EAGE

EUROPEAN ASSOCIATION OF GEOSCIENTISTS & ENGINEERS

UNDER THE PATRONAGE OF HIS EXCELLENCY SHAIKH MOHAMMED BIN KHALIFA AL KHALIFA, MINISTER OF OIL, KINGDOM OF BAHRAIN

EAGE Subsurface Intelligence Workshop

STATE OF THE ART TECHNOLOGY APPLIED TO GEOSCIENCE

8-9 DECEMBER 2019 • MANAMA, BAHRAIN

- **Technical Programme**

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WORKSHOP OVERVIEW

Subsurface Intelligence (SI) aims to create high definition representations of the petroleum system where uncertainty is minimized, or the intrinsic uncertainty is quantified. SI couples state of the art technologies (including high performance computing, data sciences and AI) and deep knowledge of geoscience fundamentals to achieve the best constrained predictions for hydrocarbon prospects, producing fields and reservoirs.

Success in SI depends on the effective integration of human knowledge and skills with computer-generated models of the subsurface based on the suite of geophysical and geological datasets available to the industry from both the surface and sub-surface.

Conventional approaches for estimating the economic potential of subsurface targets requires the acquisition of different types of data throughout exploration and production. This typically means, that the deepest subsurface knowledge for given location is achieved when commercial operations are abandoned, and the opportunity to profit further from fully integrated data and interpretations has gone.

In addition, the timing of acquisition for different data types, such as an expenditure on a 3D seismic survey, or acquiring specific well logs, impacts the timing of new geologic insights and, in turn, key investment decisions.

The potential reward of applying SI during the process is to maximise the insight obtained from existing data prior to acquisition of new data, hence reduces the uncertainty in the subsurface model at an earlier stage. Not only does this increase confidence in the risk management process, from which commercial decisions are taken, it can ensure subsequent data acquisition is focused on reducing uncertainty of the revised critical risks.

With the advent of the 4th industrial revolution, technologies and techniques such as cloud computing, machine learning and advanced software algorithms, and cyber-physical systems are rapidly becoming integral to the Petroleum business. Furthermore, with geoscience knowledge at its all-time peak, the time is right to adopt a different mindset and shift to the new paradigm of Subsurface Intelligence, whereby practitioners can estimate, and continually revise, uncertainty in a more quantitative manner throughout the lifetime of a project leading to a more informed decision-making process.

Effective Subsurface Intelligence will enable us to capture full value from continuing hydrocarbon discoveries in mature basins, achieve more accurate evaluations of hydrocarbon resources and improve field development and production strategies. These objectives pose challenging questions, such as:

- What technology developments will be required?
- In what time frames can these be realistically achieved?
- How should we be training future generation of - geoscientists?
- What is the role of the future geoscientist in building an accurate high-definition representation of the subsurface?

EAGE GeoHack | 6-7 December 2019

A two-day coding, problem solving and social hackathon event, set to take place prior to the EAGE Subsurface Intelligence Workshop.

As a prelude to the workshop, we are excited to announce that we will be holding the first hackathon in the region on 6-7 December 2019 in Manama, Bahrain: the EAGE GeoHack.

Focusing on solving on big data geoscience problems in the oil & gas industry, the GeoHack is highly anticipated and will bring together machine learning enthusiasts, students, geoscientists, and industry specialists to exchange ideas and develop solutions to the many complex earth imaging problems the industry is faced with.

The GeoHack will facilitate a suitable atmosphere where coders, software developers, engineers and geoscientists will spend intensive hours to hack, test and experiment with the latest advancements in machine learning algorithms against subsurface data such as seismic, logs, cores, to solve data mining, geological interpretation and quantitative reservoir characterization problems. It is a great opportunity for companies to benchmark machine learning algorithms performance, expose the most promising technologies, and understand successes and pitfalls in machine learning.

Prizes for the winning team await!

