Software Engineer [KTP Associate]: Automated analysis of laser scans of production plants

SCHOOL OF ENGINEERING

Closing date: 5 January 2021
Interview date: TBC
Reference number: ENG161R
INTRODUCTION

We are seeking a Software Engineer [KTP Associate] to work in on a 30 month Knowledge Transfer Partnership [KTP] between the University of Aberdeen and Global Design Innovation Ltd (GDi). GDi are an Aberdeen-based engineering business specialising in innovative upstream Engineering, Procurement and Construction (EPC) business providing survey (laser scanning), asset management software, engineering/design, fabrication and construction services to the energy sector.

The role of the KTP Associate is to develop a software tool that automatically recognises equipment from laser scans of production plants. This will require the processing of terabytes of scan data automatically to identify pipes, pipe fittings, and equipment. This strategic project aims to deliver massive savings in engineering time and enable new products and services to be launched by GDi, such as automatically verifying a whole plant design. The applicant therefore needs to be an experienced researcher who can lead their own research and apply their programming skills to object recognition through machine learning. They will also need to have excellent interpersonal skills as they will work within the engineering teams at GDi to transfer and embed the software tool, while integrating their feedback. They will also need entrepreneurial skills to assist GDi in commercialising this tool through exploring new opportunities that the availability of this technology provides.

The Associate will be supported and academically supervised by Dr Marcus Bannerman and Dr Andrew Starkey in the School of Engineering at the University of Aberdeen. Dr Bannerman has worked extensively with industrial partners on over £3.7M of externally funded research and is an expert in computational simulation, applied programming, and data analysis. Dr Starkey has as over 20 years’ experience of developing AI technologies winning multiple awards for his commercial work. His expertise in machine learning and optimisation will be crucial in delivering the object extraction algorithms required for this KTP project.

JOB DESCRIPTION

Main purpose of the role:

The Associate will develop an innovative new software tool which using C++/C# and python; thus, the candidate will require strong background as a research programmer. They will develop an AutoCAD plugin frontend which is to be linked to a Point Cloud Library backend for basic data processing; however, the intermediate processing of point cloud data into AutoCAD Plant 3D objects is the primary technical challenge. The Associate will extend existing code from the recognition of pipes to include pipe fittings such as valves until entire pipe runs can be identified and accurately remodelled. They will also develop a complementary tool to fit structural elements identified within the point cloud and extract mechanical design measurements.

While many basic algorithms for object extraction exist in the literature and implementations are available in open source libraries such as the Point Cloud Library, these will need specialising to the problem (and scanning equipment) that is in use. This is a research-intensive project and will require rapid development and deployment of machine learning approaches as well as more traditional optimisation-based approaches.

The Associate will lead the project, which includes updating the key stakeholders including the management team at GDi, the academic supervisory team, and the funders. They will also interface with the commercial and engineering teams within GDi to carry out key tasks such as commercial development and integration of feedback from the deployment and use of early versions of the software tool.

Key Responsibilities:

- Leading the development of the technology, reporting to key stakeholders, and being the bridge between the academic and industrial teams.
- Development of the software tool code and deployment of the tool to the GDi engineering team.
- Researching and implementing novel object recognition algorithms that can automatically extract equipment from laser point scans.
- Developing new commercial opportunities for the technology.

AT A GLANCE:

- SALARY: £40,000 per annum, with an additional £5,000 training budget over the project duration.
- HOURS OF WORK: Full Time
- CONTRACT TYPE: 30 months
CANDIDATE BACKGROUND

The candidate should be a capable programmer as the key technical challenge of this project is the development of a software tool. As this is a technological breakthrough, the applicant should also have a strong research background, with proven experience in developing novel code/algorithms. They should hold a PhD, or have equivalent experience, degree in Engineering or applied sciences (physics, computer science, physics, or a related field).

The candidate needs to have excellent communication and interpersonal skills, they should be able to manage their own workload, working both independently and as part of a team as required. The candidate should also demonstrate a high level of enthusiasm for the research programme and the development of commercial opportunities.

TERMS OF APPOINTMENT

Knowledge Transfer Partnerships [KTP] support partnerships between business and universities, placing graduates [KTP Associates] within a business to work on strategic, innovative, high-profile projects.

This project is a full-time position based at the Global Design Innovation Ltd [GDi] office in Aberdeen.

As this post is funded by Innovate UK, the Scottish Funding Council and GDi it is available for a period of 30 months.

Salary will be paid at the rate of £40,000 per annum.

The position also benefits from an additional personal development budget of £5,000 and provides an excellent opportunity to develop a career as an industry innovator.

