Job Description

Job title	Research Software Engineer
Department/School	Bath Institute for the Augmented Human
Job family	Education and Research
Grade	7
Salary	£37,099 to £44,263
Working arrangement	Fixed term (4 years, possibly extending to end of funding period) @ 1.0 FTE
Reporting to	Director, Bath Institute for the Augmented Human
Responsible for	N/A
Location	University of Bath campus (Claverton Down or Bath City sites).

Background and context

The Bath Institute for the Augmented Human (IAH) is the University's newest research Institute, established in 2023, as an innovative and agile leader in Human Augmentation R&D in the UK and Internationally.

Our opportunity

Human augmentation is the use of science and technology to enhance physical and cognitive performance. It has the potential to transform every aspect of our lives. It can enable humans to transcend our biological limitations, improve our health and wellbeing, and extend our lifespans.

The speed at which advanced innovations in this field are developing is rapid. The opportunities to bring multiple new human-machine interfacing technologies together are immense and it is very important for the UK to lead innovation in human augmentation and capitalise on these opportunities. There is an opportunity to help humans across the whole spectrum of their lives, not just physically and mentally, but supporting the way we live and work on a day-to-day basis. Human augmentation is expected to lead to many beneficial social and economic impacts.

Our response

The Bath Institute for the Augmented Human aims to be a leading institute nationally and globally, driving responsible, cutting-edge research and trialling and deploying human augmentation technologies that can impact broadly. Our vision is a complete multidisciplinary training and innovation ecosystem that revolutionises the way that humans' interface, interact, improve, and evolve with technology. The Institute will be a unique body of interdisciplinary research focusing on research excellence and addressing

the global need for new tools and technologies for augmenting the human and developing researchers that have the skills to develop, trial, regulate and deploy human augmentation technologies.

We will work together – along with industry partners, patient groups and others – to find new and imaginative ways to integrate machines with our bodies and minds. Our end goal is to push the limits of our natural capabilities – improving quality of life and benefiting humanity. We'll also be taking a leading role in devising rules that ensure no harm is done by the tech developed in this field. We want to guarantee Human Augmentation technology is deployed both safely and ethically. The Bath Institute for the Augmented Human has been founded to accelerate technological developments and help the UK prepare for the growing impact of direct human-to-machine interactions.