TECHNICAL PROGRAMME

Oral Presentations | Sunday 8 December

NOBLE & REGENT MEETING ROOM	
08:00	**Registration & Welcome Coffee**
08:50	**HSE from hotel**
09:00	**Co-chair Welcome**
09:15	**Opening Speech from His Excellency Shaikh Mohammed Bin Khalifa Al Khalifa, Minister Of Oil, Kingdom of Bahrain**
09:30	**Keynote: Technology Applications in Reservoir Characterization -** Dr. Aus Al-Tawil (Saudi Aramco)
10:00	**Coffee Break**
Automation of Seismic Interpretation	
10:30	**SSI01- Application of unsupervised machine learning to the processing of a land mega-survey -** S. Hou[1], S. Angio[1]*, H. Hoeber[1], V. Massart[1], L. Peng[1], R. Johnston[2], R. Walters[2] [1] CGG; [2] BP
10:55	**SSI02- Aspects of automated seismic interpretation using supervised and unsupervised machine learning -** A.J. Bugge[1]*, J.E. Lie[1] [1] Lundin Norway AS
11:20	**SSI03- Pseudo-Wells based HitCube 'trace-matching' and Machine Learning Inversions: Seismic Reservoir Characterization in a Challenging Environment -** G. Kocsis[1], H. Jaglan[2]* [1] MOL Norge AS; [2] dGB Earth Sciences
11:45	**Deconstructing the EAGE GeoHack: Recap Session**
12:10	**Lunch**
AI Application in Reservoir Characterization	
13:25	**SSI05- Rock-physics based Augmented Machine Learning for Reservoir Characterization -** J. Downton[1], O. Collet[1], T. Colwell[1]* [1] CGG
13:50	**SSI06- Data-driven well placement strategy based on variational simulations -** N. Bukhanov[1], A. Orlov[2], M. M. Ozhgibesov[2]*, E. Grishnyaev[2], T. Dogadova[2], B. Belozerov[1] [1] Gazpromneft STC; [2] Perfect Art
14:15	**SSI08- AI-assisted Core Description - Unsupervised Facies Classification and Manifold Learning of Fluvio-Deltaic Shaly Sands -** N. Leseur[1]*, P. Ragettli[2] [1] Baker Hughes; [2] IS-45
14:40	**Coffee Break**
NOBLE & REGENT LOBBY	
Poster Presentations	
15:00	**POS02 - Seismic horizon detection using Convolutional Neural Networks -** D. Mylzenova[1]*, S. Tsimfer[1], A. Koryagin[1], R. Khudorozhkov[1], S. Zaytcev[1] [1] Gazprom Neft
	POS03 - Automatic fault interpretation from seismic data via convolutional neural networks - D. Egorov[1]* [1] LLC «Gazprom Neft Science and Techology Center»
	POS04 - An Improved Particle Swarm Optimization for History-Matched reservoir Parameters - A. Awotunde[1]* [1] King Fahd University of Petroleum & Minerals
	POS05 - Data Driven Approach to Image, Classify and extract Seismic Discontinuities in Complex Geological Settings - S. Ali Syed[1]*, T. Turkistani[1], M. Khan[1] [1] SPE
16:00	**Discussion Session & Close of Day 1**

Oral Presentations | Monday 9 December

NOBLE & REGENT MEETING ROOM	
08:00	**Morning Coffee**
09:00	**Panel Discussion: Opportunities and challenges of adopting 4.0 IR in Geoscience** led by Douglas Paton (Leeds University) Across the hydrocarbon industry, there is increasing recognition that Artificial Learning/Machine Learning and Big Data will play a central role in the coming years. While much of this workshop focuses on technical advances and the future implementation of AI/ML, a critical question remains how we train staff to have the skills required for this implementation and should we be adapting undergraduate and/or graduate training to account for this. This session will discuss what skills will be needed, where this skills development is best placed and whether should it sit within the realm of Computer Science, Geoscience or transcend these existing subject domains.
10:30	**Coffee Break & Posters**
11:00	**Breakout Group Discussions**
12:00	**Lunch**
Case studies in Application AI and ML	
13:15	**SSI09- Quantification of errors in well-trace positions and uncertain measurements for improvement of subsurface imaging-** I. Fernandes[1]*, K. Mosegaard[1] [1] Niels Bohr Institute, University of Copenhagen
13:40	**SSI10- WellNet: improvement of machine learning models robustness via comprehensive multi oilfield dataset -** A. Reshytko[1]*, D. Egorov[2], A. Klenitskiy[1], A. Shchepetnov[1] [1] IBM; [2] Gazpromneft
14:05	**SSI11- A new way of handling unstructured data in the age of digitalization -** F. Baillard[1], K.G. Maver[1]*, N.M. Hernandez[1] [1] Iraya Energies
14:30	**SSI12- The Digital Underground: Integrating petroleum geoscience with data science principles to create an intelligent subsurface platform -** B. Alaei[1]*, S. Purves[1], E. Larsen[1], D. Economou[1], D. Austin[1] [1] Earth Science Analytics
14:55	**Coffee Break & Posters**
15:25	**Breakout Group Discussions**
16:30	**Conclusion & End of Workshop**

