Dr CLAIRE BIRNIE

DATA SCIENTIST

PROFILE

Data scientist in the energy sector with expertise in geophysics and a strong background in physics, statistics and computer science. Passionate about devising new solutions to current business problems by combining established physics-based approaches with emerging data science techniques.

PROFESSIONAL EXPERIENCE

Jan 2021 - Present
Research Scientist - KAUST
Apply ML techniques to geoscientific problems.

Jan 2018 - Dec 2020
Data Scientist / Senior Data Scientist - Equinor (ne. Statoil)
Combine signal processing and ML for predictive maintenance and microseismic detection. Utilise NLP, ML, and knowledge grophs for improving offshore safety.

Apr 2017 - Aug 2017
R&D Intern - Nanometrics
Develop and document incorporation of noise suppression procedures into production toolbox.

Oct 2016 - Jan 2017
Visiting Researcher – University of Western Australia
Quantify and reduce uncertainties in microseismic imaging for CCS and subsurface reservoir utilisation.

May 2015
Geophysics Intern - Pinnacle, Halliburton
Microseismic imaging.

Jun 2013 - Aug 2013
Geophysics Intern - VSFusion, Baker Hughes
VSP modelling and processing.

EDUCATION

2014 - 2018
Ph.D. Geophysics - University of Leeds, UK
Title: Statistical methods for ambient noise characterisation, modelling and suppression: theory and applications for surface microseismic monitoring.

2017
Microsoft Professional Program in Data Science - Remote
Relevant modules: statistical data analysis; data cleansing and transformation; feature selection; dimensionality reduction; machine learning methods and optimisation.

2010 - 2014
B.Sc. with Hons. Geophysics and Meteorology - University of Edinburgh, UK
Project 1 (self-proposed): Effect of Gardner's relation on uncertainties in synthetic seismogram production
Project 2: Using a nearest-neighbour analysis for clustering of supra-glacial lake drainage in Greenland.

CONTACTS

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cebirnie92

SKILLS

Languages:
English – mother tongue, Italian – basic, Norwegian - basic.

Programming Languages:
Python (tensorflow, keras, pytorch, scikit-learn, nltk, plotly, pytest, sphinx), Neo4j, MATLAB, SQL, Unix shell scripting, LaTeX.

Others:
Microsoft Azure, Amazon AWS, Git, Bitbucket, JIRA.

AWARDS

Sep 2019 - Finalist for best application of AI, The DataSci & AI Awards

Jun 2017 - Subsurface Machine Learning Hackathon, Best Presentation Award.

Dec 2016 - Codess and Microsoft Scholarship for Professional Program in Data Science.

Aug 2016 - Australian Bicentennial Scholarship Award.

INVITED TALKS

Mar 2021 — **Second EAGE Workshop on Machine Learning**
Title: The key ingredients for scaling ML solutions in geoscience: explainability and infrastructure

Dec 2019 — **UiO Data Science M.Sc. guest lecture**
Title: Giving context to unstructured data.

Dec 2016 — **Curtin/CSIRO Geophysics seminar**
Title: An introduction to Isolated Covariance-based Noise Modelling and Whitening.

Apr 2015 — **UKCCSRC Spring 2015 Bi-annual meeting**
Title: Passive noise analysis from the permanent surface array at the Aquistore CCS site.

PUBLICATIONS

For a detailed list of publications see the attached publication list or visit my Google Scholar.

OPEN-SOURCE CONTRIBUTIONS

eNLP - A python library of commonly used NLP routines
Primary developer and maintainer.

TEACHING EXPERIENCE

June 2021 — **Utilising Unstructured Data in Geoscience Summer School - Instructor**
Prepared course material and taught virtual summer school hosted by KAUST–Iraya Energies.

Sept 2019 - Dec 2020 — **Python for Data Science - Instructor**
Prepared syllabus and material and taught course internally within Equinor.

Jul 2019 — **IGSC A mini-hackathon on data from the continental shelf - Organizer**
Prepared and hosted a hackathon for geoscience students. Open-sourced course material.

ORGANIZATIONAL EXPERIENCE

Oct 2020 - Present — **EAGE 2021 Workshop 'Development of ML Solutions at Scale: Going from proof of concepts to integrated workflows'**
Convenor.