Our focus
The **Bath Institute for the Augmented Human** will establish pathways to impact with minimum barriers, achieving impact across multiple sectors. Responsible research addressing societal, legal, and ethical considerations will be at the core of the institute. The Institute is founded on the following Mission, Vision, and Values:
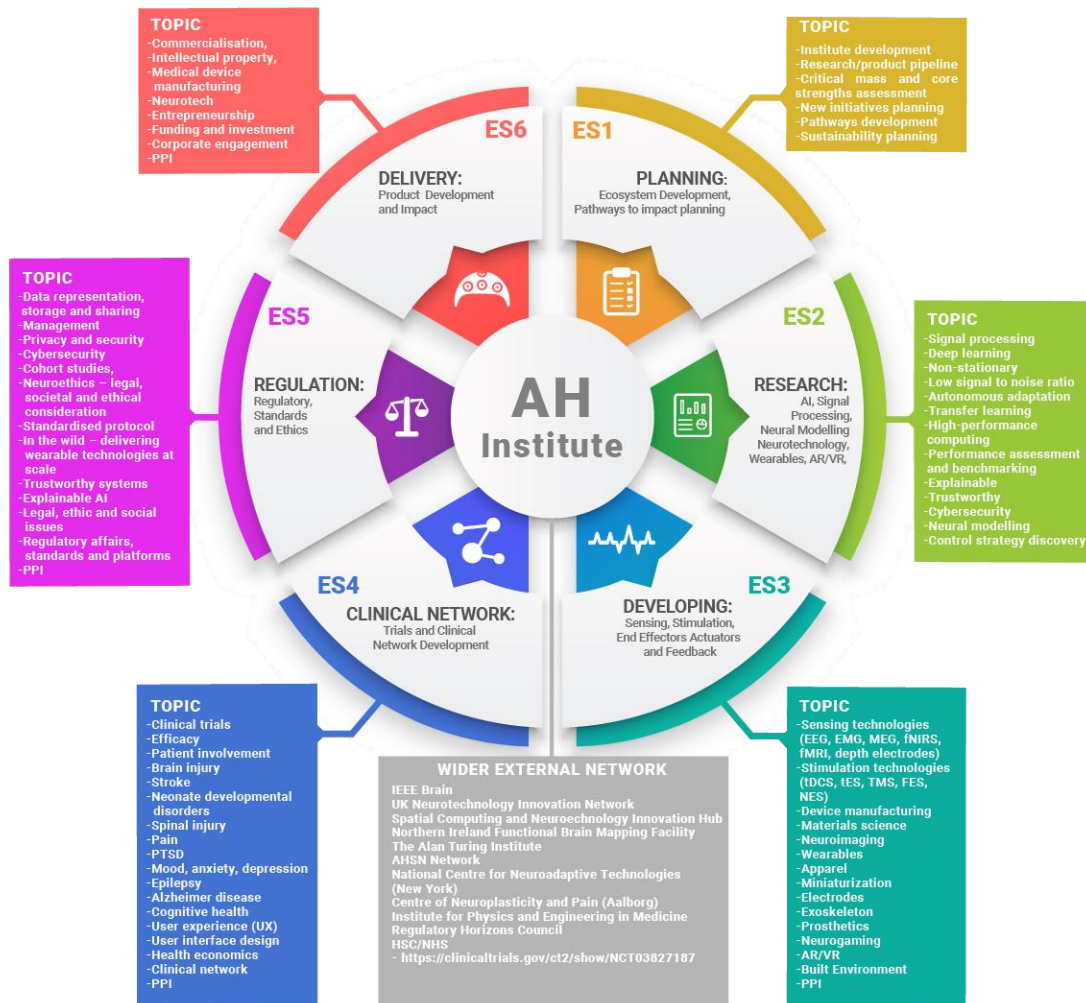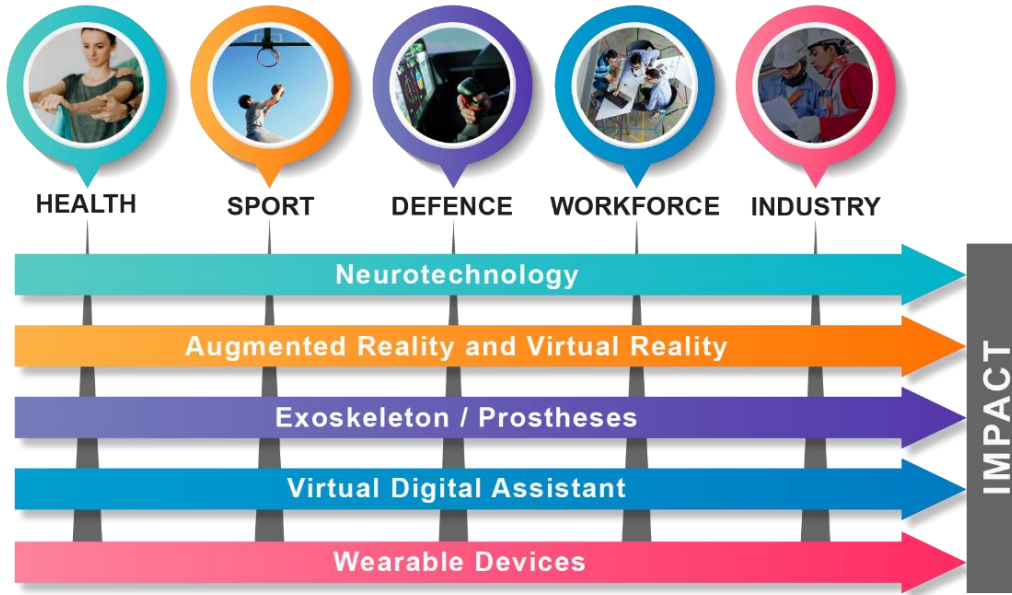
Mission – To leverage technology for the advancement of human health, wellbeing, and performance.