VENUE

Westin City Centre Bahrain
Sheikh Khalifa Bin Salman Highway Al Seef District
Manama
Bahrain

EAGE has negotiated room rates for event attendees at this venue. Please get in touch via middle_east@eage.org or check the event website for more information.

The Workshop is held under the Patronage of His Excellency Shaikh Mohammed Bin Khalifa Al Khalifa, Minister of Oil, Kingdom Of Bahrain.

SOCIAL PROGRAMME

Icebreaker Reception

Saturday 7 December 18.00-20.00
Nasmat Bar Westin City Centre Bahrain

Workshop Dinner

Sunday 8 December 19.00
Brasserie Royale Jumeirah Royal Saray Hotel
Transport to and from the workshop dinner is arranged by EAGE, please meet at the hotel reception where buses will leave at 6.30 PM

IMPORTANT DATES

Registration Opens	15 September 2019
Early Registration Closes	8 November 2019
Registration Closes	3 December 2019

SPONSORSHIP

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REGISTRATION

REGISTERED AND PAID	FROM 1/09/2019 UNTIL 8/11/2019	FROM 9/11/2019 UNTIL 3/12/2019	ONSITE
EAGE Green Member	€ 945	€ 1045	€ 1045
EAGE Bronze/Silver/ Gold Member	€ 795	€ 895	€ 895
EAGE Platinum Member	€ 795	€ 795	€ 795
EAGE Student Green Member	€ 425	€ 475	€ 475
EAGE Bronze/Silver/ Gold Student Member	€ 400	€ 450	€ 450
Non-member*	€ 995	€ 1095	€ 1095
Student Non-member*	€ 450	€ 500	€ 500
EAGE GeoHack (Professionals)	€ 50	€ 50	€ 50
EAGE GeoHack (Students)	€ 25	€ 25	€ 25

*Memberships are provided for Non-Member registrations and the activation will only take place after the event, between 2-3 weeks.
All fees are in Euros (€). One Euro of your total registration fee is donated to the EAGE Green Fund.
Please note: The deadlines are following the Local Time in the United Arab Emirates.
Members please note: To qualify for the member registration fee, your EAGE membership dues for 2019 must have been paid and confirmed. The processing time for membership applications or renewals is 10 working days.
To qualify for the reduced student registration fee:

- Students must be enrolled in a full time study programme at a recognized university or institute
- The registration must be accompanied by a copy of a student ID card and/or official proof of enrolment.

Please note: Student non-members cannot be older than 34 years of age (when registering).
The non-member fee includes EAGE membership for the remainder of 2019.
Please note that EAGE reserves the right to cancel the workshop due to low participation. In this case, payment will be refunded in full.
EAGE registration fees differentiate between EAGE membership recognition levels and non-members. First year members have Green membership status which gives you a € 50 discount (€ 25 for students) on the Non-member fee for each EAGE event registration;starting from Bronze status, you can benefit from an even greater reduced EAGE member registration fee. Click here for more information about the recognition programme.

CONTACT

For more information please contact EAGE Middle East at middle_east@eage.org or +971 4 369 3897

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