

Results of Competition: UKRI Ideas to Address COVID-19: Innovate UK De Minimis Dec 2020

Competition Code: 2009_UKRI_IDEAS_COVID19_OPEN_DEMINIMIS

Total available funding is £5m for projects below £800k

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|--------------------------------|---|------------------------|------------------------|
| ATDBIO LIMITED | Improved oligonucleotide synthesis for faster, more accurate COVID-19 testing | £168,130 | £168,130 |

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Project description - provided by applicants

Testing people to find out whether they are infected with coronavirus is important in order to get them treated properly if they do test positive, and to keep the virus under control in the population. Programmes such as the UK Government's Test and Trace scheme work out whether the virus has infected someone by assessing whether its genetic material is present in a sample of human tissue such as a nasopharyngeal swab. There are two ways of doing this -- a test known as LAMP, which is a newer approach, or the current gold standard test, qPCR. Both tests use strands of DNA known as oligonucleotides.

The use of the LAMP test has grown dramatically during the coronavirus pandemic because it uses cheap and simple equipment. However, the fact that it uses more oligonucleotides than qPCR, and the massive demand for LAMP testing, means that manufacturers are struggling to produce large volumes of high purity oligonucleotides rapidly. The oligonucleotides need to be highly pure, with no unwanted material such as DNA strands which are too short, so that the tests give accurate results. Large volumes are needed so that people can be tested repeatedly and regularly.

ATDBio is a UK based company which is an expert in making the DNA needed for LAMP testing. Based on its experience it has devised a method which should enable the production of large, highly pure quantities of DNA more quickly and economically. Its new method combines reducing the amount of unwanted shorter strands produced when making oligonucleotides, with a better way of removing them and other unwanted pieces.

The company already has early data suggesting that this new approach will work. In this Innovate UK project, the funds will be used to develop and research the new techniques further and assess whether the oligonucleotides they produce work in COVID-19 tests. The new oligonucleotides will then be produced on a large scale and tested independently in COVID-19 tests outside ATDBio's laboratories.

ATDBio's new method is expected to increase the amount of DNA that can be produced three fold, reduce the time taken to purify it by three quarters, and increase its purity to 96%. This should make the LAMP COVID-19 tests faster and more accurate, and reduce their cost. In addition, the new techniques will be suitable for making DNA when testing for other infections, and in diseases such as cancer.

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| PROTECTBOX LTD | Ethical AI Marketplace-as-a-Service to help businesses impacted by COVID build back better | £72,058 | £72,058 |

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ProtectBox have developed an "artificial intelligence (AI) Engine" (a highly adaptable AI Marketplace-as-a-Service) with many user-friendly features that lets B2B/C/G/I users (in minutes, for free) assess, match/bundle, compare, personalize, buy and rate a range of products and services. The latter are bundled and matched by proprietary AI that has been trained on the millions of products and services in the Cybersecurity market. Our current partners, as well as many more, are asking ProtectBox to repurpose their "AI Engine" for the defense operational technology (OT), health and agriculture markets, supporting the UK government's Integrated Review; the UK Government's COVID Recovery Strategy; NHS 5 Year forward plan; UK government's Ten Point Plan for a Green Industrial Revolution; EU Horizon challenges; 2 of UK's Industrial Strategy Challenge Fund (ISCF) challenges and 4 UN Sustainable Development Goals (SDGs). Our vision is to become the go-to AI Marketplace-as-a-Service that lets you Build Back Better! So, an improved Amazon, that's more inclusive and sustainable!

We're an easy value-add, add-on to existing player's and wider player's offerings. In the same way, banks sell insurance as add-on, ProtectBox can be sold as all-in-one cyber add-on by accountants, banks, insurers, lawyers, telecoms, anyone who is a data service provider to users, even governments.

We've won 10 Awards, including CogX 2020's Best AI in Cybersecurity (humbled to beat BT & Darktrace for this); 2020, 2019 & 2018's Most Influential Women in UK Technology longlist; Wired Security 2017 and Security Excellence Award's Special Pandemic Award finalist alongside Barnsley Council, National Police Chiefs' Council and Opengear. Coverage in The Times, Telegraph, Wired, CityAM, Evening Standard amongst 30+ others. Help us help you! Sharing is caring so spread the love by joining the ProtectBox family today - MayTheProtectBoxBeWithYou (check out our Lego video to find out more)!

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| VECTOR AI LTD | Advanced Algorithm Training on European Languages and Edge-Cases in Logistics to Drive Widespread AI Adoption to Build Pandemic Resilience | £148,864 | £148,864 |

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Project description - provided by applicants

The World Economic Forum (WEF) highlighted that COVID-19 exposed systemic weakness in logistics' physical and manual data-processing operations, primarily email and trade-document driven workflows. The pandemic compounds existing inefficiencies and lack of scrutiny, costing Fortune 500 companies \$81 billion of unnecessary supply chain costs each year (JPMorgan 2017 Trade Outlook).

