**********projekt 1**********
https://relativity-train-sim.vercel.app/

🚆 Relativity Tunnel Simulation

A visual, interactive simulation of one of the most fascinating paradoxes in Einstein's Special Relativity:

Can a train longer than a tunnel fit inside it — without crashing?

This app lets you explore the weird and beautiful world of relativistic physics by adjusting the train's speed and observing what happens from the perspective of a stationary observer.

🍼 What It Demonstrates

This simulation brings key concepts from Special Relativity to life:

- **Length Contraction**: As objects move near light-speed, they appear shorter in the direction of motion.

- **Time Dilation**: Moving clocks tick more slowly compared to stationary ones.

- **Relativity of Simultaneity**: Events that seem simultaneous in one frame may not be in another.

> From your perspective (as a stationary observer), the faster the train moves, the shorter it appears.

> At the right speed, the contracted train can actually fit inside the tunnel — even though it's longer than the tunnel at rest!

🎯 Your Mission

Use the sliders to:

- Adjust the train's speed (as a percentage of the speed of light)

- Modify the tunnel’s length

Then hit **"Start Simulation"** and watch physics unfold!

At the moment the nose of the train reaches the tunnel center:

- The tunnel doors close.

- The simulation checks whether the contracted train fits inside the tunnel or not.

- You’ll get a visual success or collision result.

After each round, the page **automatically reloads** so you can experiment again.

🛠️ Tech Stack

- **React** with Vite

- **CSS3 animations** for motion and styling

- Fully responsive design

- Physics math based on Lorentz contraction formula

🧠 Educational Purpose

This simulation is designed to help physics students, educators, and curious minds visualize an abstract but fundamental principle of modern physics.

It’s inspired by the famous thought experiment:

> _“The Train and the Tunnel” (also called “The Ladder Paradox”)_

🌐 Live Demo

🔗 [Visit the live simulation](https://fourier-visualizer-pipuzzel.vercel.app/)

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📥 How to Run Locally

```bash
git clone https://github.com/your-username/relativity-tunnel-simulation.git
cd relativity-tunnel-simulation
npm install
npm run dev
```