Max Nicosia, PhD

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maxnicosia DOB: 30 May 1986 British (with 5-year Eng. JP Visa)

PhD graduate located in Japan with over 10 years of hands-on experience in software and hardware development, system design, evaluation and integration with commercial research experience. Founder of a company that worked with the UK Ministry of Defence to prototype interfaces and which is still active in the development of passion projects.

Holder of a 5-year visa currently looking to further his development career in Japan in the long term.

SKILLS

Languages / Libraries / Paradigms / Software

• C/C++ • C# • Python • Java • Android / Gradle • iOS XCode • R • TypeScript • JavaScript • Ruby • React • CSS • MySQL/SQL • AR/VR • TCP/UDP/IP • WebSockets • AWS • Bash • PowerShell • Linux • GitHub • Unreal • Unity • Boost • psutil • scikit-learn • PyTorch • scipy • numpy • d3.js • LaTeX

Development and Programming Skills

• Agile development • Scrum Development • Test-driven development • Designing and building custom APIs to expose functionality for information feeds and/or hardware control • Development of custom 2D/3D adaptive interfaces • Custom 2D/3D interactive visualisations development for real-time live object tracking and/or data stream monitoring of stats to display visualisations using d3.js in TypeScript with React • Rapid prototyping and integration of proprietary interfaces / systems for demos • Middleware design and implementation for multi-platform integration • Multithreading / lockless coding / synchronisation / memory barriers • Memory management for restrictive hardware and/or operations • Interfacing with hardware drivers, e.g. sensors • Sensor fusion and machine learning model building • MapReduce implementation and integration (Hadoop) • Design and implementation of custom network protocols at kernel level • TCP / UPD / WebSockets • Implementation of custom network paradigms, e.g. data-centric networks, publish-subscribe and distributed networks

Unity / Unreal

• Use of assets such as Mixamo characters • Importing/modifying and blending character animations • Textures • Lighting effects / filters • Some shader experience • LOD use and configuration • Dynamic asset loading • Spline implementation and collision avoidance for custom pathfinding, e.g. vehicles and pedestrians • Behaviour trees and blackboards for characters • Custom object serialisation for loading and saving, e.g. data-structure marshalling • Blueprint design

Analytical / Research

• Statistical testing • Statistical model fitting • Machine learning models • Participant and participant-free design and execution • Big data management and analysis • Scientific data visualisation / presentation

Project Management

• Meeting with all stakeholders • Requirement elicitation • Coordination of priorities and milestone allocation • Live demos and presentations • Official reporting

DEVELOPMENT PROJECTS

Mar 23 -

Learning Optimiser Mobile Application – Passion Project (Part-time)

Main Developer - (Cambridge Intelligent Systems UK Ltd)

• Developing a prototype of an iOS mobile app in Unreal that uses machine learning to optimise learning outcomes based on the user's learning performance in a given problem space.
• Used XCode and Apple App Store to test deployments for testing purposes and publishing.

Subt. Aug 22, Grad. Oct 23

PhD Thesis Title: Design, Implementation and Evaluation of an Attention Management System – University of Cambridge, UK

Main Research: PhD Research

• **Designed** a middleware system architecture with multiple components capable of interoperating with various sensors across multiple networked computers to detect operator's attentional states within applications, match it to application's data changes and deliver instructions to applications based on evaluation of live operator and task performance.
• Used a completely **agile development philosophy** as requirements were discovered through direct experimentation and iteration. All component and test development was Git source controlled.
• **Implemented** a sensor networking component built in C++ directly interacting with both structured lighting sensors and eye-tracker drivers in C/C++.
• **Implemented** a live monitoring component developed in Python with TCP and WebSockets to directly interact with sensor information and Web applications built in TypeScript.

• **Implemented** a the live performance visualiser tool in TypeScript/React with d3.js to showcase live operator performance and retrospectively.
• **Implemented** a simulator in Python that could re-run captured operator actions to model alternative operational outcomes under different visualisation policies. This could plug into the performance visualiser.
• **Evaluated** system through experiments involving live testing with whole system integration and simulation using collected participant task performance data. Results published in peer-reviewed papers.

