Artificial Intelligence and the Environment

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Introduction

Generative Artificial Intelligence (AI) has been pushed to improve worker productivity, enhance research, and solve problems quickly. Many people view generative AI as an accessible and easy way to find solutions, but don't know the power required to train AI. For example, AI requires immense amounts of electricity to run, which can lead to increased carbon dioxide emissions and put pressure on electrical grids. On the other hand, it can also reduce errors and enhance decision-making. This results in the usage of Artificial Intelligence having advantages and disadvantages, with many disadvantages affecting the environment.
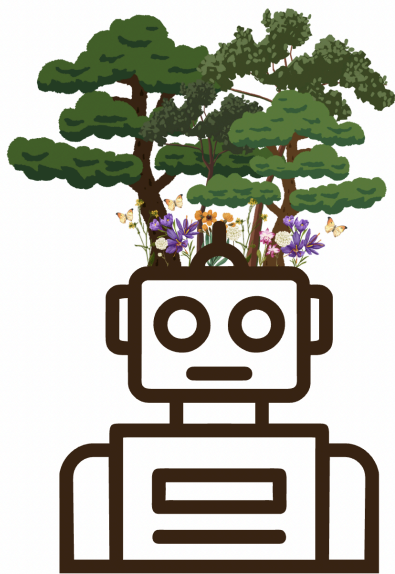

Figure 1. A graphic showing the environment and AI

Advantages of AI

Before discussing how Artificial Intelligence impacts our environment, it is important to note the positive impacts AI can have. Besides AI being available 24 hours a day for our usage, some examples of positive AI applications include mitigating human error, improving transportation, and enhancing cybersecurity.

Artificial Intelligence Detection and Mitigation of Human Errors

Human error is a significant factor when considering the usage of AI. A variety of factors can cause human error while on a job, including time availabile to complete a task, complexity of a task, stress and workload pressure, and available staffing. This can result in poor decision making and misinterpretations. For example, in the case of a nuclear power plant, human errors can result in extensive down time for power plants while repairs are made.

AI can assist operators in making critical decisions and executing tasks in a timely manner, and mitigate human error to enhance performance. Examples of how AI can decrease human errors include decision support systems, sensor fault detection systems, predictive maintenance systems, and safety assessment systems.

Artificial Intelligence in Transportation

AI can be a beneficial addition to transportation systems due to its ability to predict travel patterns and traffic models. Some applications of AI benefiting transport include:

- Road planning
- Public transport
- Predictive models for traffic information

Artificial Intelligence Enhancing Cybersecurity

Using AI to enhance cybersecurity can provide a more effective and proactive approach to threat detection and response. AI can process large systems

and identify new threats that other detection methods may be unable to. Greater automation and shortening the time for threat identification make AI very useful in security.

Disadvantages of AI

Generative AI creates a demand for data centers. The growing demand for AI models to continue growing and improving has raised concerns about AI's environmental impact and the future global challenges it may bring regarding climate change and drought mitigation. The following sections go into the specific details on how generative AI is negatively impacting the environment.

Carbon Footprint

Along with the energy needed to run these models, AI leaves a substantial carbon footprint. An enormous amount of energy is required to train and run these models. This increase in energy is directly related to greenhouse gas emissions, aggravating climate change. The training process alone for a single AI model can emit hundreds of tons of carbon, roughly equivalent to the annual carbon emissions of hundreds of American households.

By 2040, the Information and Communications Technology (ICT) industry is expected to account for 14% of global emissions. These emissions will come from ICT infrastructure, including data centers and communication networks. A study at the University of Massachusetts found that training generative AI can produce 626,000 pounds of carbon dioxide, equivalent to 300 round-trip flights between New York and San Francisco.

Water Usage

Do you know how your laptop can overheat if it is used for an extended period of time? That is what happens to hardware in data centers every time generative AI is utilized. A large amount of water is needed to cool hardware used for training, deploying and fine-tuning AI models. This disrupts local ecosystems and strains municipal water supplies,

which can worsen prolonged droughts in water-stressed areas.

E-Waste

Generative AI technology can produce large amounts of electronic waste, severely challenging the environment. E-waste contains hazardous chemicals, including lead, mercury, and cadmium. These chemicals can contaminate soil and water supplies. This will endanger human and environmental health. The World Economic Forum (WEF) projects that by 2050, the total amount of e-waste generated will surpass 120 million metric tonnes.

Conclusion

While Artificial Intelligence can reduce human error and enhance transportation and cybersecurity, it can also negatively impact the environment. The increasing need for AI has increased its carbon footprint, water usage, and e-waste. The best way as an individual to minimize AI environmental impacts is to be conscious of your AI usage. Choose more energy-efficient AI models and use data centers powered by renewable energy.

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About this Publication

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