Job Description

Job title	Research Associate (MyWorld)
Department/School	Computer Science
Job family	Education and Research
Grade	7
Reporting to	Prof Neill Campbell
Responsible for	Some co-supervision of doctoral, postgraduate or undergraduate students may be required.
Location	University of Bath premises (Claverton Down Campus and University of Bristol Sheds Studio)

Background and context

As part of the £35m MyWorld programme, we are searching for two motivated individuals to create the next generation of content capture and creation tools for the creative industries across film, TV, games and immersive Virtual and Augmented/Mixed Reality. This work will make use of the latest advances in Machine Learning technology, e.g. generative AI, trained on datasets of world-leading quality obtained via our unique CAMERA Studio facilities.

Work will be interdisciplinary and collaborative and will span research across computer vision, computer graphics, animation, machine learning and large language models. Candidates can come from a background in any but should be motivated to expand and learn techniques and theory from across the disciplines; all areas will build on firm foundations in maths and programming.

CAMERA is an established research centre with a track record in the fields of motion capture, analysis and work with the creative industries. We have a strong track record of supporting the career development of our researcher including four former research associates now with faculty positions. Our intention is to help support and develop the future leaders of the field and there will be many opportunities to showcase and champion the new research and technology developed on a global stage. We also hope that you will help advise the CAMERA project and PhD students working on aligned topics.

As part of our recent expansion we are very excited about the opening of the new CAMERA studio which uniquely comprises four state-of-the-art capture stages:

1. **Motion Capture Stage:** Our marker based motion-capture facility is centred on 36 26MP Vicon Valkyrie cameras that can be used to capture highly detailed movement (e.g. individual fingers) as well as group interactions (many participants) in the large capture volume. We are interested in capturing truly realistic motion: this could be for training or validating markerless capture systems or biomechanical analysis. We have

force-plates to capture ground-reaction forces and suspension harnesses to simulate constrained motion (e.g. movement under Lunar or Martian gravity).

2. **Face/Body Light Stage and Photogrammetry Rig:** The face capture system comprises a light-stage from Esper with 25MP cameras and high-speed -ing control. The photogrammetry rig allows us to perform body reconstructions, e.g. for creating avatars. Combined, they allow us to capture cinematic quality datasets, e.g. to investigate training data for automatic avatar creation and rig construction suitable for high-end visual effects.
3. **4D Volumetric Capture Stage:** This new room scale stage allows for free-form 4D capture or light-field capture using 48 24MP Emergent machine vision cameras. This will allow capture of high-quality, dynamic datasets and we are interested in using new view synthesis to provide virtual camera paths as well as new methods for artistic control and editing of volumetric data (e.g. allowing NERFs or similar to be used in immersive AR/VR productions or in visual effects).
4. **Virtual Production Stage:** This brand new 12m by 3m LED wall will allow us to develop the next generation of capture and editing tools for media production. After initial success with projects such as ILM's work on the Mandalorian, there is an increasing demand for virtual production. Access to a state-of-the-art background wall plus movable front lighting walls and ceiling panels will let us work on the next generation of production and visual effects pipelines. We are particularly interested in generation of the highest quality capture, e.g. recreation of light-fields for lighting accuracy, and to provide the most intuitive creative control for the director, actors and crew.

Join a World-Class Research Team Driving the Future of Media Technology

You will work alongside existing PDRAs and members of our CAMERA studio team who have long-standing experience across both technical and creative/artistic aspects of the studio. Collaboratively, they will assist with capturing exciting and challenging new datasets or showcasing our research with internationally leading studios and award-winning creative teams (e.g. DNEG and Aardman Animations).

You'll be based at the cutting-edge CAMERA Studio, collaborating with a dynamic and growing team of researchers. Supported by the expert CAMERA Research Engineering team — bringing deep hardware, software, and creative know-how — you'll also join a vibrant research network through the MyWorld project. Work alongside fellow Postdoctoral Researchers, PhD students, and leading academics from the University of Bath, University of Bristol, and UCL's renowned 3D Computer Vision Group. Be part of an inspiring community at the forefront of Visual Computing, AI, and Machine Learning.

CAMERA partners with the world's top external collaborators to bring new technology from the lab into real-world production studios. Our work consistently features at the most prestigious conferences in Computer Graphics (SIGGRAPH) and Computer Vision (CVPR, ICCV, ECCV), giving you a platform to shine at the forefront of your field.

Job purpose

Project Focus

We have two positions available targeted across a range of activities but there is great scope for input in specific projects from candidates and the project is intended as a collaborative undertaking alongside our MyWorld team at the University of Bristol.

Topics of focus include:

1. Beyond SMPL: Building Anatomically Accurate Digital Human Models

While parametric body models like SMPL have revolutionised 3D shape and pose estimation, their low-resolution surface parametrisations and simplified representation of skeletal structure results in inaccurate predictions of human or animal motion, limiting their use in downstream tasks such as biomechanical analysis. This motivates the development of more expressive representations that capture the interplay between high-resolution surface geometry and anatomically accurate internal structures.

