Saudi Arabia InterPore Chapter

Third Annual Meeting
Dec. 15 – 16, 2024

The 3rd Interpore Saudi Chapter Annual Meeting

Executive Summary:

The **3rd Interpore Saudi Chapter Annual Meeting** was held online over two days (**December 15–16, 2024**). This year's meeting featured **4 keynote speeches** and **7 mini-symposium sessions**, with an **average of 25 attendees per session** and **63 registered participants** overall. The meeting brought together participants from diverse geographical locations, including **Saudi Arabia**, **Europe**, **US**, **China, and India**, covering a range of several professional positions, including professors, assistant professors, researchers, consultants, and students.

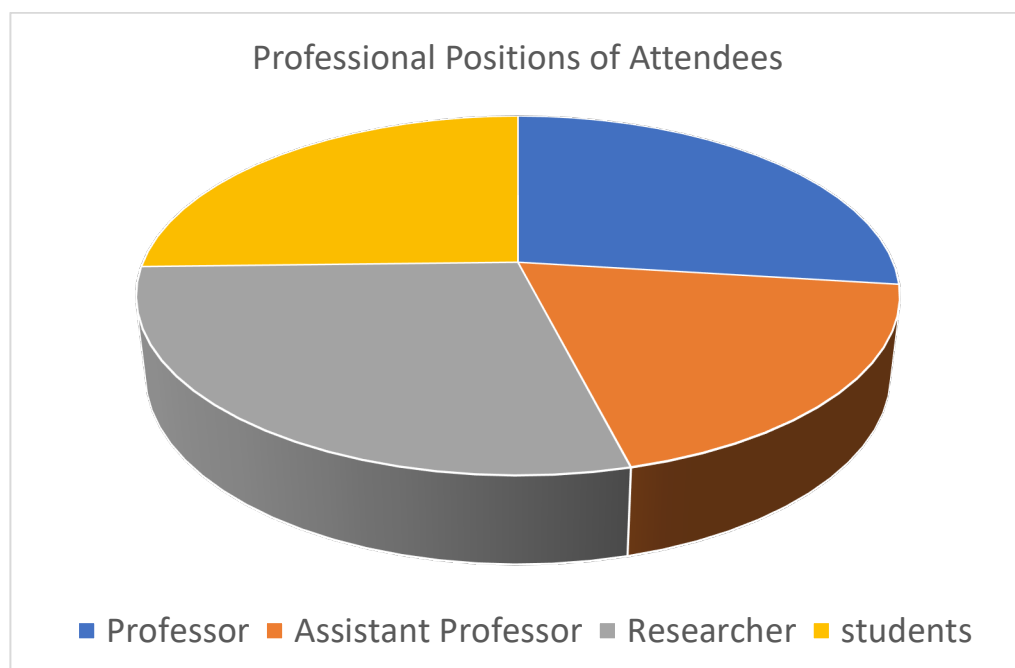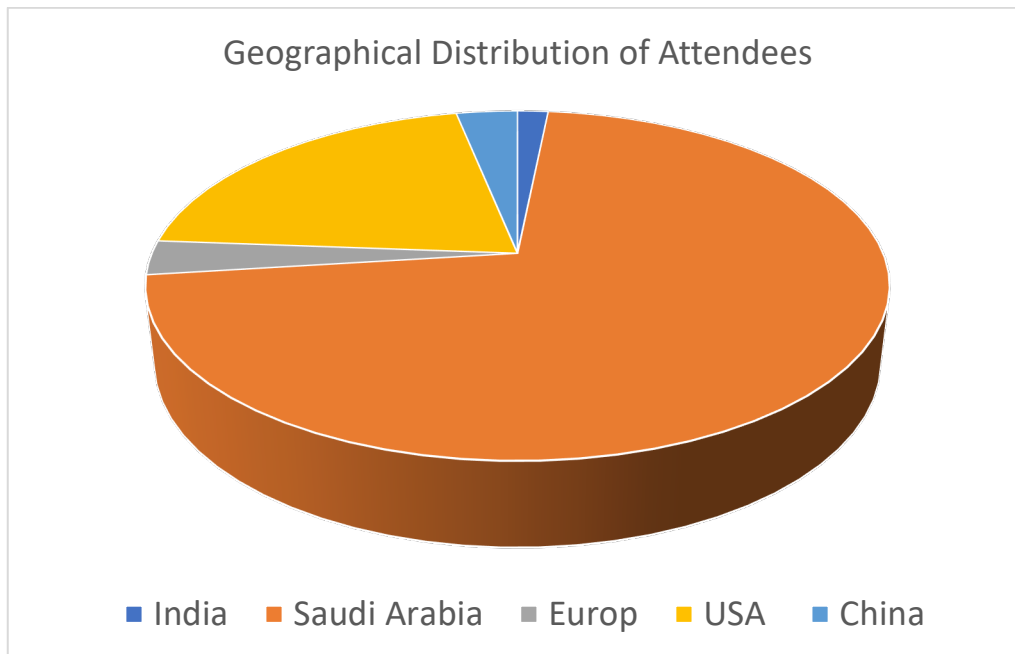The event covered a variety of topics related to porous media research, including:
- Advances in subsurface storage and computational modeling
- Pore-scale processes under stress
- Data-driven and AI applications in porous media
- Innovative approaches in CCUS (Carbon Capture, Utilization, and Storage)
- Digital rock techniques: from direct numerical simulation and pore network models to molecular simulation and electronic density functional theory
- Mathematical insights in porous media applications
- High-performance computing applications for enhanced reservoir and carbon storage modeling

