Job Description

ENGINEERING SCIENCE

Job title	Postdoctoral Research Assistant in Energy System Analytics
Division	Mathematical, Physical and Life Sciences Division
Department	Engineering Science
Location	Oxford e-Research Centre
Grade and salary	Grade 7: £32,817- £40,322 per annum
Hours	Full time
Contract type	Fixed-term for 19 months, or until 30 June 2021 (whichever is sooner)
Reporting to	Professor David Wallom
Vacancy reference	
Additional information	Reimbursement of relocation costs for postdoctoral positions is only available where allowed on the project.

Research topic	Energy Data science, Machine Learning, Analytics
Principal Investigator / supervisor	Prof David Wallom
Project team	Energy and Environmental Informatics Research group
Project web site	http://www.oerc.ox.ac.uk/collaborations/energy-and-environment
Funding partner	The funds supporting this research project are provided by EPSRC.
Recent publications	- Granell, R., Axon, C.J., Kolokotroni, M. and Wallom, D.C., 2019. A data-driven approach for electricity load profile prediction of new supermarkets. *Energy Procedia*, *161*, pp.242-250. - Caithness, N. and Wallom, D., 2018, August. Anomaly detection for industrial big data. In *Proceedings of the 7th International Conference on Data Science, Technology and Applications* (Vol. 1). Scitepress - Granell, R., Wallom, D., Janda, K.B. and Bright, S., 2017.

	Quantifying the impact of green leasing on energy use in a retail portfolio: limits to big data analytics. In *Proceedings of the European Council for an Energy Efficient Economy* (Vol. 4, pp. 1849-1859). ECEEE. -

The role

The Energy and Environmental Analytics research group has recently been awarded funding as part of the Analytical Middleware for Informed Distribution Networks (AMIDiNe) project sponsored by EPSRC for two roles within the project.

The programme of research that constitutes AMIDiNe will devise analytics that link point measurement to whole system to address the increasingly problematic management of electrical load on distribution networks as the UK transitions to a low carbon energy system. Traditionally, distribution networks had no observability and power flowed from large generation plant to be consumed by customers in this 'last mile'. Now, and even more so in future, those customers are generators themselves and the large generators that once supplied them have been supplanted by intermittent renewables. The UK government's initiative to roll out Smart Meters across the UK by 2020 has the potential to illuminate the true nature of electricity demand at the distribution and below levels which could be used to inform network operation and planning. Increasing availability of Smart Meter data through the Data Communications Company has the potential to address this but only when placed within the context of analytical and physical models of the wider power system - unlike many recent 'Big Data' applications of machine learning, power systems applications encounter lower coverage of exemplars, feature well understood system relations but poorly understood behaviour in the face of uncertainty in established power system models.

AMIDiNe sets out its analytics objectives in 3 interrelated areas, those of understanding how to incorporate analytics into existing network modelling strategies, how go from individual to group demand behavioural anticipation and the inverse problem: how to understand the constituent elements of demand aggregated to a common measurement point.

Both of the PDRA positions within the project will be contributing to workpackage 2, Distribution Load Understanding and Insights. This work package will analyse demand observations as provided on a per Meter Point Administration Number (MPAN) basis to develop understanding of the different group behaviours occurring rather than individual bespoke load profiles. This approach will be used in three ways: 1) to create specific models of different segmented groups of users where the segmentation is based on different energy consumption behaviour to inform the dynamics of regional load growth 2) to characterise points of aggregation within the network, such as ‘private wires’, aggregating the typical consumption profiles for clusters and 3) to help in the creation of possible scenarios where LCT are included.

Responsibilities

Specific Tasks

Both positions will be leading contributors on the outputs of a single work package within the project with the activities shared between both recruited positions depending on strengths across range of required capabilities;

- Investigate the effectiveness of a range of approaches for disaggregating the load profile obtained directly at the MPAN. Utilising a number of different approaches (e.g. Empirical Mode Decomposition, Probabilistic Time Frequency Masking or Independent Component Analysis) separating the profile into generation/storage and consumption classes and inform the capabilities for local and regional network operation.

- Deriving commonality amongst MPAN behaviours to increase the visibility of customers who adopt new technologies such as PV panels, batteries and EV to the network utilising Bayesian and traditional clustering mechanisms. This will build on our experience in the analysing of domestic and non-domestic customers with the driver for this work now being how flexibility will affect the visibility of different technologies within the data collected.