ADDITIONAL RESEARCH / SOFTWARE DEVELOPMENT / MAINTENANCE TASKS

• Participated in the research group's **Scrum** group for developing tools/libraries that were used across the entire research group. This included live graphing data through d3.js, Unity interfaces for prototyping, networking libraries for logging results, sensor polling and ML model building.
• **Maintained** documentation to shared resources and libraries for the research group that I owned.
• **Deployed** and **maintained** the VMs and Docker containers used in the research group's local servers for running experiments and number crunching.
• **Developed** and **maintained** Python scripts using *psutil* to monitor the usage of the research group's local servers to ensure up-time and catch any user misuse/abuse.
• Used AWS services to test and build ML models from sensor data collected for various research projects. This allowed maximising resource utilisation so only specific parameters in the search grid would get scheduled for building models based on previous results.
• **Developed** an application that exposed through an API the head pose of an operator in a 5m $\times$ 5m room fitted with 8 Microsoft Kinect 2.0 through a purposely built ML classifier model. Work published in **HCCS 2018**.
• **Developed** Android apps to collect data on various Fittz Law tasks that were used by the research group in some of their publications.

MAR 20 – FEB 21

ATTENTION-AWARE SYSTEM FOR MIXED AND AUGMENTED REALITY CONTROLS IN ARMOURED VEHICLES – PROJ. REF: ACC2006330 – CAMBRIDGE, UK

TECHNICAL LEAD / MAIN DEVELOPER / PROJECT COORDINATOR

• **Objective**: Distil requirements and deliver a simulation VR environment to test/train operator threat detection capabilities under various attention-aware visualisations.
• Simulation environment features developed: multiple stages with different NPCs with animations, spline paths and navigation paths for journeys and NPCs, threat visualisations using standard NATO nomenclature in 3D world and minimap, 360-world view, UI interactive interface for tagging threats and menus, logging of operator performance and three dynamic attention-aware visualisations as follows: 1) Tracking of attended and non-attended areas in 360-world map and minimap, 2) Animated pointers to areas not attended during specified intervals. 3) Out-of-view pointers to threats with extra moving animations if not attended to, and 4) Animated motions to NATO threat nomenclature symbols under certain configurations/conditions.
• Git source-controlled repositories for auditing.
• Held regular meetings with DSTL/UK MoD members to gather requirements and constructed software specifications, attended briefings and managed all project milestones.

DEC 18 – OCT 19

MIXED REALITY CONTROLS FOR ARMOURED VEHICLES – PROJ. REF: ACC2000981 – CAMBS, UK

TECHNICAL LEAD / MAIN DEVELOPER / PROJECT COORDINATOR

• **Objective**: Developed a UI within VR for the Oculus Rift that emulated an AR deployment inside a tank. The UI followed the Generic Vehicle Architecture (GVA) and used the UltraLeap sensor for input.
• Simulation environment features developed: Multi-GVA interface simulating mixed-reality with pass-through for arms and hands, in- and out-of-vehicle spherical 360 simulated cameras that could be rotated/directly manipulated through touching gestures (scrolling) and various NATO threat visualisation markers.
• Git source-controlled repositories for auditing.
• Held regular meetings with DSTL/UK MoD members to gather requirements and constructed software specifications, attended briefings and managed all project milestones.

MAY 17 – DEC 17

DISTRIBUTED MULTI-DISPLAY SYSTEM AND MIDDLEWARE FOR CLOSE PROXIMITY OPERATOR GAZE AND ATTENTION TRACKING – PROJ. REF: ACC101965 – CAMBRIDGE, UK

TECHNICAL LEAD / MAIN DEVELOPER / PROJECT COORDINATOR

• **Objective:** Developed a middleware that demoed capabilities of tracking and showing attentional states in multi-display Web Applications interacting with the middleware's API.
• Built a TypeScript React application with d3.js to visualise live operator attentional state while monitoring data.
• Built visualisations within application to show the history of point movements, attentional state (seen/unseen) and relative age from last seen.
• Built an API (TypeScript) that Web Applications could use to register and receive attention events through callbacks and hooks.
• Git source-controlled repositories for auditing.

