Machine Learning

Your Name: Faraz Janan

Link to your staff profile page: http://staff.lincoln.ac.uk/fjanan

Any other relevant links to your research:

http://www.assure-project.eu/partners/matakina-ltd/staff/faraz-janan-dr/

Copy, paste & fill in the below box for each project that you propose:

Project Name
3D Modelling using Hololens
Project Description: (This can be as long and detailed as you wish, but about 3 or 4 sentences will probably get the point across)
The project will aim to develop a 3D projection model for imaging data. Hololens is state of the art technology, introduced by Microsoft recently, to create a 3D hologram of an object imaged from various angles. This project will implement such a hologram and then further try to segment regions of in the 3D projections from the data in the 2D images. This is a challenging project while offering a considerable demand in industry.
Are there any prerequisite skills / courses? Image processing and machine learning skills would be an advantage.
Computer Programming
Which degree program is this aimed at? (It can be more than 1) Computer science, game programming
For students of any bachelors/masters lever program in computer science. Both bachelors and masters, however, for the masters level the final goals are set more precisely
Number of students you wish to undertake this project

Your Name: Dr George Leontidis

Link to your staff profile page: http://staff.lincoln.ac.uk/gleontidis

Any other relevant links to your research: http://mlearn.lincoln.ac.uk

Complete this form for each project that you propose:

Project Name
Deep Neural Networks for Image Classification
Project Description:
A deep neural network is an artificial neural network with multiple hidden layers of units between the input and output layers. DNNs can model complex non-linear relationships and provide very good results in object recognition and image classification. The extra layers enable composition of features from the lower layers, enabling us to model complex data. This project aims to build and test deep neural architectures to effectively classify images into various categories, according to their content. Application areas vary such as images of food packages, images of dogs to classify actions, MRI scans to classify disease/no-disease, etc
Are there any prerequisite skills / courses?
No
Which degree program is this aimed at? (It can be more than 1)
Any
Number of students you wish to undertake this project
No limit

Your Name: Dr George Leontidis

Link to your staff profile page: http://staff.lincoln.ac.uk/gleontidis

Any other relevant links to your research: http://mlearn.lincoln.ac.uk

Complete this form for each project that you propose:

Project Name
Optic Disc Localisation in Retinal Fundus Images
Project Description:
Human retina is an important, non-invasive window for monitoring the blood vessels, and is part of the brain's vascular system. A number of retinal, cardiovascular and systemic diseases can be identified by studying the retinal vasculature and the morphological changes. A challenging task is to localise and measure the diameter of the optic disc, which is found in every fundus image and has been associated with diseases, such as glaucoma.   This project aims to build and test image processing and/or machine learning techniques in order to localise and/or measure the diameter of the optic disc and possibly identify any irregularities.
Are there any prerequisite skills / courses?
No
Which degree program is this aimed at? (It can be more than 1)
Any
Number of students you wish to undertake this project
No limit

Your Name: Dr George Leontidis

Link to your staff profile page: http://staff.lincoln.ac.uk/gleontidis

Any other relevant links to your research: http://mlearn.lincoln.ac.uk

Complete this form for each project that you propose:

Project Name
Leveraging big data analytics for digital heritage and culture
Project Description:
Large collection of items that refer to heritage and culture as can be found in museums and libraries include large amount of data as well. This project aims to collaborate with other students from the **School of History and Heritage**, to combine knowledge so that a system can be developed to crawl large amount of data, find associations between items, recommend the user an item based on previously visited one, such as a specific painting from the Enlightment period might be linked to another item. So the user might be interested to view this item as well. This is a challenging task given that the collections include millions of items. To conclude, the project will investigate all the above and come up with some sort of solutions.
Are there any prerequisite skills / courses?
No
Which degree program is this aimed at? (It can be more than 1)
Any
Number of students you wish to undertake this project
No limit

Dr Grzegorz Cielniak

http://staff.lincoln.ac.uk/gcielniak

My research interests include robotics, computer vision, machine learning and AI. I would be happy to supervise students with similar interests. If you would like to discuss your own ideas,please drop me an email(gcielniak@lincoln.ac.uk).

