order management, and onboarding of new employees.

2021 – 2023

Chess Club Founder, Leader, Treasurer: Beckfoot School

- Founded (by showing strong initiative and handling school resources) and effectively scaled a school chess club to a weekly crowd of 70+ young people. Involved the hiring of volunteers, organising class teaching and individual mentorship.
- Established a tournament structure to enable students to represent their school in regional tournaments, demonstrating a concrete legacy.