AUG 10 – SEP 10

OPENMATH BINARY ENCODING PACKAGE – GAP SOFTWARE – ST ANDREWS, UK

OPEN SOURCE DEVELOPER INTERN

• Developed functionality of the OpenMath binary encoding package for the GAP mathematical software (https://www.gap-system.org/Packages/openmath.html).

WORK EXPERIENCE / ENTREPRENEURSHIP

Nov 22 – **Tokyo Academics** – Tokyo, Japan
Head of Research
• Supervise CS projects, for prototyping and machine learning in various languages.
• Manage a team of ≈15 part-time researchers who supervise young students research projects.
• Manage division, including sales and marketing strategy.
• Current YTD sales performance is at 125%, exceeding the 50% target increase.

Nov 17 – **Cambridge Intelligent Systems UK Ltd** – Cambridge, UK
Technical Lead / Main Developer / Project Coordinator (Exec. Director & Co-founder)
• Technical and lead developer for all projects (see projects for details).
• Responsible for all director duties including company tax compliance and payroll.
• Writing research proposals and bidding for contracts.
• Responsible for project management, stakeholder liaison and deliverables.

Oct 19 – Jul 20 **University of Cambridge – Department of Engineering** – Cambridge, UK
Research Associate
• Developed support software for the research groups in C++/TypeScript and ran research experiments.

EDUCATION

Oct 23 **University of Cambridge** – **Fully Funded by DSTL (UK MoD)** – Cambridge, UK
PhD in Engineering/CS – Supervised by Prof Per Ola Kristensson
• **Thesis title:** Design, Implementation and Evaluation of an Attention Management System
• Detailed information in Projects.

Jul 13 **University of Cambridge** – Cambridge, UK
MPhil in Advanced Computer Science
• **Thesis title**: A privacy-preserving advertisement delivery system
• Developed a Python server ad delivery system that provided advertisements to a purposely built Chrome extension based on a publish-subscribe architecture that could not be used to identify individual users and/or their data preferences. All connectivity done over RSA via WebSockets.
• **Courses:** Security, Data-centric Networks, Network Theory, Dist. Networks and Mobile App Development.

Jun 12 **University of St Andrews** – St Andrews, UK
BSc in Computer Science
•**Thesis title:** A reduced implementation of INLPv4 (Identifier-Locator Network Protocol) for Linux.
• Implemented the INLPv4 protocol described in RFC 6740 in C as a kernel-level module.

PUBLICATIONS

• **[IN PRINT]** Nicosia, M. and Kristensson, P.O. 2024. Risk Management in Human-in-the-Loop AI-Assisted Attention Aware Systems. TBC (Eds.) Putting AI in the Critical Loop. Cham: Elsevier
• Nicosia, M. and Kristensson, P.O. 2021. Design principles for AI-assisted attention aware systems in human-in-the-loop safety critical applications. In Lawless, W.F., Llinas, J., Sofge, D.A. and Mittu, R. (Eds.), Engineering Artificially Intelligent Systems: A Systems Engineering Approach to Realizing Synergistic Capabilities. Cham: Springer Nature
• Nicosia, M. and Kristensson, P.O. 2020. A conceptual design of an inattention management middleware with adaptive target saliency. In Proceedings of the 41st IEEE Aerospace Conference. IEEE Press.
• Nicosia, M. and Kristensson, P.O. 2018. Inattention management middleware for human-in-the-loop multi-display applications. In Proceedings of the IEEE Workshop on Human-Centered Computational Sensing (HCCS 2018). IEEE Press: 71-76
• Nicosia, M., Oulasvirta, A. and Kristensson, P.O. 2014. Modeling the perception of user performance. In Proceedings of the 32nd ACM Conference on Human Factors in Computing Systems (CHI 2014). ACM Press: 1747-1756

LANGUAGES

Spanish:	Conversational
German:	Conversational

REFERENCES

Available upon request