Artificial Energy General Intelligence AEGI

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Abstract
Artificial Energy General Intelligence (AEGI) is a natural progression of Artificial General Intelligence (AGI) that caters to the energy industry. It is crucial to optimize the entire value chain involved in generating, transporting, and storing energy for the betterment of humanity, the environment, industry, and the scientific community. Most research efforts focus on a specific area of the value chain, leading to a disconnect between multiple disciplines and hindering effective problem-solving. AEGI proposes integrating the learning from each discipline in the energy sector to create an optimal solution that simultaneously addresses multiple objectives. This integration is more complex than solving each discipline's challenges separately, but achieving a sustainable and efficient energy system is necessary.

Introduction
We understand that each discipline needs to improve its problem-solving abilities in a more integrated way. This is because solving challenges at one stage of the energy value chain can create new challenges for the next stage. Therefore, we are building algorithms that will allow AEGI to understand objectives and challenges from data and recommend optimized solutions [1]. These solutions include going greener during energy generation across the whole value chain. Therefore, we include the environmental enhancement element in every decision optimization [2]. This work considers the oil and gas (O&G) value chain for AEGI, including an objective to become a cleaner energy production operation where integrated data is analyzed.

The optimum data integration across the O&G would be using the cloud [3]. However, the O&G data in many countries are rarely in the cloud unless the servers are in the country. In Fig. 1, the O&G value chain we use in this research shows the impact sequence of each of the seven stages with Artificial intelligence (AI) optimization: Geoscience [4-38], Reservoir [39-46], Completion [47], Drilling [48], Production, Network, and Facility. Where integrated optimization with AEGI provide high efficiency in term of time, cost [49], environment, and energy production. To build the AEGI, we capture the interconnectivity between each stage to establish a full coupling between the stages where the input of each stage is the output of the previous stage. Also, we consider feedback from each stage to the other to optimize backward. Therefore, the whole system appears like one extensive deep neural network that keeps optimizing itself to provide insight to the human user.
Fig. 1. O&G Value Chain with the AI Optimization at each Stage for AEGI.

Method
Keep the system life with continuous learning despite the data being a semi-live copy with a short delay for generating an offline copy to prevent damaging the original data. The learning that the machine acquire is part of the feature engineering and the feedback loop that the domain expert of each stage provides. This machine has an autonomous path to try other data that are not part of the channels provided by the domain expert. Also, the machine can establish feedback loops that are different from the ones established by the domain expert. Then every time the machine reaches a better optimization, a notification is set to the domain expert explaining the new added value generated by the new optimization. The machine would also be provided the freedom to link multistage to identify the root cause of some phenomena not generated from the prior stage but the one before or even before that. This understanding of the root cause and recommendation options provides new insights that the expert would have never been able to reach without this autonomous freedom given to the machine to explore.

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