- Understanding Regional Load Growth, including demand profile migration, dynamics and prediction in terms of the demand-side response and behavioural change motivations. Increase understanding of the impact of external perturbations such as a cold weather events, clustered EV charging or internally social or domestic driven changes such as adoption of storage or low carbon heating will be investigated. The stability of characteristics will be assessed using established tools (e.g. bifurcation analysis).

Additional Tasks

- Manage own academic research and administrative activities. This involves small scale project management, to co-ordinate multiple aspects of work to meet deadlines
- Adapt existing and develop new scientific techniques and experimental protocols
- Test hypotheses and analyse scientific data from a variety of sources, reviewing and refining working hypotheses as appropriate
- Contribute ideas for new research projects
- Develop ideas for generating research income, and present detailed research proposals to senior researchers
- Collaborate in the preparation of scientific reports and journal articles and occasionally present papers and posters
- Use specialist scientific equipment in a laboratory environment
- Act as a source of information and advice to other members of the group on scientific protocols and experimental techniques
- Represent the research group at external meetings/seminars, either with other members of the group or alone
- Carry out collaborative projects with colleagues in partner institutions, and research groups
- The researcher may have the opportunity to undertake ad-hoc paid teaching (this includes lecturing, demonstrating, small-group teaching, tutoring of undergraduates and graduate students and supervision of masters projects in collaboration with principal investigators). Permission must be sought in advance for each opportunity and the total must not exceed 4 hours a week.
- Any other duties appropriate with the role.

This job description should be viewed as a guide to the role and is not intended as a definitive list of duties. It may be reviewed in light of changing circumstances with consultation with the post holder.

Selection criteria

Essential

- Hold a relevant PhD/Dphil, (or near completion*) together with relevant experience
- Demonstrable Data Science experience, including some but not necessarily all of, clustering (Bayesian/traditional), statistical techniques (e.g. PCA/CA), Machine Learning (supervised and unsupervised) or probalistic forecasting
- Demonstrable experience in developing software to implement analytic pipelines in languages such as python/C/C++ or similar.
- Ability to manage own academic research and associated activities
- Previous experience of contributing to publications/presentations
- Ability to contribute ideas for new research projects and research income generation
- Excellent communication skills, including the ability to write for publication, present research proposals and results, and represent the research group at meetings

**please note that 'near completion' means that you must have submitted your PhD thesis.*

Desirable

- Experience of performing analytics on energy data
- Experience of implementing mixture models on different types of dataset
- Experience of independently managing a discrete area of a research project
- Experience of actively collaborating in the development of research articles for publication

About the University of Oxford

Welcome to the University of Oxford. We aim to lead the world in research and education for the benefit of society both in the UK and globally. Oxford's researchers engage with academic, commercial and cultural partners across the world to stimulate high-quality research and enable innovation through a broad range of social, policy and economic impacts.

We believe our strengths lie both in empowering individuals and teams to address fundamental questions of global significance, and in providing all of our staff with a welcoming and inclusive workplace that supports everyone to develop and do their best work. Recognising that diversity is a great strength, and vital for innovation and creativity, we aspire to build a truly diverse community which values and respects every individual's unique contribution.

While we have long traditions of scholarship, we are also forward-looking, creative and cutting-edge. Oxford is one of Europe's most entrepreneurial universities. Income from external research contracts in 2014/15 exceeded £522.9m and ranked first in the UK for university spin-outs, with more than 130 spin-off companies created to date. We are also recognised as leaders in support for social enterprise.

Join us and you will find a unique, democratic and international community, a great range of staff benefits and access to a vibrant array of cultural activities in the beautiful city of Oxford.

For more information please visit www.ox.ac.uk/about/organisation

Engineering Science Department

Engineering teaching and research takes place at Oxford in a unified Department of Engineering Science whose academic staff are committed to a common engineering foundation as well as to advanced work in their own specialities, which include most branches of the subject. We have especially strong links with computing, materials science and medicine. The Department employs about 120 academic staff (this number includes 13 statutory Professors appointed in the main branches of the discipline, and 25 other professors in the Department); in addition there are 9 Visiting Professors. There is an experienced team of teaching support staff, clerical staff and technicians. The Department has well-equipped laboratories and workshops, which together with offices, lecture theatres, library and other facilities have a net floor area of about 22,000 square metres. The Department is ranked first in the world in the latest *Times Higher Education World University Rankings*.