Links for background information:

- SMPL

- SKEL

Technical Background

This role is ideal for someone passionate about advancing next-generation digital humans and animals, and excited to work with rich, real-world 3D data acquired using our cutting-edge motion and volumetric capture facility. You'll tackle challenging problems at the intersection of **deep learning**, **3D computer vision**, and **mathematics** to train and evaluate deep learning models. Thus, we are looking for candidates with a proven track record in developing novel architectures, ideally utilising **Transformer** and **Diffusion** based approaches. Knowledge of **Pytorch** and/or **JAX** is essential, while a familiarity with **C++** and **CUDA** for GPU-accelerated computing and knowledge of **OpenGL/Metal** is an advantage. A solid mathematical foundation is also highly desirable, with topics such as **differential equations**, **differential geometry**, **continuum mechanics** and **geometric measure theory** being particularly relevant to our work.

For further details, please contact Prof Neill Campbell

2. Next Generation Virtual Production with Light-Fields

Create the future of filmmaking! Help develop cutting-edge light-field technology for virtual production—used in hits like The Mandalorian and House of the Dragon. Work with hardware and industry giants like Foundry and DNEG to revolutionise on-set lighting and elevate realism for both the audience and performers.

Help Shape the Future of Film & TV Production

Virtual Production combines real-time game engines and giant LED screens to create immersive film sets — used in shows like The Mandalorian and House of the Dragon. This project pushes the boundaries by developing **light-field technology** to improve on-set lighting realism for actors and audiences alike. You'll work hands-on with cutting-edge virtual production screens, with access to top-tier hardware and expert guidance from industry leaders like Foundry and

DNEG. An exciting opportunity to drive innovation at the intersection of film, technology, and visual effects.

Links for background information:

- Behind-the-Scenes Look into the Virtual Production of 1899

- DNEG Introduction and DNEG 360

Technical Background

This is an ideal role for anyone passionate about applying advanced computer science, AI, and machine learning to the world of film, TV, and games. You'll work at the intersection of **computer vision**, **graphics**, and **3D rendering**, developing next-gen virtual production tools.

We're looking for someone with strong programming skills in **Python**, plus experience with **C++** and **CUDA** for GPU-accelerated computing. Familiarity with game engines like **Unreal** or **Unity** is a big plus, as they power most Virtual Production stages.

You'll tackle exciting challenges in areas like **light-fields**, **real-time rendering**, **volumetric lighting**, and **3D computer vision**—contributing to the future of immersive media.

For further details, please contact Prof Neill Campbell

3. Creating data-driven 3D human representations that combine the fidelity of implicit models with explicit controls preferred by animators

This project addresses the challenge of creating data-driven 3D human representations that combine the fidelity of implicit models with explicit controls preferred by animators. Current parametric models lack detail, while implicit methods lack direct manipulation. We aim to use a single "in-the-wild" video to learn a controllable 3D representation for an individual by understanding the latent space of implicit representations.

Problem Statement
Effectively modeling humans in 3D for animation and other real-world applications presents significant challenges. Current approaches often fall into two categories, each with its own limitations. Parametric models, such as SMPL-X, offer explicit controls that are highly valued by animators, allowing for precise manipulation of human pose and shape. However, these models often lack the fidelity required for realistic representations, appearing somewhat generic or simplified. Conversely, recent advancements in human representations obtained through implicit representations such as diffusion models and flows, have shown promise in generating highly detailed realistic 3D human models. The primary drawback of these implicit representations is their inherent lack of explicit controls, making it difficult for animators to directly manipulate or animate the generated human models in a practical way.

The core problem this project addresses is the need for a 3D human representation that combines the high fidelity of diffusion models with the explicit controls crucial for real-world tasks and animation workflows. Furthermore, achieving this ambitious goal requires the ability to derive such a controllable and high-fidelity 3D representation from minimal input, ideally a single "in-the-wild" video of an individual. This necessitates a deep understanding of the latent space, enabling the extraction and manipulation of features that correspond to intuitive controls while maintaining realism.

For further details, please contact : Dr Vinay Namboodiri

4. Exploring the capabilities of state-of-the-art large language models and Large Reasoning Models

This study analyses how large language and reasoning models handle tasks requiring different cognitive skills by examining internal activations and output behaviour. We explore when different forms of reasoning (e.g., planning, arithmetic) emerge and if such capabilities can be clustered by their underlying cognitive, memory retrieval, and linguistic demands.

Detailed Description

This is an exciting opportunity for a highly skilled and motivated researcher with an interest in **Natural Language Processing and Deep Learning** to work on exploring the capabilities of state-of-the-art large language models (e.g., GPT-4o) and Large Reasoning Models (e.g., GPT-o1, Deepseek-R1).

You'll join a fast-growing, ambitious team led by Professor Nello Cristianini, a leading AI expert whose work spans from SVMs to recent books on LLMs including Machina Sapiens and The Shortcut.

The selected candidate will be co-supervised by Dr Harish Tayyar Madabushi, whose work on LLM reasoning was included in the discussion paper on the Capabilities and Risks of Frontier AI, which was used as one of the foundational research works for discussions at the UK AI Safety Summit held at Bletchley Park.