Should you require a visa to undertake employment in the UK you will be required to fulfil the minimum points criteria to be granted a Certificate of Sponsorship under the requirements of the Skilled Worker visa. At the time an offer of appointment is made, you will be asked to demonstrate that you fulfil the criteria in respect of qualification and competency in English. For research and academic posts, we will consider eligibility under the Global Talent visa. Please do not hesitate to contact Heather Clark, HR Adviser (e-mail: h.m.clark@abdn.ac.uk) for further information.
# PERSON SPECIFICATION

<table>
<thead>
<tr>
<th>Education/Qualifications</th>
<th>Essential</th>
<th>Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic, technical and</td>
<td>• A minimum of a 2.1. degree in Engineering or applied sciences</td>
<td>• The applicant must be familiar with scientific programming and</td>
</tr>
<tr>
<td>professional education</td>
<td>(physics, computer science, physics, or a related field).</td>
<td>computation, developing data processing algorithms, and the</td>
</tr>
<tr>
<td>and training</td>
<td>• A PhD or similar research experience is also required in a related</td>
<td>processing of large data sets.</td>
</tr>
<tr>
<td></td>
<td>field, with an applied computational focus.</td>
<td></td>
</tr>
<tr>
<td>Work and Other relevant</td>
<td>• A strong background in scientific/applied programming for</td>
<td>• Development experience in C# (for Plant3D development).</td>
</tr>
<tr>
<td>experience (including</td>
<td>algorithmic development.</td>
<td>• Experience with the Point Cloud Library.</td>
</tr>
<tr>
<td>training)</td>
<td>• Experience in C/C++ and Python</td>
<td>• Experience with AutoCAD development/API.</td>
</tr>
<tr>
<td></td>
<td>programming is also required due to working with AutoCAD and some</td>
<td>• Familiarity with optimisation and machine learning techniques will</td>
</tr>
<tr>
<td></td>
<td>existing code.</td>
<td>be very useful.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Experience in object recognition algorithms in three dimensions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Knowledge of engineering in the upstream oil and gas industry,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>particularly around modifications offshore is highly desirable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal qualities and</td>
<td>• A self-motivated researcher, capable of proposing and independently</td>
<td>• Exposure to the wider energy</td>
</tr>
<tr>
<td>abilities</td>
<td>exploring modifications to algorithms.</td>
<td>industry to understand the market.</td>
</tr>
<tr>
<td></td>
<td>• An excellent team worker capable of working closely with both the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>commercial and engineering teams at GDi.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A person with an entrepreneurial outlook and strong project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>management skills as they will be expected to develop and launch a new</td>
<td></td>
</tr>
<tr>
<td></td>
<td>product within the scope of the KTP project.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Strong oral and written communication skills.</td>
<td></td>
</tr>
</tbody>
</table>
Aberdeen is a broad based, research intensive University, which puts students at the centre of everything it does. Outstanding in a wide range of discipline areas, Aberdeen has also been credited for its international reach and its commercialisation of research ideas into spin out companies. The University has over 16,000 matriculated students and 3,600 staff representing 130 nationalities. We encourage bold thinking, creativity and innovation, and we nurture ambition with many opportunities for professional and personal development in an inclusive learning environment which challenges and inspires.

2019 HIGHLIGHTS

- SCOTTISH UNIVERSITY OF THE YEAR (TIMES & SUNDAY TIMES)
- 70TH IN THE WORLD FOR RESEARCH CITATIONS (THE)
- 32ND IN THE WORLD FOR CONTRIBUTION TO THE UN SUSTAINABLE DEVELOPMENT GOALS (THE)
- 28TH MOST INTERNATIONAL UNIVERSITY IN THE WORLD (THE)
- 15TH EQUAL IN THE UK FOR OVERALL STUDENT SATISFACTION (NSS)
- 11TH BEST STUDENT INTAKE IN THE UK (TIMES & SUNDAY TIMES)
- PERCENTAGE OF SCOTTISH INTAKE FROM MOST DEPRIVED AREAS UP FROM 4.5% IN 2018/19 TO 9% IN 2019/20

CURRENT CONTEXT

The University will build on the significant achievements above in 2020 and beyond. Underpinning our high performance and significant growth is a £100m investment in Aberdeen’s estate which will include the completion of a new Science Teaching Hub, the regeneration of the historic King’s Quarter, and a new Business School building. The University has also invested in 50 new academic posts, and 2020 will see the launch of 5 Interdisciplinary, cross-institution Research Centres that will catalyse world-leading research in our areas of research strength. The 5 Interdisciplinary Challenges are: Energy Transition; Social Inclusion and Cultural Diversity; Environment and Biodiversity; Data and Artificial Intelligence; and Health, Nutrition and Wellbeing.

The University of Aberdeen is a recent recipient of The Queen’s Anniversary Prize, awarded to recognise world-class excellence in innovation and practical benefit to people and society. The University was given this award for health service research leading to improvements in academic and clinical practice and delivery of health care.

INTERNATIONAL

Aberdeen is also increasing its international presence, positioning the University as a global organisation, and building on its established partnership in Qatar with new partnerships in Sri Lanka, with the International Institute of Health Sciences, and in China, with Shanghai University and SCNU.

The University of Aberdeen is proud to be the first UK University to operate on a dedicated campus in Qatar. Phase 1 of this partnership with AFG College has successfully recruited over 600 students. Phase 2 will see the creation of a substantially larger campus, with capacity for at least 5,000 students and research activity. For further information on our Qatar campus, visit https://www.abdn.ac.uk/qatar/.
ABERDEEN 2040

On Founders’ day in 2020, our 525th anniversary as a University, we launched our new strategy ‘Aberdeen 2040’. Over the next 20 years, four strategic themes will shape our learning, discovery and strategic actions:

INCLUSIVE: We welcome students, staff and partners from all backgrounds, organisations and communities. We value diversity.