The Interpore Saudi Chapter remains committed to fostering collaborations in the field and advancing porous media research both locally and globally.
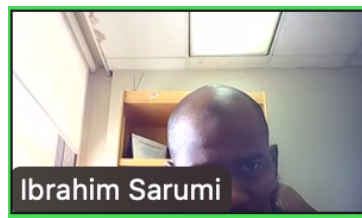
Attendees:

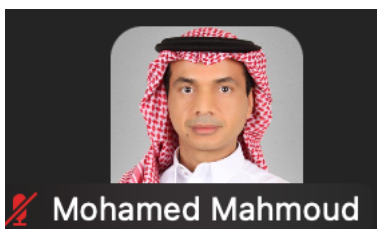| Averge 25 Attendeed per Session	63 Registrations

Demographical & Professional Distributions:

Geographical Distribution of Attendees

■ India ■ Saudi Arabia ■ Europ ■ USA ■ China

Professional Positions of Attendees

■ Professor ■ Assistant Professor ■ Researcher ■ students
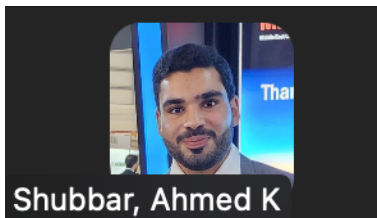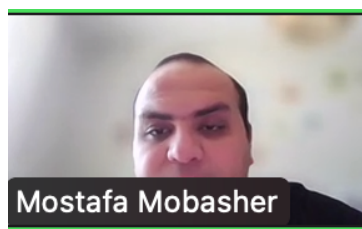
Detailed Meeting Agenda:

Day (1): Sunday, December 15, 2024

8:30 AM– 8:45 AM	Opening Remarks: Welcome to the 3rd Interpore Saudi Chapter Annual Meeting (Day 1) – **Dr. Manal Alotaibi (KFUPM)**
8:45 AM – 9:00 AM	Brief Overview of Interpore – **Prof. Majid Hassanizadeh**. Managing Director; International Society for Porous Media
MS 01: Advances in Subsurface Storage and Computational Modeling MS 01 Chair: Prof. Abdullah Shah - KFUPM	
9:00 AM – 10:00 AM	**Keynote Speech (1):** **Prof. Saad Alafnan (KFUPM)** Are geological formations really suitable for hydrogen storage?
10:00 AM – 10:20 AM	**Dr. Muhammad Sabeel Khan** On the observation of three-phase elastic deformation within micropolar continuous media through implementation in FreeFEM++
10:20 AM – 10:40 AM	**Dr. Muhammad Sohaib** Diffuse Interface Methods for Two-Phase Flow with Moving Interfaces: Numerical Simulations
MS 02: Pores under stress **MS 02 Chair: Dr. Osman Hamid – Saudi Aramco**	
10:40 AM – 11:00 AM	**Dr. Mostafa Mobasher** Leveraging Machine Learning to Enhance Coupled Processes Simulations: A focus on fracture modeling
11:00 AM – 11:20 AM	**Dr. Gaisoni Naseldin** Ensuring protection of critical turtle nesting habitat: 3D Geomechanical Modelling estimates production induced subsidence at Torosa Field, Browse Basin, Australia
11:20 AM – 11:40 AM	**Rima Alfaraj** SAGE (Saudi Aramco Geomechanics Expert): A Well from Geomechanics Perspective
11:40 AM – 12:40 PM	Lunch Break
MS 03: Data-driven and AI applications in Porous Media **MS 03 Chair: Prof. Bicheng Yan (main), Co-Organizer: Prof. Shuyu Sun - KAUST**	
12:40 PM – 1:00 PM	**Dr. Zeeshan Tariq** Multiphase Flow Prediction in Carbon Storage: A Comparative Study of Deep Learning Algorithms
1:00 PM – 1:20 PM	**Dr. Xupeng He** Subsurface Gas Leakage Detection Using Machine Learning and Well Testing Techniques

