

## Nomination for Research Impact Awards 2017

Award Category	Best Potential Economic Impact
Title of the project	Pattern recognition in big data
Name, department and email of lead researcher (the person to whom all communications will be sent)	Alexander Gorban, Department of Mathematics, <a href="mailto:ag153@le.ac.uk">ag153@le.ac.uk</a>
Names and departments of other researchers involved	Jeremy Levesley, Ivan Tyukin, Evgeny Mirkes, Andrey Mudrov (Department of Mathematics)
Research funder/s (if any)	<ul style="list-style-type: none"> <li>- Innovate UK</li> <li>- European Regional Development Fund (ERDF)</li> <li>Industry funding</li> </ul>
Summary of the impact achieved or summary of the impact potential if applicable to the category. Please include details of any partnership working, or information about how the impact came about, i.e. the pathway from research to impact. Summary should be suitable for an educated lay audience. Relevant websites can be referenced but essential information in support of the application should be present in the text. Please include no more than two academic references.	<p>Fundamental research into ‘pattern recognition in big data’, instigated five years ago by the Data Analytics Group (comprising Prof Gorban, Prof Levesley, Dr Tyukin, Dr Mirkes &amp; Dr Mudrov) in the Department of Mathematics, is projected to deliver considerable economic impact over the next 5-7 years, generating over £333M of additional turnover and £105M of profit for company partners and creating, at least, 39 new jobs.</p> <p>Specifically, the research has led to industrial applications in two distinct areas:</p> <ul style="list-style-type: none"> <li>i.) Pattern recognition in image processing (for mobile devices, smart phones and security systems).</li> <li>ii.) Text mining (for the financial investment, knowledge management and oil &amp; gas sectors).</li> </ul> <p><b>i.) Pattern recognition in image processing</b></p> <p>Applied research in this area has progressed via a series of collaborative projects between the Data Analytics Group and company partners:</p> <ul style="list-style-type: none"> <li>• Industrial PhD project (2013-17) with Apical Ltd (£93,000); project aim: <i>‘Image processing methods based on analysis of visual scenes’</i>. (PI Dr Tyukin)</li> <li>• Partnerships in Knowledge Transfer project with Apical Ltd (2013–14) funded by the ERDF (£32,750); project aim: <i>‘To develop object identification and tracking algorithms for image processing tools’</i>. (PI Dr Tyukin, Lead Academic Prof Gorban)</li> <li>• Knowledge Transfer Partnership (2015-17) with Apical Ltd (£179,135); project aim: <i>‘To develop a novel visual intelligence technology for efficient image processing, object detection, recognition and tracking, implemented in a System On Chip’</i>. (PI Dr Tyukin, Lead Academic Prof Gorban)</li> <li>• Knowledge Transfer Partnership (2017-19) with VMS Ltd (£206,176); project aim: <i>‘To develop leading edge convergent low-cost, power-efficient security systems capable of real-time facial recognition.’</i> (PI Dr Tyukin, Lead Academic Prof Gorban)</li> </ul>

- Potential Knowledge Transfer Partnership (proposal to be submitted March 2017) with Photek Ltd (£182,577); project aim: *'To develop a product range of image intensifiers enhanced with data analytics capabilities.'* (PI Dr Mudrov, Lead Academic Dr Tyukin)

**ii.) Text mining**

Applied research in this area has progressed via a series of consultancy work and collaborative projects between the Data Analytics Group and company partners:

- Various consultancy contracts (2015-18) with Scicasts Ltd (c.£100,00); project aims: *'To develop a knowledge management system with enhanced data analytics capabilities'* (PI Prof Levesley, Co-I Dr Mirkes)
- Knowledge Transfer Partnership (2017-19) with Dataffirm Ltd (£158,801); project aim: *'To analyse social data as part of developing a new generation of product that will deliver leading information and predictions to the professional investment community'*. (PI Dr Mirkes, Lead Academic Prof Gorban, Support Academic Prof Levesley)
- In addition the group has had various consultancy contracts (2013-16) with Weatherford Int. (c. £400,000); with project aims: *'Data analytics and modelling'* (PIs for various projects Prof Levesley, Prof Gorban, Co-I Dr Mirkes). This is one of the highest amounts of money paid to any university in the world by Weatherford Int. This research has resulted in a patent application on software which will improve services to Weatherford clients.

**SUMMARY OF EXPECTED ECONOMIC IMPACT**

Based on company projections, the projected economic impact on the company partners – in terms of generating increases in additional turnover, profit and jobs created – over the next 5-7 years is summarised in the table below:

Company partners	Additional turnover	Additional net profit before tax	No. of jobs created
Apical Ltd	£17.6M	£6.2M	6
VMS Ltd	£5M	£2.1M	5
Photek Ltd	£10M	£2.2M	8
Scicasts Ltd	£100M	£50M	10
Dataffirm Ltd	£201.3M	£45.3M	10
<b>TOTAL</b>	<b>£333.9M</b>	<b>£105.8M</b>	<b>39</b>

Details of collaborating organisations and individuals

Apical Ltd (now Imaging and Vision Group of ARM) - Ilya Romanenko (Research Director)  
 VMS Ltd – Jay Shields (Managing Director)  
 Photek Ltd – Gareth Jones (Managing Director)  
 Scicasts Ltd – Tim El-Sheikh (Managing Director)  
 Dataffirm Ltd - John Paleomyllites (Chief Executive Officer)  
 Weatherford Int. - Peter Elkington (Chief Geoscientist, RD&E)