Vision – To establish a world-leading multidisciplinary training and innovation ecosystem that revolutionises the way that humans interface, interact, improve and evolve with technology.

Values -
1. **Trusted** – The leading voice in the development and deployment of human augmentation.
2. **Inclusive** – Enabling a diverse, interdisciplinary, collaborative, and inclusive community.
3. **Impactful** – Embedding co-creation to deliver impact through innovation.

The figures below provide a high-level overview of the main application domains and underpinning human augmentation technologies we aim to focus on along with an outline of the innovation ecosystem.

UNIVERSITY OF BATH

HEALTH   SPORT   DEFENCE   WORKFORCE   INDUSTRY

Neurotechnology

Augmented Reality and Virtual Reality

Exoskeleton / Prostheses

Virtual Digital Assistant

Wearable Devices

IMPACT

AH Institute

ES1 — PLANNING: Ecosystem Development, Pathways to impact planning

ES2 — RESEARCH: AI, Signal Processing, Neural Modelling Neurotechnology, Wearables, AR/VR,

ES3 — DEVELOPING: Sensing, Stimulation, End Effectors Actuators and Feedback

ES4 — CLINICAL NETWORK: Trials and Clinical Network Development

ES5 — REGULATION: Regulatory, Standards and Ethics

ES6 — DELIVERY: Product Development and Impact

TOPIC (ES6)
-Commercialisation,
-Intellectual property,
-Medical device manufacturing
-Neurotech
-Entrepreneurship
-Funding and investment
-Corporate engagement
-PPI

TOPIC (ES1)
-Institute development
-Research/product pipeline
-Critical mass and core strengths assessment
-New initiatives planning
-Pathways development
-Sustainability planning

TOPIC (ES5)
-Data representation, storage and sharing
-Management
-Privacy and security
-Cybersecurity
-Cohort studies,
-Neuroethics – legal, societal and ethical consideration
-Standardised protocol
-In the wild – delivering wearable technologies at scale
-Trustworthy systems
-Explainable AI
-Legal, ethic and social issues
-Regulatory affairs, standards and platforms
-PPI

TOPIC (ES2)
-Signal processing
-Deep learning
-Non-stationary
-Low signal to noise ratio
-Autonomous adaptation
-Transfer learning
-High-performance computing
-Performance assessment and benchmarking
-Explainable
-Trustworthy
-Cybersecurity
-Neural modelling
-Control strategy discovery

TOPIC (ES4)
-Clinical trials
-Efficacy
-Patient involvement
-Brain injury
-Stroke
-Neonate developmental disorders
-Spinal injury
-Pain
-PTSD
-Mood, anxiety, depression
-Epilepsy
-Alzheimer disease
-Cognitive health
-User experience (UX)
-User interface design
-Health economics
-Clinical network
-PPI

TOPIC (ES3)
-Sensing technologies (EEG, EMG, MEG, fNIRS, fMRI, depth electrodes)
-Stimulation technologies (tDCS, tES, TMS, FES, NES)
-Device manufacturing
-Materials science
-Neuroimaging
-Wearables
-Apparel
-Miniaturization
-Electrodes
-Exoskeleton
-Prosthetics
-Neurogaming
-AR/VR
-Built Environment
-PPI

WIDER EXTERNAL NETWORK
IEEE Brain
UK Neurotechnology Innovation Network
Spatial Computing and Neuroechnology Innovation Hub
Northern Ireland Functional Brain Mapping Facility
The Alan Turing Institute
AHSN Network
National Centre for Neuroadaptive Technologies (New York)
Centre of Neuroplasticity and Pain (Aalborg)
Institute for Physics and Engineering in Medicine
Regulatory Horizons Council
HSC/NHS
- https://clinicaltrials.gov/ct2/show/NCT03827187

Job purpose

The Bath Institute for the Augmented Human Research Software Engineer (RSE) will have significant responsibility for assisting in delivering projects and supporting research teams across five key thematic areas within the Institute.