Teaching

We aim to admit 160-170 undergraduates per year, all of whom take a 4-year Engineering Science course leading to the MEng degree. The course is accredited at MEng level by the major engineering institutions. The syllabus has a common core extending through the first two years. Specialist options are introduced in the third year, and the fourth year includes further specialist material and a major project.

Research

The Department was ranked the top engineering department in the UK, as measured by overall GPA, in the Research Excellence Framework 2014 exercise. We have approximately 350 research students and about 130 Research Fellows and Postdoctoral researchers. Funding for research grants and contracts, from a variety of sources, generates an annual turnover of approximately £34m in addition to general turnover of about £24m. The research activities of the department fall into seven broad headings, though there is much overlapping in practice: Thermofluids; Materials and Mechanics; Civil and Offshore; Information, Control and Vision; Electrical and Optoelectronic; Chemical and Process; Biomedical Engineering.

For more information please visit:

http://www.eng.ox.ac.uk/

The Department of Engineering Science holds a bronze Athena Swan award to recognise advancement of gender equality: representation, progression and success for all.

The Mathematical, Physical, and Life Sciences Division

The Mathematical, Physical, and Life Sciences (MPLS) Division is one of the four academic divisions of the University. In the results of the six-yearly UK-wide assessment of university research, REF2014, the MPLS division received the highest overall grade point average (GPA) and the highest GPA for outputs. We received the highest proportion of 4* outputs, and the highest proportion of 4* activity overall. More than 50 per cent of MPLS activity was assessed as world leading.

The MPLS Division's 10 departments and 3 interdisciplinary units span the full spectrum of the mathematical, computational, physical, engineering and life sciences, and undertake both fundamental research and cutting-edge applied work. Our research addresses major societal and technological challenges and is increasingly focused on key interdisciplinary issues. MPLS is proud to be the home of some of the most creative and innovative scientific thinkers and leaders working in academe. We have a strong tradition of attracting and nurturing the very best early career researchers who regularly secure prestigious fellowships

We have around 6,000 students and play a major role in training the next generation of leading scientists. Oxford's international reputation for excellence in teaching is reflected in its position at the top of the major league tables and subject assessments.

MPLS is dedicated to bringing the wonder and potential of science to the attention of audiences far beyond the world of academia. We have a strong commitment to supporting public engagement in science through initiatives including the Oxford Sparks portal (http://www.oxfordsparks.net/) and a large variety of outreach activities. We also endeavour to bring the potential of our scientific efforts forward for practical and beneficial application to the real world and our desire is to link our best scientific minds with industry and public policy makers.

For more information about the MPLS division, please visit: http://www.mpls.ox.ac.uk/

How to apply

Before submitting an application, you may find it helpful to read the 'Tips on applying for a job at the University of Oxford' document, at www.ox.ac.uk/about/jobs/supportandtechnical/.

If you would like to apply, click on the **Apply Now** button on the 'Job Details' page and follow the on-screen instructions to register as a new user or log-in if you have applied previously. Please provide details of two referees and indicate whether we can contact them now.

You must upload a CV and a supporting statement. The supporting statement should explain how you meet the selection criteria for the post using examples of your skills and experience. This may include experience gained in employment, education, or during career breaks (such as time out to care for dependants).

Your application will be judged solely on the basis of how you demonstrate that you meet the selection criteria stated in the job description.

References
Please give the details of people who can provide a reference for you. If you have previously been employed, your referees should be people who have managed you, and at least one of them should be your formal line manager in your most recent or current job. Otherwise they may be people who have supervised you in a recent college, school, or voluntary experience. It is helpful if you can tell us briefly how each referee knows you (e.g. 'line manager', 'college tutor'). Your referees should not be related to you.

We will assume that we may approach them at any stage unless you tell us otherwise. If you wish us to ask for your permission before approaching a particular referee, or to contact them only under certain circumstances (for example, if you are called to interview) you must state this explicitly alongside the details of the relevant referee(s).

Please upload all documents **as PDF files** with your name and the document type in the filename.

All applications must be received by **midday** on the closing date stated in the online advertisement.

Information for priority candidates

A priority candidate is a University employee who is seeking redeployment because they have been advised that they are at risk of redundancy, or on grounds of ill-health/disability. Priority candidates are issued with a redeployment letter by their employing departments.