Jan 2020 - Sept 2020 — **EAGE/AAPG Digital Geoscience Asia Pacific Conference & Exhibition**
Member of organizing commitee.

Jul 2019 — **Equinor DataDay18**
Organised an internal conference designed to connect different business units involved in using data.

Mar 2018 - Dec 2018 — **Data Science Team Training**
Identified core-areas of competence for data science team; sourced instructors; and, organised training courses.

VOLUNTEERING

Jan 2021 - Present — **Associate Editor of SEG Geophysics Journal**

Oct 2019 - Present — **Committee member of EAGE AI special community**

Jul 2019 - Dec 2020 — **Reverse mentor of Equinor COO**

Jan 2019 - Present — **Reviewer for several Geophysics journals**

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FULL PUBLICATION LIST

For a detailed list of publications and citation statistics visit my Google Scholar.

THESIS

Birnie, C.E. [2018], Statistical methods for ambient noise characterisation, modelling and suppression: theory and applications for surface microseismic monitoring. Doctoral dissertation, University of Leeds.

JOURNAL PUBLICATIONS

Birnie, C.E., Hansteen, F. [2021], Bidirectional recurrent neural networks for seismic event detection, Geophysics. Under Review.

Birnie, C.E., Ravasi, M., Alkhalifah, T., Liu, S. [2021], The potential of self-supervised networks for random noise suppression in seismic data, Artificial Intelligence in Geoscience.

Wang, H., Alkhalifah, T., bin Waheed, U., **Birnie, C.E.**, [2021], Data-driven Microseismic Event Localization: an Application to the Oklahoma Arkoma Basin Hydraulic Fracturing Data, IEEE Transactions on Geoscience and Remote Sensing.

Ravasi, M., **Birnie, C.E.**, [2021], A joint inversion-segmentation approach to assisted seismic interpretation, Geophysical Journal International.

Schuberth, M.G, Bakka, H.S. **Birnie, C.E.**, Dümmong, S., Haavik, K.E., Li, Q., Synnevåg, J.F., Saadallah, Y., Vinje, L., Constable, K. [2021] A Real-Time Fiber Optical System for Wellbore Monitoring: A Johan Sverdrup Case Study, SPE Offshore Europe Conference & Exhibition

Birnie, C.E., Jarraya, H., Hansteen, F. [2020], An introduction to distributed training of deep neural networks for segmentation tasks with large seismic datasets.

Birnie, C.E., Ravasi, M. [2020], Generating Custom Word Embeddings for Geoscientific Corpi, First Break.

Birnie, C.E., Chambers, K., Angus, D., and Stork, A. [2020], On the importance of benchmarking algorithms under realistic noise conditions, Geophysical Journal International.

Birnie, C.E., Sampson, J., Sjaastad, E., Johansen, B., Obrestad, L., Larsen, R., Khamassi, A. [2019], Improving the quality and efficiency of operational planning with risk management with ML and NLP, SPE Offshore Europe.

Stork, A.L., Nixon, C.G., Hawkes, C.D., **Birnie, C.**, White, D.J., Schmitt, D.R. and Roberts, B. [2018], Is CO_2 injection at Aquistore aseismic? A combined seismological and geomechanical study of early injection operations. International Journal of Greenhouse Gas Control.

Birnie, C., Chambers, K., and Angus, D. [2017], Seismic arrival enhancement through the use of noise whitening. Physics of the Earth and Planetary Interiors.

Birnie, C., Chambers, K., Angus, D., and Stork, A. [2016], Analysis and models of pre-injection surface seismic array noise recorded at the Aquistore carbon storage site. Geophysical Journal International.

CONFERENCE ABSTRACTS

Birnie, C., Ravasi, M., Alkhalifah, T. [2021], Self-supervised learning for random noise suppression in seismic data, First International Meeting for Applied Geoscience & Energy, 2869-2873

Birnie, C. [2021], GeoGraphI: An interactive graph database of openly available seismic datasets. 82nd EAGE Annual Conference & Exhibition 2021 (1), 1-5

Birnie, C., Ravasi, M. [2021], Geometry-independent realistic noise models for synthetic data generation. 82nd EAGE Annual Conference & Exhibition 2021

Ravasi, M., **Birnie, C.** [2021], A joint inversion-segmentation approach to assisted seismic interpretation. 82nd EAGE Annual Conference & Exhibition 2021

Birnie, C., Ravasi, M. [2021], On the generation of geometry-indipendent noise models for microseismic monitoring purposes. EGU General Assembly 2021.