The RSE will be required to work closely with Institute members and thematic leads in any of the areas listed below as required. The postholder should understand software requirements in one or more of these areas but have the background and skills to support software engineering and development across various technologies and research projects:

- **Neurotechnology**: This involves interfacing with the human nervous system to both monitor and influence brain activity. In an integrated system, neurotechnology can be used to interpret user intentions or emotional states directly from brain signals. This data can guide the behaviour of other system components.

- **Virtual/Augmented Reality (AR):** AR overlays digital information onto the physical world, which can be seen through devices like AR glasses or headsets. In combination with neurotechnology, AR can display information that is contextually relevant to what the user is thinking or feeling, enhancing decision-making and situational awareness.

- **Wearables:** These are smart electronic devices worn on the body. In this system, wearables can track health metrics like heart rate or physical activity, provide haptic feedback, and augment the capabilities of AR and neurotechnology by offering additional data sources or control interfaces.

- **Virtual Digital Assistants (VDAs):** These are AI-driven tools that can understand and respond to natural language. Integrated with the other technologies, a VDA can offer hands-free operation and personalized assistance based on the user's mental state, environment, and activity as detected by neurotechnology, AR, and wearables.

- **Exoskeletons/Prosthetics:** These are wearable devices that enhance physical strength and endurance. When combined with insights from neurotechnology, AR, and wearables, an exoskeleton can be precisely controlled based on the user's intentions and physical needs, providing support exactly when and where needed.

The IAH Research Software Engineer will contribute to cohesive and performance driven teams which include academic staff, technical support team (software and electronics engineers and technicians), PhD researchers and post-doctoral researchers within the IAH, ensuring team members within thematic areas are supported to achieve the successful delivery of shared goals across the Institute.

The Research Software Engineer is line managed by the Director of the Institute. The post-holder will have considerable autonomy and will be expected to show substantial personal initiative.

The post-holder will play a key role in the development, testing and validation of software to support the delivery of projects and processes within the Institute's strategy and operational plans and contribute to developing the knowledge and skills within the research community at all stages of the research software development cycle (e.g. by providing hands-on technical training, coaching sessions and promoting the adoption of best practices) as well as working collaboratively with researchers to develop and redevelop code for optimal productivity and research quality.

The postholder will be required to assist in translating software code between languages and testing and trialling of software, the production of technical reports, documentation, user information material and commercialisation documentation and setting-up experiments or investigations and recruit human participants to test software implementations.

The post-holder will be responsible for ensuring that all software developed within the Institute and in collaboration with its partners meet the highest standards of clinical and regulatory requirements. This includes engaging in rigorous coding practices, leveraging state-of-the-art development tools, and collaborating closely with clinical partners and stakeholders to align the software with user needs and commercial objectives.

The RSE should be able demonstrate experience across several of the areas listed below:

- Algorithm and software programming using Python, Matlab, or C/C++/C#,
- Optimising the performance of software for high performance computing on CPU and GPU clusters.
- Human Computer Interaction practices and user experience and user interface design
- API development for hardware interfacing experience and hardware driver development
- Cross platform application development using tools such as Visual Studio and MAUI
- Medical device standard and regulatory processes for software as medical device e.g., IEC 60601 – Medical Device; IEC 62304 – Software as a Medical Device; IEC 82304-1 – Health software
- Industry standard games development software e.g. 3DS Max, Photoshop, Unity3D, UDK, and HTML5
- Signal processing and data analytics skills
- AI research, developing and applying technologies including deep-learning using platforms such as Keras, Pytorch or Tensor Flow HTML and CSS (SCSS preferable), database technologies Javascript, RESTful architecture
- Good knowledge of Agile development practices and the software development lifecycle

- Good understanding of version control software, specifically Git
- Mobile App development
- Infrastructure / DevOps (provisioning servers, running applications in a production environment etc.)
- Cloud systems AWS, Azure, Google Cloud Platform

