

Achieving sustainability with energy, environment and economics trilogy (E-Cubed) using Artificial Intelligence and Data Analytics (AI-DA)

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Opinion

Debate has been going on for many years whether it is possible to achieve sustainable energy and other natural resources without compromising our stewardship of the environment with the economics in mind. Proponents of fossil energy argue that the economics continues to be on their side. Those who are passionate about the environment argue alternative energy resources is the only way to save the planet of earth from the harm of the emission of CO₂, methane and other pollutants to the air, underground water supplies and the oceans. The solution doesn't necessarily have to be either one or the other approach but a properly designed engineered system that offers the hybrid approach, utilizing recent advances in data analytics and artificial intelligence (e.g. large language models, LLM) techniques.

I introduced the "E-cubed" concept several years back where the trilogy of Energy, Environment and Economics is treated as an ensemble, Aminzadeh 2014. That is, I maintained the need to realize the importance of looking into all three elements simultaneously, if we are serious about sustainability. We need to explore the interactions among the three pillars of sustainability energy and other natural resources and the ongoing tradeoff between economics and environment. Doing so, we hope to achieve the desired objectives while updating the solutions as we face ever-changing dynamics of E-cubed phenomena.

As sustainability issues become a more pressing problem to tackle, new ideas to fully achieve it with necessary efficiency, in a more cost-effective way are demanded. Artificial Intelligence and Data Analytic (DA) methods could be helpful. AI-DA promises to enhance sustainability in supply chain by reducing waste, minimizing power consumption, improving efficiency, and enabling emissions tracking. AI-DA also presents a paradox for sustainability: it is a powerful tool for environmental optimization while simultaneously posing a significant threat through high energy and water consumption. AI-DA accelerates climate solutions like grid management and climate modeling, yet data centers could use over half of their electricity for AI-DA.

Ensuring sustainability requires developing green AI-DA by design, prioritizing efficiency, and managing resource consumption. That is exactly where the E-cubed trilogy, integrated with AI-DA in a responsible fashion may offer a path forward to accomplishing a practical solution for sustainability of energy and other natural resources. Similarly, in my speech in Los Angeles Science Museum, Aminzadeh, 2018, "To frack or not to: that is the question" I tackled the issue of fracking. I maintained that the best solution is to understand all the risks and challenges such as induced seismicity and potential contamination of water columns, surface and air, before reaping the benefits such as better economics and achieving energy security. This was followed by Aminzadeh, 2019.¹⁻³

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Conflicts of interest

The authors declare no competing interests.

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