AI-Driven ADHD Prediction and Analysis at Early Age:

A Novel Approach Integrating Machine Learning, Explainable AI, LLMs, and Dialogflow with a Virtual Therapist Chatbot (ComfortChat)

Environment and Sustainability

Senior Design Project

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This section highlights how the proposed AI-driven ADHD diagnosis and therapy system addresses sustainability and environmental responsibility. By leveraging modern computing tools, virtual diagnostics, and intelligent therapy chatbots, the system contributes to social well-being while minimizing environmental impact.

The project exemplifies sustainable engineering by promoting early mental health support, reducing dependency on resource-intensive healthcare infrastructure, and offering a scalable solution that aligns with global sustainability goals. It integrates technology with empathy—bridging societal needs with responsible innovation.

Impact of the Project on the Environment and Sustainability

This software-based project, *AI-Driven ADHD Prediction and Analysis at Early Age*, has a substantial impact on social sustainability and offers an indirect but meaningful contribution to environmental sustainability. While the system itself does not involve traditional industrial processes that consume natural resources or emit pollutants, it significantly advances social sustainability by addressing early mental health care—a pressing, long-term societal need.

By offering a digital, accessible, and scalable solution to early ADHD detection and intervention, the project reduces the dependency on in-person visits and large clinical infrastructures. This shift toward virtual therapeutic services through Dialogflow minimizes carbon emissions related to transportation and resource use in medical facilities. Moreover, the use of a virtual therapy chatbot (ComfortChat) eliminates reliance on paper-based diagnostics, printed surveys, and physical infrastructure—minimizing environmental footprint.

Additionally, the system is deployed via web and mobile platforms, allowing it to run efficiently on existing personal devices without the need for new hardware production or energy-heavy installations. This ensures sustainable use of technological resources, aligning with principles of green computing and energy efficiency.

From a sustainability perspective, the project contributes to:

- **Early intervention in ADHD**, which reduces long-term societal strain on healthcare, education, and social services. The system promotes sustainable development goals (SDGs), particularly **SDG 3 (Good Health and Well-being)**.
- **Accessibility for underserved populations**, especially in rural or low-resource regions, reducing inequality (**SDG 10**).
- **Promotion of digital public health tools** that scale efficiently without expanding physical infrastructure, supporting **sustainable cities and communities**

(**SDG 11**).

- **Minimized technological waste** by optimizing software for lightweight devices, contributing to **responsible consumption and production (SDG 12)**.

In summary, although the system is not directly targeting the environment like air or waste monitoring projects, it promotes ecological responsibility through virtualization, reduced resource dependency, and scalable sustainability in mental healthcare delivery. It serves as a model for how software-based interventions can support environmental sustainability by transforming traditionally resource-heavy processes into efficient, low-footprint digital systems. Additionally, by encouraging remote mental health solutions, it reduces urban congestion and the strain on physical infrastructure. The system fosters a culture of green innovation in healthcare, inspiring future developers to adopt eco-conscious approaches in digital health. It also highlights how AI applications can advance both technological progress and environmental awareness, contributing to a more sustainable digital future.