Birnie, C., Jarraya, H., Hansteen, F., Schuchert, F. [2020], Enhanced microseismic event detection using deep neural networks. 82nd EAGE Conference and Exhibition 2020.

Birnie, C., Ravasi, M. [2020], Generating custom word embeddings for geoscientic corpi. 1st EAGE Digitalization Conference and Exhibition 2020.

Birnie, C., Jarraya, H. [2020], How to leverage advanced TensorFlow and cloud computing for efficient deep learning on large seismic datasets. 1st EAGE Digitalization Conference and Exhibition 2020.

Nowacki, A., Shi, P., Angus, D.A., Rost, S., **Birnie, C.**, Yuan, S. [2017], Automatic seismic waveform location using multichannel coherency migration for induced and natural earthquakes. AGUFM 2017.

Birnie, C., Chambers, K., Angus, D, and Stork, A. [2017], Exploiting the covariance of the noise field for robust noise suppression. SEG's International Exposition and 87th Annual Meeting.

Birnie, C., Chambers, K. and Angus, D. [2017], Noise Whitening of Seismic Data. 79th EAGE Conference and Exhibition 2017.

Birnie, C., Chambers, K., Angus, D, and Stork, A. [2016], Effect of noise on microseismic event detection and imaging procedures using ICOVA statistical noise modelling method. SEG's International Exposition and 86th Annual Meeting.

Birnie, C., Chambers, K. and Angus, D. [2016], Statistical Modelling of Pre-injection Noise Recorded at the Aquistore Carbon Storage Site. 78th EAGE Conference & Exhibition.

Birnie, C., Chambers, K., Angus, D, and Stork, A. [2016], Modelling the enemy: A comparison of methods for simulating noise in seismic datasets. 17th International Seismix Symposium.

Birnie, C., Stork, A., Roach, L., Angus, D., and Rost, S. [2015], Spatial and temporal properties of noise from the Aquistore CCS pilot permanent surface array. Third Sustainable Earth Science Conference & Exhibition.

Birnie, C., Stork, A., Roach, L., Angus, D. and Rost, S. [2015], Passive noise analysis from the permanent surface array at the Aquistore CCS site. UKCCSRC Spring 2015 Bi-annual meeting.

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TRAINING HISTORY

Oct 2020 - Introduction to GANs	Online - Days: ●●●●●+
Apr 2019 - Introduction to Neo4j	Classroom - Days: ●
Jan 2019 - Subsurface: Introduction to the Full Lifecycle	Classroom - Days: ●●●●●
Dec 2018 - Spark with PySpark	Classroom - Days: ●●
Nov 2018 - Deep Learning with Keras/TensorFlow	Classroom - Days: ●●
Oct 2018 - Visualisation with Plotly and Dash	Classroom - Days: ●●
Oct 2018 - Advanced Python for Data Scientists	Classroom - Days: ●●
Sept 2018 - Estimating computational complexity	Classroom - Days: ◖
Sept 2018 - Python Best Practices for Software Development	Classroom - Days: ●
Sept 2018 - Introduction to Reinforcement Learning	Classroom - Days: ◖
Jun 2017 - Microsoft's Applied Machine Learning	Online - Days: ●●●●●+
May 2017 - Microsoft's Programming with Python for Data Science	Online - Days: ●●●●●+
Apr 2017 - Microsoft's Principles of Machine Learning	Online - Days: ●●●●●+
Mar 2017 - Microsoft's Data Science Essentials	Online - Days: ●●●●●+
Feb 2017 - ColumbiaX's Statistical Thinking for Data Science and Analytics	Online - Days: ●●●●●+
Jan 2017 - Microsoft's Querying with Transact-SQL	Online - Days: ●●●●●+
Jul 2016 - 2016 Madagascar School on Reproducible Computational Geophysics	Classroom - Days: ●●
Jul 2015 - VERCE Summer School	Classroom - Days: ●●●
Mar 2015 - NERC Numerical Earth Science Modelling	Classroom - Days: ●●●●●
Jan 2015 - NERC Software Carpentry Course	Classroom - Days: ●●