Some of the projects for consideration by students who like programming:
-navigation, perceptionand remote management of agricultural robotsincluding Thorvald (https://www.youtube.com/watch?v=uae7ga-q5oU) and Husky (https://www.youtube.com/watch?v=XRYusHTtaN0);-
real-time simulation of deformable terrain;
-procedural generation of agricultural vegetation in simulation;
-using Internet of Things buttons (e.g. Amazon Dash) as a simple user interface to control apps/home appliances/robots, etc.;

-computer vision for agriculture;
-augmented reality to assist the analysis of 3D point clouds of agricultural crop.

Heriberto Cuayáhuitl

http://staff.lincoln.ac.uk/hcuayahuitl

Project Name
Data-Driven Automated Personal Assistant
Project Description:
The goal of this project is to develop and to train an Android-based agent for human-car or human-watch interactions using speech. Its purpose is to help car drivers or pedestrians on the move in tasks such as searching for music to be played, navigating to desired locations, sending/reading text messages, reading news, reading twitter feeds, making phone calls, querying the Internet, and searching or updating calendar information. All or some of these need to take into account personal preferences and historic information, and should be addressed in a conversational manner rather than one-shot interactions. You will collect example interactions for training your agent using machine learning.
Are there any prerequisite skills / courses?
This project can use the following software resources: • Android Auto: https://developer.android.com/auto/index.html • Android Wear: https://developer.android.com/wear/index.html • SimpleDS: https://github.com/cuayahuitl/SimpleDS • Alfred: https://github.com/JackDuffy/alfred

Which degree program is this aimed at?
Bsc/MSc Computer science and information systems
Number of students you wish to undertake this project
Up to 5

Your Name: James Brown

Link to your staff profile page: https://staff.lincoln.ac.uk/jamesbrown

Any other relevant links to your research:
https://scholar.google.com/citations?user=bBXF4jgAAAAJ&hl=en

Complete this form for each project that you propose:

Project Name
Classification of musculoskeletal phenotypes in x-ray images of mouse models
Project Description:
Musculoskeletal disorders (MSDs) are the second leading cause of disability globally, comprising more than 200 different conditions of the bones, muscles and joints. Basic research into the genetic factors associated with MSDs is essential to the development of new drugs, which is made possible using x-ray imaging to study "knockout" animal models. For large scale projects, the annotation of such data is prohibitively time consuming. This project will involve the development of image classification techniques to automatically annotate bone abnormalities from x-ray images.
Are there any prerequisite skills / courses?

Programming in Matlab/C++/Python, some knowledge/experience in machine learning. CMP3108M Image Processing

Which degree program is this aimed at? (It can be more than 1)
BSc Computer Science, MComp Computer Science

Number of students you wish to undertake this project
3 - 4

Project Name
Intracranial hemorrhage classification from computed tomography data

Project Description:
Intracranial hemorrhages are bleeds inside the skull that require a timely diagnosis and intervention to prevent serious complications such as stroke. When a patient presents with relevant neurological symptoms, a computed tomography (CT) scan is typically performed so that doctors can identify the presence, location and type of hemorrhage. This process is both difficult and time consuming, and could be improved through the use of automated techniques. This project will involve the development of image classification techniques to automatically diagnosis intracerebral hemorrhage from CT scans.

Are there any prerequisite skills / courses?
Programming in Matlab/C++/Python, some knowledge/experience in machine learning. Passed CMP3108M Image Processing

Which degree program is this aimed at? (It can be more than 1)
BSc Computer Science, MComp Computer Science

Number of students you wish to undertake this project
2 - 3

Project Name
Optimization of pre-training schemes for medical image analysis

Project Description:
Nowadays, deep learning is the "weapon of choice" for solving problems in medical image analysis. A key limitation of deep learning however is the need for large annotated datasets to minimize overfitting and maximize generalizability. While many researchers use external datasets such as ImageNet to "pre-train" their networks, there is no clear evidence that this significantly improves performance in medical contexts, as they tend to be biased towards irrelevant texture features. Furthermore, ImageNet pre-trained networks cannot be readily applied to 3D and 4D images. This project will look to explore and propose pre-training methods that are better suited to medical images and offer improved performance/robustness over ImageNet.