The AI research group at the University of Bath offers the perfect opportunity for candidates interested in Large Language Models to work in an environment focused on **developing their research and NLP skills** and achieving **high-impact publications** at top NLP venues.

Technical Details

Large Language Models (LLMs) are fundamentally different from all previous forms of machine learning. Their ability to solve a range of tasks, often requiring advanced reasoning in humans, emerges primarily from next-token prediction training objectives. However, despite their now extensive deployment, the underlying principles governing these capabilities of LLMs remain poorly understood. Furthermore, their unpredictable failure modes, even in scenarios where they demonstrate remarkable performance, pose a significant concern.

There is some disagreement between researchers on exactly how LLMs function, with some believing that LLMs have AGI-like emergent intelligence and others ascribing their functioning to sophisticated template completion systems. Recent research at the University of Bath has been actively exploring these inherent capabilities and how variations to existing chain-of-thought methods can be used to improve reasoning in LLMs.

This project is aimed at accelerating this work and covers a range of capabilities and models including the very latest reasoning models that use reinforcement learning to train state of the art reasoning models such as GPT-o1 and Deepseek-R1.

For further details, please contact **Dr Harish Tayyar Madabushi**

Main Duties and Responsibilities	
	Responsible to the PI/CI for (as appropriate to discipline):
1	Conduct individual and/or collaborative research projects. Contribute to the design and execution of the project e.g. timetabling and meeting project milestones; participating in regular discussions with collaborative partners. Generate, collect and analyse existing data related to the project using qualitative and/or quantitative techniques. e.g. research and development of new software, hardware and technologies, production of prototypes and the construction of new datasets.
2	Liaise closely with and support other CAMERA and MyWorld staff working on related fields to the common benefit of the centre and research group. Working with researchers, artists and other collaborators to gather research goals and specifications, to perform and assess user studies and to assist with the transfer of developed technologies to real-world products.
3	Write-up results of research and contribute to the publication of results in high-quality peer-reviewed academic literature. e.g. the production of papers in leading peer-reviewed conferences and journals, the development and maintenance of a code base and engage in public dissemination of research outputs as appropriate.
4	Disseminate research project results at a national and internation level through activities such as • overseas research visits • conference presentations • public engagement activities • preparation and delivery of demos to external stakeholders • organisation of workshops with collaborators and partners
5	Participate regularly in research group meetings and prepare and deliver presentations and reports to the project team, internal and external collaborators and partners.
6	Assist with the supervision of graduate students and undergraduate project students and the assessment of student knowledge.
7	Continually update knowledge and understanding in field or specialism to inform research activity.
8	Identify sources of funding and provide assistance with preparing bids to funding bodies. Develop ability to secure own funding e.g. travel grants.
9	Contribute to the development of research objectives and proposals for own or joint research projects, with assistance of a mentor, if required.
10	Disseminate knowledge of research advances to inform departmental teaching.

11	As a member of Research Staff at the University, you will be encouraged to take up a minimum of 10 days' professional development pro rata per year. You should use this time to spend on activities that will benefit your career development and your personal growth. Examples include: attending workshops, career development coaching, mentoring, training courses, participation in networks, attending conferences, writing fellowship or funding applications, and representing the research staff community on committees or working groups. The University, as a signatory to the Concordat for the Career Development of Researchers, is committed to its principles. We aim to provide a supportive and inclusive environment, where researchers' contributions are recognised and valued, and we provide opportunities to enable research staff to develop their full potential.
12	You will from time to time be required to undertake other duties of a similar nature as reasonably required by your line manager. You are required to follow all University policies and procedures at all times and take account of University guidance.

Person Specification

Criteria	Essential	Desirable
Qualifications		
PhD in Computer Vision, Graphics, Machine Learning or a strongly related discipline **or** Professional/industrial experience in relevant discipline equivalent to that of a PhD	X	
Experience/Knowledge		
Excellent background knowledge of standard visual computing and machine learning approaches	X	
Experience with the practical implementation/application of visual computing and machine learning methods	X	
Evidence of published research in high quality peer reviewed journals and/or conferences	X	
Familiarity with industrial pipelines and workflows		X
Experience with the production of software and associated engineering skills		X
Experience of conducting evaluation studies		X
Post doctoral experience		X
Skills		
Experience of programming in technical languages such as Python, C++, CUDA, OpenGL	X	
Proven track record of production of clean and robust research code including numerical code	X	
Design and production of graphical user interfaces		X
Use of industry standard creative software; e.g. Nuke, Photoshop, After Effects, Maya, etc..		X
Excellent written and oral communication skills	X	
Ability conduct independent research	X	
Ability to prepare research proposals		X
Ability to organise and prioritise own workload	X	

Ability to write research reports and to effectively disseminate outcomes	X	
Attributes		
Motivated to perform research using visual computing and machine learning and its application in the creative industries	X	
Enthusiasm and self-motivation	X	
Commitment to excellence in research	X	
Organisation – able to plan and deliver work to meet required deadlines	X	
Tenacity – working to achieve own and team objectives and to overcome obstacles	X	
Ability to work individually and as an effective team member	X	
Commitment to working within professional, safe and ethical codes of conduct	X	