If you are a priority candidate, please ensure that you attach your redeployment letter to your application (or email it to the contact address on the advert if the application form used for the vacancy does not allow attachments)

Should you experience any difficulties using the online application system, please email recruitment.support@admin.ox.ac.uk. Further help and support is available from www.ox.ac.uk/about_the_university/jobs/support/. To return to the online application at any stage, please go to: www.recruit.ox.ac.uk.

Please note that you will be notified of the progress of your application by automatic emails from our e-recruitment system. **Please check your spam/junk mail** regularly to ensure that you receive all emails.

Important information for candidates

Pre-employment screening

Please note that the appointment of the successful candidate will be subject to standard pre-employment screening, as applicable to the post. This will include right-to-work, proof of identity and references. We advise all applicants to read the candidate notes on the University's pre-employment screening procedures, found at:

www.ox.ac.uk/about/jobs/preemploymentscreening/.

Data Privacy

Please note that any personal data submitted to the University as part of the job application process will be processed in accordance with the GDPR and related UK data protection legislation. For further information, please see the University's Privacy Notice for Job Applicants at: www.admin.ox.ac.uk/councilsec/compliance/gdpr/privacynotices/job/. The University's Policy on Data Protection is available at: www.admin.ox.ac.uk/councilsec/compliance/gdpr/universitypolicyondataprotection/.

The University's policy on retirement

The University operates an Employer Justified Retirement Age (EJRA) for all academic posts and some academic-related posts. From 1 October 2017, the University has adopted an EJRA of 30 September before the 69th birthday for all academic and academic-related staff in posts at grade 8 and above. The justification for this is explained at: www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revaim/.

For **existing** employees, any employment beyond the retirement age is subject to approval through the procedures: www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revproc/

Form 1 October 2017, there is no normal or fixed age at which staff in posts at **grades 1–7** have to retire. Staff at these grades may elect to retire in accordance with the rules of the applicable pension scheme, as may be amended from time to time.

Equality of Opportunity

Entry into employment with the University and progression within employment will be determined only by personal merit and the application of criteria which are related to the duties of each particular post and the relevant salary structure. In all cases, ability to perform the job will be the primary consideration. No applicant or member of staff shall be discriminated against because of age, disability, gender reassignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief, sex, or sexual orientation.

Benefits of working at the University

University Club and sports facilities

The University Club provides social, sporting and hospitality facilities. It incorporates a bar, café and sporting facilities, including a gym. Staff can also use the University Sports Centre on Iffley Road at discounted rates, including a fitness centre, powerlifting room, and swimming pool. See: www.club.ox.ac.uk and www.sport.ox.ac.uk/oxford-university-sports-facilities.

Information for international staff (or those relocating from another part of the UK)

If you are relocating to Oxfordshire from overseas, or elsewhere in the UK, the University's International Staff website includes practical information related to moving to and settling in Oxford such as advice on immigration, relocation, accommodation, or registering with a doctor. See: www.internationalstaffwelcome.admin.ox.ac.uk/

The University of Oxford Newcomers' Club

The University of Oxford Newcomers' Club is an organisation run by volunteers that aims to assist the partners of new staff to settle into Oxford and to provide them with an opportunity to meet people in the area. See www.newcomers.ox.ac.uk/

Childcare

The University has excellent childcare services with five University nurseries, as well as University-supported places at many other private nurseries.

For full details including how to apply and the costs, see www.admin.ox.ac.uk/childcare.

Family-friendly benefits

The University subscribes to My Family Care (www.admin.ox.ac.uk/personnel/staffinfo/benefits/family/mfc/) and staff are eligible to register for emergency back-up childcare and adultcare services, a 'speak to an expert' phone line and a wide range of guides and webinars through a website called the Work + Family space.

Disabled staff

We are committed to supporting members of staff with disabilities or long-term health conditions. Please visit www.admin.ox.ac.uk/eop/disab/staff for further details including information about how to make contact, in confidence, with the University's Staff Disability Advisor.

Staff networks

The University has a number of staff networks including the Oxford Research Staff Society, BME staff network, LGBT+ staff network and a disabled staff network. You can find more information at www.admin.ox.ac.uk/eop/inpractice/networks/

Other benefits

Staff can enjoy a range of other benefits such as free visitor access to the University's colleges and the Botanic Gardens as well as a range of discounts.
See www.admin.ox.ac.uk/personnel/staffinfo/benefits