Catapult Researcher in Residence (RiR) Programme: Opportunity Description

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Digital Economy - Disruptive Technologies

Name of the Catapult(s)	Digital Catapult (DC)
Location(s)	London and/or DC's local centres
Description of the Catapult(s)	Digital Catapult accelerates business access to new digital markets and carries out applied research and development to identify new applications of emerging technology, helping scale up digital companies and supporting traditional businesses to make better use of new and emerging digital technologies. https://digicatapult.org.uk/ Applying business-led research, Catapults help businesses transform great ideas into valuable products and services to compete in the global markets of tomorrow.
Description of the Challenge	This challenge is aimed towards researchers interested in disruptive technologies and/or their impact To help spark application ideas, the below list outlines the focus areas for the Digital Catapult The **Digital Catapult** focusses on four main technology areas: Immersive Technologies (VR/AR/MR), Artificial Intelligence (AI/ML), Future Networks (IoT, 5G, LPWAN) and Future Focus (Cybersecurity, Distributed Ledgers, Blockchain and Smart Contracts). Key markets sectors for the Digital Catapult are the Creative Industries, and Digital Manufacturing **Some examples of projects we are interested are described below. We will however consider all projects that fall within the focus of the catapult:** 1. Measuring Economic Impact in Disruptive Technologies: use of Agent Based Modelling: Computer simulation modelling for projecting potential impacts. Specifically, advancing the application of Agent based Modelling, primarily for exploring diffusion of disruptive technologies. In doing this we are convening stakeholders from the innovation policy arena, to explore appetite for collaboration and networking. 2. 5G and AI for network optimization: The next generation networks is envisaged as an interconnection of several types of networks, ranging from low power networks, e.g. LoRaWAN, NB-IoT, to mobile networks, e.g. 4G and 5G as well as satellite. This diverse network-of-networks is required to address the highly demanding aspirations for support of new customers from vertical industries (e.g. e-health, automotive, energy). However, such complex system poses a big challenge

for operators in 5G on how to balance investments, user experience and profitability. The vast amount of data generated not only from the end-user application, but also from the network itself, can be exploited embracing knowledge and intelligence to achieve a proper understanding of the network usage in multiple dimensions. Using self-learning/AI/cognitive techniques could assist in perform network optimization both at operational time as well as planning time.

3. 5G and AI for Network Planning:
   The next generation mobile network, 5G, is bringing the usage of higher spectrum from 3.5-3.8GHz and millimetre wave bands (e.g. 28GHz). Further, the increased capacity demands can only be met with increased densification of the network. Small cells are expected to be deployed in urban environments and along key roads to increase the available network capacity. Strategic placement of those cells is required efficient operation of the system both from user perspective as well as from network economics. Current state-of-the-art techniques for network planning include creation of "digital-twin" of cities by capturing real-world features in detail, using a resolution of 10cm. Features include street furniture such as lamp-posts, road signs, bus stops, and also natural items such as trees. However, generating these digital twins requires capturing of vast amount of data using LiDAR technology. Earth observing satellites and aircrafts use LiDAR imagery to monitor the changes of the planet. This project will aim to exploit existing datasets with the help of AI for recognision of features mentioned above to create digital twins of cities and other areas where 5G networks are to be deployed.

4. Explore the potential role of Voice UI and its value in critical or immersive environments such as in the creative, medical or industrial sectors. We would be interested in how a Voice UI can convey and express emotion and immediacy, manage cognitive load and provide ample response and tracking mechanisms in order to manage progress of relevant processes.

5. Reliable QA for AI companies

   In the advent of data-hungry and complex machine learning models, there is a need to augment current techniques for ensuring and evaluating the performance of machine learning, in addition to the well established methods of cross-validation and the assessment of learning curves respectively. These could include, but are not limited to:

   - Evaluation of hidden biases in the raw data.
   - Conventional statistical analyses that define for example whether a 5% improvement in a model is a genuine improvement over statistical chance.
   - A framework for picking a measure of accuracy (precision, recall, AUC etc) depending on requirements of the model.
   - A methodology to investigate so-called black-box models in order to gain some understanding of their behaviour under various conditions.
   - A framework for assessing the ethical implications and guidelines on how to act accordingly.

	Machine learning models are developing fast but can suffer from unforeseen consequences due to obfuscation in the methodology and lack of consideration around some of the points outlined above. This research project would be an opportunity for a Machine Learning expert to work with the Catapult to explore and investigate some of these methodologies, establish best practice, with the opportunity to disseminate findings to the wider community.
	Please contact us to discuss you project idea before you submit your application. This will ensure that it will be within the focus areas of the Catapult. **catarina.fernandes@digicatapult.org.uk**
Researcher Specification	For this call, we are following EPSRC Eligibility Criteria.
Other Details	The aims of the Researchers in Residence (RiR) programme are to build connections, support pathways to impact, and knowledge exchange between academia and the Catapult centres. The output of this residency would include a report, and depending on the project, could include a prototype system to demonstrate the principles of a larger project.
Closing Date for Applications	17:00 (GMT) on Fri 21 September 2018

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