1:20 PM – 1:40 PM	**Dr. Billal Aslam** CGNet - Frac : A Novel Hybrid Physics/Data-Driven Model for Fractured Reservoir Simulation
1:40 PM – 2:00 PM	**Dr. Ali Alhubail** Modeling fluid flow in heterogeneous porous media utilizing the mixed pressure-velocity formulation with weighting strategies
2:00 PM – 3:00 PM (Houston Time 5:00 AM – 6:00 AM)	**Keynote Speech (2):** **Dr. Horacio Florez (Saudi Aramco)** Implementing an automatically tuned-support vector regression (SVR) distributed Gauss-Newton (DGN) optimizer: algorithms and applications.
MS 04 : Innovative Horizons in CCUS: Perspectives, Methods, and Advancements MS 04 Chair: **Dr. Abeer Alarawi – (Saudi Aramco)**	
3:00 PM – 3:20 PM	**Dr. Ahmad Shubbar** Carbon Capture Utilization and Storage (CCUS): A Reservoir Simulation Engineer Perspective
3:20 PM – 3:40 PM	**Dr. Tameem Almani** Flow and Geomechanics Iterative Coupling Schemes with Contact Mechanics
3:40 PM – 4:00 PM	**Dr. Abeer Alarawi** Recent Advancements in Upstream CCUS Research.
4:00 PM – 4:20 PM	End of Day 1 and Online Networking

Day (2): Monday, December 16, 2024

8:40 AM – 9:00 AM	Opening Remarks: Welcome to the 3rd Interpore Saudi Chapter Annual Meeting (Day 2) – **Dr. Manal Alotaibi**
MS 05: Digital rock techniques: from direct numerical simulation and pore network models to molecular simulation and electronic density functional theory MS 05 Chair: **Prof. Shuyu Sun (main), Co-Organizer: Prof. Bicheng Yan- KAUST**	
9:00 AM – 9:20 AM	**Dr. Arun Narayanan Nair, KAUST** CO_2-EOR: Insights from Molecular Dynamics Simulations
9:20 AM – 9:40 AM	**Dr. Xiuping Wang, KAUST** An Unconditionally Structure-Preserving Iterative Scheme for The Kohn-Sham Gradient Flow Model
9:40 AM – 10:00 AM	**Dr. Remya Nair, KAUST** Adsorption of gases on fullerene-like nanocages
10:00 AM – 10:20 AM	**Dr. Ronghao Cui, KAUST** Molecular simulations of clay swelling in the presence of polar solvents
MS 06: Mathematical Insights in Porous Media Applications MS 06 Chair: **Dr. Manal Alotaibi - KFUPM**	

10:20 AM – 10:40 AM	**Prof. Mohammed Yousef , KFUPM** Simulation of Anomalous Diffusion and Pressure Dynamics in Porous Media Near Wellbores
10:40 AM – 11:00AM	**Dr. Ibrahim Saromi, KFUPM** Memory Effects in Diffusive Processes: Modeling and Simulation Insights
11:00 AM – 11:20 AM	**Dr. Jamal Al-Smail, KFUPM** Material Porosity Design for Controlling Electro-Chemical Reactions in Hydrogen Fuel Cells
11:20 AM – 11:40 AM	**Prof. Naseer-Aldeen Tatar. KFUPM** Recent advances in the theory of porous media
11:40 AM – 12:40 PM	Lunch Break
MS 07: Innovative AI and HPC Applications for Enhanced Reservoir and Carbon Storage Modeling. MS 07 Chair: **Dr. Abdulrahman Almanea- Saudi Aramco**	
12:40 PM – 1:40 PM (Delft Time – 10:40 AM - 1: 40 PM)	**Keynote Speech (3):** **Prof. Hadi Hajibeygi (TU Delft)** CCS in Fractured Reservoirs: will it work?
1:40 PM – 2:00 PM	**Dr. Michel Cancelliere** Scaling up Geochemical Complexity: Harnessing Computational Power for Field-Scale Reactive Transport Simulations
2:00 PM – 2:20 PM	**Dr. Rayan Kanfar** Graph neural networks as a surrogate model for reservoir simulation
2:20 PM – 2:40 PM	**Dr. Omar Al-Olayyan** AI Parallel History Matching
2:40 PM – 3:40 PM (Houston Time 5:40 AM – 6:40 AM)	**Keynote Speech (4):** **Prof. Eduardo Gildin (Texas A&M)** Fast and Robust Data-driven surface and subsurface simulation for leveraging decarbonization efforts in the Oil & Gas Industry
3:40 PM – 4:20 PM	Concluding Remarks: Prof. Shuyu Sun, Dr. Tameem Amani & Dr. Manal Alotaibi