Are there any prerequisite skills / courses?
Programming in Matlab/C++/Python, some knowledge/experience in machine learning. Passed CMP3108M Image Processing

Which degree program is this aimed at? (It can be more than 1)
BSc Computer Science, MComp Computer Science

Number of students you wish to undertake this project
2 - 3

Your Name: DEA's Dicky Patounas + SoCS mLearn/LoVE

Link to your staff profile page: www.dea.aero

Any other relevant links to your research:

Complete this form for each project that you propose:

Project Name
Follow-on project from work placement with DEA Aviation Ltd related to airborne ISR and airborne remote sensing.
Project Description:
Design software to improve data transfer rates of video and image files via a beyond line of sight satellite link between airborne capture and ground station.   DEA Aviation Ltd (www.dea.aero) operates maritime patrol aircraft fitted with a variety of systems. These systems are: Electro-optical and infra-red cameras Maritime radars Automatic Identification System (AIS) receivers Beyond Line of Sight Satellite links   DEA sends live full motion video over a low bandwidth beyond line of sight satellite link. The bandwidth available is only 384kbps. The imagery is sent via an encoder which suppresses and controls the output quality of the video before it is transmitted via the satellite link. DEA would like to further compress the video data before it is sent via the satellite link, in order to improve the quality of the image that is received at the ground station.   The project aims to devise ways of compressing the image through a combination of smart masking and advanced compressing techniques (software + hardware) with the end result being the best possible video quality received at the ground station.
Are there any prerequisite skills / courses?

Machine Learning and Vision/Imaging or equivalent preferred. Familiarity with DEA's equipment and modus-operandi.

Which degree program is this aimed at? (It can be more than 1)
BSc, MComp/MSc

Number of students you wish to undertake this project
This project is intended as a follow-on of a current placement.

our Name: Sills & Betteridge LLP, Solicitors (Andrew Kerrigan or colleague) + SoCS mLearn & CS

Link to your staff profile page:

Any other relevant links to your research:

https://www.legalfutures.co.uk/latest-news/regional-firms-motoring-law-chatbot-first-of-many

http://www.thebusinessdesk.com/eastmidlands/news/2017203-law-firm-launches-legal-tech-drive

Complete this form for each project that you propose:

Project Name
Health and safety sentencing guide or daily assistant

Project Description:
The penalties for breach of health and safety law vary substantially depending on the circumstances of the breach. It is often difficult for businesses and professionals to properly assess and predict the outcome of health and safety investigations and prosecutions.

The project is to develop a web based tool to assist businesses, solicitors, insurers and others estimate the penalty risk arising from a breach of health and safety legislation. The tool may utilize an element of machine learning/AI technology.

Users of the tool should be guided through the decision tree of health and safety guidelines and the information provided will be cross-referenced against the HSE database of prosecution results collated since 1 February 2016. The tool will provide the user with a list of relevant decided cases more accurately than a search engine (e.g. Google or equiv.) and more efficiently than manually trawling through the HSE database.

Alternatively, or in addition, the project might consider whether it is possible to utilize a machine learning tool to create a health and safety daily assistant which asks a question such as "What is the next task you are about to perform?" in response to which the assistant will search for and provide the most relevant health and safety guide to assist with that task and also find relevant cases which illustrate the type of accidents people have suffered whilst undertaking that task.

If, subject to review and testing, the web based tool is successful, the project may be published on the Sills & Betteridge website and/or promoted by Sills & Betteridge for the benefit of its clients.

Are there any prerequisite skills / courses?
Computing, database, ML/AI, web app; teaming up with Law student a +
Which degree program is this aimed at? (It can be more than 1)
BSc; MComp/MSc (depending on the extent of the ML/AI component and level of implementation)
Number of students you wish to undertake this project
No preference.