Whilst the WEF recommendation of digitisation innovations offer remedies to improve desperately needed business resiliency, there are challenges to effective adoption. The logistics industry has been notably slow to adopt AI, only 12% of organisations currently leverage AI (MHI Industry report,2020). One major reason for the lack of AI adoption is that the logistics sector has ever-changing, non-standard and complex information, which poses massive algorithm scalability challenges.

This project aims to meaningfully enhance our research and development of an automated algorithm-training pipeline in-built into our existing logistics' machine learning workflow automation platform. The no-code pipeline operates in the background, automatically re-training our data-extraction algorithms to customers' evolving email and document content. This project's research will thoroughly and specifically explore academic application of extraction techniques on multi-lingual and edge-case data-samples to bolster our basic training pipeline, thus increasing applicability, encouraging rapid adoption via scaling ease and efficiency.

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| TEN BIO LIMITED | Skin safety testing to enable far-UV-C technologies for wide-spread inactivation of SARS-CoV-2 | £136,204 | £136,204 |
| University of St Andrews | | £39,286 | £39,286 |

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Project description - provided by applicants

UV light is known to inactivate SARS-CoV-2, the virus responsible for the COVID-19 pandemic. It is also widely claimed that high energy UV light, called "far-UV-C", is 'safe for humans', although this claim is based predominantly on animal studies and limited studies in human volunteers. The UK is expected to begin employing far-UV-C in public spaces in 2021. It is proposed here to _rapidly_ generate safety data showing whether or not far-UV-C causes the types of damage that full-spectrum UV light does (for example, sunburn, DNA damage, immunosuppression of the skin, and modifications to the skin microbiome, which is the natural flora that lives in healthy human skin). It is imperative that we understand the effects of far-UV-C on human skin to ensure it can be deployed to its full effect

We are proposing here to conduct the following far-UV-C research projects to investigate the efficacy and safety profile of this very promising technology:

- * DNA damage upon acute and chronic far-UV-C exposure
- * DNA damage to compromised skin (for example, wounded skin) upon far-UV-C exposure
- * Response of immune cells resident in the skin to far-UV-C (it is known that UV-B light elicits an immune response in skin, but the effect of far-UV-C has not been evaluated)
- * Evaluation of skin microbiome following acute and chronic exposure to far-UV-C. Far-UV-C irradiation may kill or modify the genetic material of the beneficial flora that colonise the skin by the same mechanism by which SARS-CoV-2 is inactivated
- * Computer simulation of far-UV-C penetration into skin guided by the data generated in the skin model

We propose to conduct these experiments in our novel patent-protected _ex vivo_ skin model (TenSkin(tm)) which is the closest mimic available to human skin while still on the body.

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| PHOENIX PRODUCT DEVELOPMENT LIMITED | Automatic No-Touch Open/Close Toilet Minimising Infection Risks from Airborne Pathogens and Surface Contamination | £147,499 | £147,499 |

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Project description - provided by applicants

COVID-19, the highly infectious disease caused by the recently discovered coronavirus SARS-CoV-2, has two major transmission routes: (1) airborne pathogens and (2) smear infections through contaminated surfaces. Toilets, especially installations with multiple cubicles in washrooms of public venues and larger organisations, are an overlooked infection risk:

Toilet flushing is known to introduce aerosolisation, where microscopic air droplets that can promote the airborne spread of pathogens, are released into the air. With residence times long after toilet users have left the cubicle, these droplets can travel tens of meters. There is also evidence that SARS-CoV-2 is present in faeces (Xiao et al 2020, Peng et al 2020) and on surfaces of objects that were previously handled by virus-positive persons (Döhla et al 2020). This makes toilets a significant source of smear infections. Involuntary, reflexive hand-to-face contact (e.g. while sneezing or coughing) occasionally overrides cautious behaviour even in people that are conscious of COVID-19 infection risks and seek to avoid them. Public toilets therefore pose a two-fold threat, because the average toilet user can neither detect aerolised pathogens nor the infectious matter on toilet parts that usually require manual operation, like push-to-flush buttons or toilet lids.

User studies have long suggested that most people do not like to touch toilet seats in public washrooms due to hygienic and health concerns, so these toilets are usually flushed with the lid open. Against the backdrop of COVID-19, the health concerns in connection with the microscopic water droplets this habit produces have now been raised more urgently than ever before. A novel solution is required that ensures the toilet lid is securely fixed in the "down"-position and sealed airtight before flushing, so that water droplets cannot escape into the surrounding air. At the same time, the acute user need of a "no touch" activation mechanism to start the toilet flush must be addressed.

The current state-of-the-art does not offer a safe, robust, mass market-ready and affordable technology to meet the demand for such a solution. In this project, we therefore propose to develop a prototype toilet that integrates a novel "no touch" activation method with a motor-driven mechanism to safely open and close toilet lids automatically, without the need for any manual operation. Most importantly, these advancements will be integrated into a toilet that is inherently designed to reduce aerolised pathogens by up to 95% by locking and sealing the lid tightly before flushing.

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