	Main duties and responsibilities
1	Manage, maintain and support the infrastructure and an effective software development environment needed to deliver the research software engineering services and outputs as required by the Director, Deputy Director and Theme Leads.
2	Collaborate with researchers and implement rigorous coding practices to ensure that the code used in all areas of IAH research meets clinical and regulatory standards (this may include MHRA approval in future).
3	Engage with researchers and collaborators at all development stages and disseminate best practices in the development, deployment and sustainability of research software, including utilising state-of-the-art development tools and methodologies for software testing, verification, and validation. This may also include working with research participants and public and patient representatives (as required) to gather requirements and feedback, integrating them into software development to meet user needs.
4	Take responsibility for the definition, documentation and satisfactory completion of collaborative software projects. This will include defining requirements, timescales and milestones, and identifying and managing risks to project success. Proactively prioritise tasks across multiple projects towards meeting objectives within agreed time and resource constraints, and provide regular communication through reports to project leads as appropriate.
5	Design, construct, test and document well-structured and maintainable software solutions to meet the requirements of collaborative software projects, ensuring these are compliant with regulatory standards where required.
6	Maintain a portfolio and archive of collaborative software projects, code documentation, release notes and manuals.
7	Maintain an awareness of technical developments, tools and ideas in research computing and in software engineering, including where appropriate attending seminars, technical briefings, conferences and technical groups. Maintain awareness of latest advances in relevant healthcare technology.
8	Write up results of software development and contribute to the publication of research in high-quality peer-reviewed academic literature.

9	Disseminate results of research projects as appropriate to the discipline through activities such as conference presentations and public engagement.
10	Participate in IAH/department meetings and prepare and deliver presentations/seminars to project team, internal and external stakeholders or funders.
11	Assist with the supervision of postgraduate students and the assessment of student knowledge.
12	Continually update knowledge and understanding of software development and relevant best practices to inform research activity.
13	Disseminate knowledge of software development and related advances to inform the activities of the IAH.
14	Contribute to IP and commercialisation initiatives of the Institute, aiming to exploit relevant opportunities in the UK human augmentation and healthcare technology market.
15	Some occasional travelling may be required, for example to community events, workshops or conferences for a variety of software engineering and research fields.
16	Perform any other research duties, as assigned by the Director, which are compatible with the designation and seniority of the post.

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 and Training		
Bachelors and/or postgraduate degree in a computational field or equivalent qualification or professional experience in a related field, e.g. software programming and development in an academic or industrial setting.	✓	
A PhD in a relevant area.		✓
A relevant professional qualification.		✓

Knowledge and Experience		
Experience in using and developing software to produce and deploy research outputs.	✓	
Experience in machine learning, cloud computing or games and/or games development		✓
Full stack experience in software development.	✓	
Significant experience of adapting and optimising existing code.	✓	
Awareness of technology developments related to the research themes of the IAH, and ability to assess their impact for algorithms or problems.	✓	
Knowledge of and commitment to using best practices in software development including documentation, issue tracking, unit testing, and version control.	✓	
Significant experience in developing with one or more of the programming approaches listed in the above job description.	✓	
Passionate about computing / programming and about being involved in the development of cutting edge technology.	✓	
Awareness of and interest in AI applications within human augmentation technologies.		✓
Knowledge and experience of build automation and continuous integration.		✓
Knowledge and experience of developing and optimising hardware and low level software.		✓
Knowledge and experience of quantitative and qualitative research methods.		✓
Experience of working in the Higher Education sector as a researcher and contributing to research through software development.		✓
Skills		

Proven ability to develop and maintain working relationships and actively collaborate with other technical and non-technical staff, teams and groups.	✓	
Excellent written and communication skills, and able to adapt communication style to suit the audience and to work with staff at all levels.	✓	
Technical competence and proven troubleshooting skills based on past experience and independent investigative analysis.	✓	
Ability to learn and adapt to new technologies and concepts.	✓	
Attributes		
Excellent organisational skills and proven project management skills.	✓	
Flexibility and adaptability and an ability to cope with a busy workload.	✓	
Ability to work either on your own or as part of a team.	✓	
Confident and able to engage with students and researchers of differing technical abilities.	✓	