Your Name: Sills & Betteridge LLP, Solicitors (Andrew Kerrigan or colleague) + SoCS CS

Link to your staff profile page:

Any other relevant links to your research:

https://www.legalfutures.co.uk/latest-news/regional-firms-motoring-law-chatbot-first-of-many

http://www.thebusinessdesk.com/eastmidlands/news/2017203-law-firm-launches-legal-tech-drive

Complete this form for each project that you propose:

Project Name
Pot Hole claims platform
Project Description:
The poor state of repair of some roads in Lincolnshire and other counties frequently causes motorists to suffer damage to their vehicles. In some circumstances local authorities are liable to compensate motorists for this damage. Unfortunately, obtaining legal advice to help pursue these claims can be prohibitively expensive and many motorists find it difficult to get clear advice regarding their particular circumstances and where to send their claim. The project is to design a web page/platform/app which enables members of the public who have suffered damage to their vehicle from pot holes to capture the location of the incident, identify the responsible local or roads authority, upload relevant evidence, populate a standard "letter of claim", all through a text chat style interface. The web page/platform/app will email the user a copy of a completed letter of claim, populated with the relevant information and enclosing or attaching the relevant evidence, together with the email address the letter needs to be sent to. If, subject to review and testing, the web page/platform/app is successful, the project may be published on the Sills & Betteridge website.

An extension to this project may be to create a general incident notification/capture platform by which law firms can produce similar procedures to generate letters of claim in other areas of the law.

Are there any prerequisite skills / courses?
Computing, web/mobile app; teaming up with Law student a +

Which degree program is this aimed at? (It can be more than 1)
BSc; MComp/MSc (depending on the extent of the ML/AI component and level of implementation)

Number of students you wish to undertake this project
No preference.

Your Name: Mingjun Zhong

Link to your staff profile page: http://staff.lincoln.ac.uk/mzhong

Any other relevant links to your research: https://arxiv.org/pdf/1612.09106.pdf

Complete this form for each project that you propose:

Project Name
Deep neural networks for nonintrusive load monitoring
Project Description:
It has been recognized that reducing energy demand is one of the most effective interventions to meet 2050 greenhouse gas emission targets. In order to reduce energy demand, it is essential to understand how the energy is used. For example, helping the householders to understand what is causing them to use energy could motivate them to reduce their energy consumption. Energy disaggregation, i.e., nonintrusive load monitoring, is a single-channel blind source separation problem that aims to decompose the whole energy consumption of a building into energy usage of individual appliances. It has been shown that disaggregated information can help householders to reduce energy consumption by as much as 5-15%. However, current electricity meters can only

report the whole-home consumption data. This triggers the demand of machine-learning tools to infer the appliance-specific consumption.

This project aims to develop deep neural network approaches to nonintrusive load monitoring. Specifically, this project is to use deep neural network methods to decompose the mains readings (the whole-home consumption readings) from a household into appliance-level readings.

Are there any prerequisite skills / courses?
Good skills in Python programming.
Which degree program is this aimed at? (It can be more than 1)
Any
Number of students you wish to undertake this project
2

Your Name: Shouyong Jiang

Link to your staff profile page: https://staff.lincoln.ac.uk/sjiang

Any other relevant links to your research:

Complete this form for each project that you propose:

Project Name

Evolutionary computing for mixed-integer programming
Project Description:
Many real-life problems can be interpreted as optimization problems (e.g. cost function in machine learning/deep learning), and these problems normally have a combination of discrete and continuous variables which we call mixed integer variables. Mixed integer problems are difficult to solve by classic mathematic programming due to either nonconvexity or indifferentiality. Instead, evolutionary computing approaches inspired by intelligent behaviors of animals/particles in nature can provide a way to solve these types of problems. This project is to develop new evolutionary computing approaches to deal with mixed integer problems.
Are there any prerequisite skills / courses?
Familiar with Matlab/python/c++, and have a bit knowledge of optimisation
Which degree program is this aimed at? (It can be more than 1)
BSc Computer Science, MComp Computer Science
Number of students you wish to undertake this project
2

Project Name
Evolutionary computing for constrained multiobjective optimisation
Project Description:
Evolutionary algorithms/bio-inspired swarm intelligence have shown great promise for solving multiobjective optimization problems to reach a good trade-off between several conflicting objectives (eg. Min effort vs max output).

However, such approaches are not well understood if facing constraints. This project is to develop advanced approaches to solve effectively multiobjective problems with constraints.