INTERDISCIPLINARY: We innovate in education and research by generating, sharing and applying new kinds of knowledge. We learn together.

INTERNATIONAL: We connect with others and extend our networks and partnerships around the world. We think across borders.

SUSTAINABLE: We understand and nurture our environment, and take care of our resources, including our people and our finances. We work responsibly.

OUR EDUCATION

Recognised as the Scottish University of the Year in the Times and Sunday Times Good University Guide 2019, we remain true to our roots as an ancient Scottish university, combining breadth and depth in our degree programmes and drawing strength from the quality of our research. Our flexible curriculum encourages students to grow as independent learners and therefore to thrive as graduates in the diverse workplaces of the future and become change-makers across the globe. Our education is open to all and we are setting ambitious targets to further widen access.

OUR RESEARCH

Researchers at the University of Aberdeen have been at the forefront of innovation and excellence throughout the centuries, generating insights in medicine, science, engineering, law, social sciences, arts and humanities. This research has contributed to five Nobel prizes as well as other awards such as the Queen’s Anniversary prize. Our research is intellectually rigorous, working within our established areas of excellence as well as new methods of enquiry. We will continue to generate new knowledge addressing economic and societal issues with ambition and imagination, ensuring that it is globally excellent and locally relevant.
**ABERDEEN AND ABERDEENSHIRE**

With a population of approximately 230,000, the city stands between the Rivers Dee and Don. This historic city has many architectural splendours and the use of its sparkling local granite has earned Aberdeen the name of the Silver City. Recognised as the energy capital of Europe, Aberdeen nevertheless retains its old-fashioned charm and character making it an attractive place in which to live.

Aberdeen enjoys excellent communication services with other European cities - e.g. flying time to London is just over one hour with regular daily flights. There are direct air links to London (City, Heathrow, and Luton), Manchester, Birmingham, Leeds, Southampton, Belfast and East Midlands within the U.K. There are also flights to international hub airports: Amsterdam (Schiphol), and Paris (Charles De-Gaulle as well as flights to other European destinations. [http://www.aberdeenairport.com](http://www.aberdeenairport.com) Road and rail links are also well developed.

The Grampian Region which took its name from the Grampian Mountains has a population of approximately 545,000. It is made up of five districts – Aberdeen, Banff & Buchan, Gordon, Kincardine & Deeside and Moray. The city and the surrounding countryside provide a variety of urban, sea-side and country pursuits. Aberdeen has first class amenities including His Majesty's Theatre, Music Hall, Art Gallery, the P&J Arena, Museums, and Beach Leisure centre. Within a short time, beach pursuits, equine activities, salmon, trout and sea fishing, hill-walking, mountaineering, golf, sailing, surfing and windsurfing can be reached. The city and the surrounding countryside are repeatedly given high ratings for quality of life in surveys.

Aberdeenshire is one of Scotland's most appealing regions. Royal Deeside and the Cairngorms National Park are within easy access of the city, and there are a variety of towns and villages scattered along the coastline.

Aberdeen and Aberdeenshire cater for a wide range of tastes in sporting and cultural activities.

To find out more about Aberdeen and Aberdeenshire go to [www.visitabdn.com](http://www.visitabdn.com)
EQUALITY & DIVERSITY

The University values a diverse working environment and recognises the benefits this can bring. The University is keen to receive applications from individuals from across all of the equality protected characteristics (age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex, sexual orientation).

The University supports opportunities for flexible working for a range of reasons and has policies in place to facilitate this. The policies can be found here: https://www.abdn.ac.uk/staffnet/working-here/flexible-working--5607.php

The University’s commitment to gender equality has been recognised through the achievement of an Athena SWAN Bronze award at institutional level and across all its subject areas. The University is also a Stonewall Diversity Champion to further LGBT+ equality.

The University is signed up to Advance HE’s Race Equality Charter, affirming the University’s commitment to the charter’s aim of improving the representation, progression and success of minority ethnic staff and students within higher education.

Candidates who are British Sign Language (BSL) user can contact us directly by using contact SCOTLAND-BSL

The University is delighted to be accredited as a Disability Confident employer and strives to ensure that disabled staff and students have the opportunity to work and study in an inclusive, accessible and supportive environment.

https://www.abdn.ac.uk/staffnet/governance/equality-and-diversity-277.php

HOW TO APPLY

Applications should include a curriculum vitae and personal statement of no more than two sides of A4, outlining your reasons for making an application.

Online application forms are available at www.abdn.ac.uk/jobs

The closing date for receipt of applications is 5 January 2021

Should you wish to make an informal enquiry please contact:

m.campbellbannerman@abdn.ac.uk

Please do not send application forms or CVs to m.campbellbannerman@abdn.ac.uk

Please quote reference number ENG161R on all correspondence