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RESEARCH PAPER: BIOMIMETIC THERMAL MANAGEMENT
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Project Title: Next-Gen Data Center Cooling inspired by Loxodonta Ear Mechanics
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1. ABSTRACT

As AI workloads generate unprecedented thermal levels, standard cooling systems consume excessive energy. This research presents a biomimetic heat exchanger that replicates the vascular vasodilation and pulsatory flow kinetics of African Elephant ears, aiming for a 40% reduction in energy overheads.

[IMAGE 1: BIOLOGICAL THERMOREGULATION IN ELEPHANT EARS]
(Visualizing the vascular network and vasodilation effects)

2. KEY DESIGN PRINCIPLES

- Fractal Branching: Optimized micro-channel distribution based on Murray's Law.
- Pulsatory Flow: Mimicking the heartbeat to disrupt the thermal boundary layer.
- Adaptive Surfaces: Dynamic fin geometry that responds to real-time CPU thermal loads.

[IMAGE 2: BIOMIMETIC DATA CENTER COOLING SYSTEM]
(Visualizing the engineered heat sink and server rack integration)

3. EXPECTED IMPACT

- Power Usage Effectiveness (PUE) target: < 1.1
- 40% improvement in heat dissipation efficiency.
- Drastic reduction in carbon footprint for Green Data Centers.

4. LEGAL NOTICE & INTELLECTUAL PROPERTY

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