Are there any prerequisite skills / courses?
Familiar with Matlab/python/c++

Which degree program is this aimed at? (It can be more than 1)
BSc Computer Science, MComp Computer Science

Number of students you wish to undertake this project
1

Project Name
Computational toolbox for dynamic multiobjective optimisation

Project Description:
Many effective algorithms have been proposed so far to solve dynamic multiobjectivve optimisation problems. However, many of them are written in different languages of different standards. This project is to create a toolbox of either matlab or python to include as many popular algorithms as possible. Therefore, good programming skills are desirable.

Are there any prerequisite skills / courses?
Familiar with Matlab/python

Which degree program is this aimed at? (It can be more than 1)
BSc Computer Science, MComp Computer Science

Number of students you wish to undertake this project
1

Your Name: Stefanos Kollias

Link to your staff profile page: mlearn.lincoln.ac.uk

Copy, paste & fill in the below box for each project that you propose:

Project Name
Affective Computing – Sentiment Analysis
Project Description: (This can be as long and detailed as you wish, but about 3 or 4 sentences will probably get the point across)
Affective Computing has been a recent significant sub area of Computer Science dealing with the analysis of human behaviors and/or synthesis of machine responses in the framework of social, leisure, business interactions.   It relates to multimedia data analysis, machine learning, emotion representation.   Sentiment analysis mainly refers to extraction of the mood of persons when they upload text messages on social media and the web; it, for example, tries to detect reactions of the public to political, or social, events, statements, activities.

It relates to natural language processing, machine learning, knowledge representation.
Are there any prerequisite skills / courses?
Understanding basic content analysis technologies
Which degree program is this aimed at? (It can be more than 1)
B.Sc or MComp.
Number of students you wish to undertake this project
1-3

Your Name: Stefanos Kollias

Link to your staff profile page: mlearn.lincoln.ac.uk

Copy, paste & fill in the below box for each project that you propose:

Project Name
Adaptation of Deep Learning Models on Image Classification
Project Description: (This can be as long and detailed as you wish, but about 3 or 4 sentences will probably get the point across)
The use of deep learning for image classification has been very successful the last five years, with its applications spanning the whole image analysis and computer vision field. In this framework one trains deep neural networks, such as convolutional, convolutional plus recurrent, in a specific problem and uses them in a similar domain, e.g., as priors, through transfer learning, or domain adaptation, to take advantage of the already acquired knowledge in them.

Automatic, or semi-automatic use of these techniques for big data analysis is of great interest, requiring combining supervised and unsupervised training and analysis of the networks used.
Are there any prerequisite skills / courses?
Understanding basic deep learning for content analysis
Which degree program is this aimed at? (It can be more than 1)
B.Sc or MComp.
Number of students you wish to undertake this project
1-2

Your Name: Wenting Duan

Link to your staff profile page:

Any other relevant links to your research:

Complete this form for each project that you propose:

Project Name
Estimation of proliferation indices from microscopic images for tumour progression analysis
Project Description:
Glioblastoma multiforme (GBM) is the most common and aggressive malignant type of primary brain tumour. This kind of tumour grows very quickly. Without treatment, 95% of patients die within 3 months of diagnosis and only a small subset survive longer. The project is about developing or using image processing/deep learning techniques to aid the clinicians to understand how fast a tumour is growing in order to make treatment decisions.
Are there any prerequisite skills / courses?
Matlab/C++/Python

Which degree program is this aimed at? (It can be more than 1)
BSc Computer Science, MComp Computer Science

Number of students you wish to undertake this project
2

Your Name: Xujiong Ye

Link to your staff profile page: http://staff.lincoln.ac.uk/xye

Any other relevant information:

My main research interests are in the area of (medical) image processing, machine learning and computer vision. I would like to supervise the projects related to this field, such as image segmentation, object detection, noise removal, shape analysis, or image reconstruction, etc.

Project Name
Medical Image Classification

Project Description:
The aim of this project is to use advanced machine learning techniques to classify tumor into different grades (i.e. low grade or high grade). You will be given a number of statistical and texture features calculated from the segmented tumor region from different imaging modalities. You will also be provided with ground truth data to train the classifier model.

Are there any prerequisite skills / courses?
Basic knowledge of Matlab/C++, machine learning, Image processing

Which degree program is this aimed at? (It can be more than one)
BSc CS, MCOMP CS

Number of students you wish to undertake this project

2