Project Genesis

Hackathon Summer Edition 2025

Project Genesis

- An AI-powered simulation engine that **forecasts plant growth under given environmental conditions**. Given an initial plant image and a set of stimuli, Project Genesis generates a new, **photorealistic image of the plant's final state**, along with a **scientific description of what happened and why**.

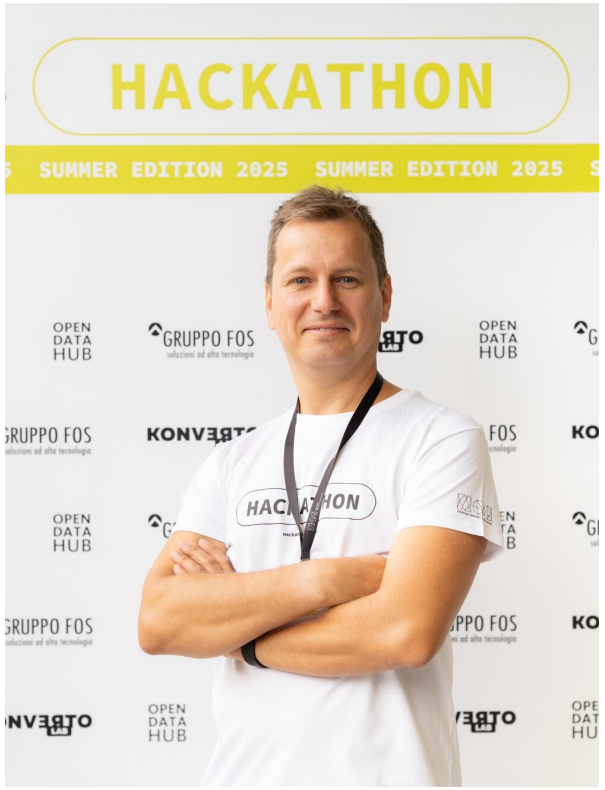
- **Goal:** Creating a robust, open-source application that accurately models plant growth and handles "strange" reasoning inputs with scientific and visual fidelity.

- **Impact:** Demonstrate a powerful method for **predictive biological modeling.** This technology can be applied to agriculture for crop forecasting, to education for botanical studies, and to creative fields for generating dynamic natural assets.

Team

- Front-end
- LLM
- RAG

- Image recognition
- Model training
- Web Scraping



- Data mining
- RAG
- Image generation

- Image generation
- Debug and testing
- DevOps

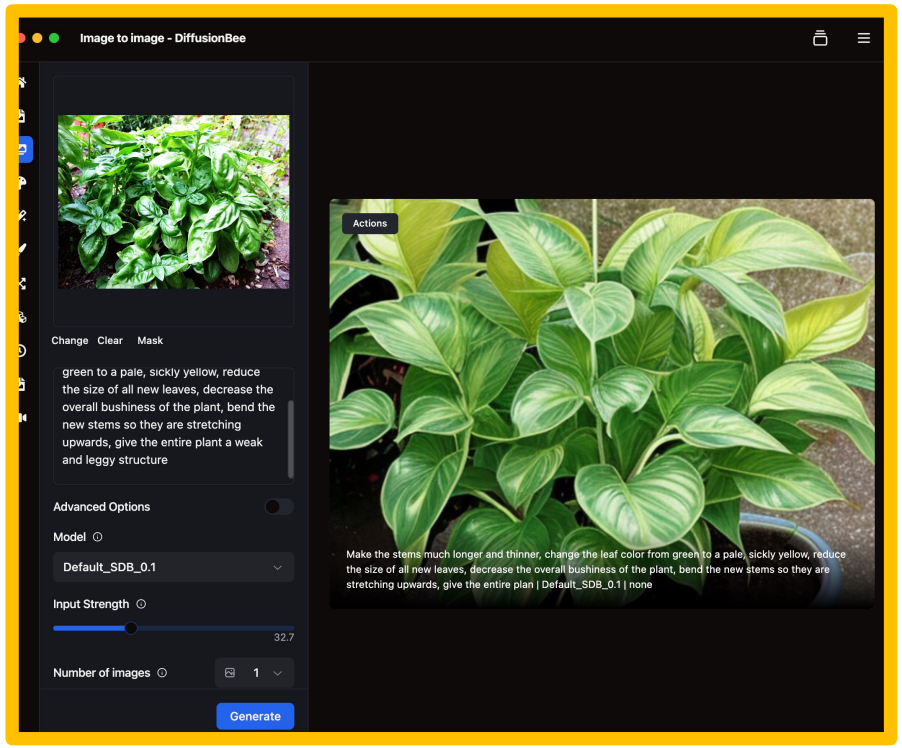
How did we approach the challenge

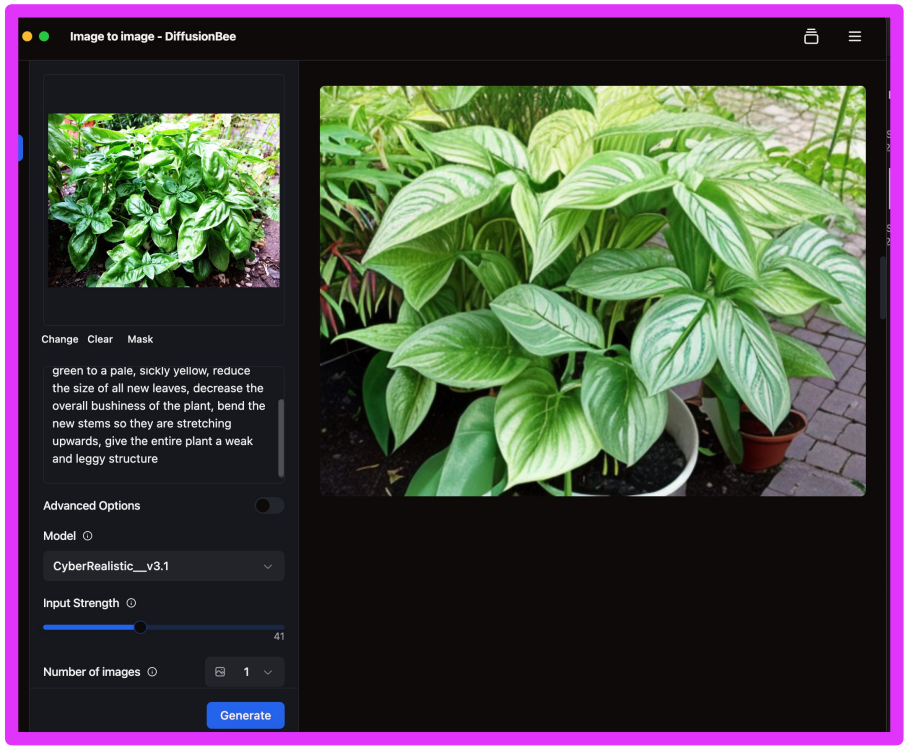
1. **Custom trained model for image recognition**:
   - classification **(OpenCV/TensorFlow/Keras)**
   - characterization **(OpenAI Clip** - Contrastive Language-Image Pre-training**)**
2. **E**nhancing the plant information with user input (**Vue.js, PrimeVue, Pinia, LlamaIndex**)
3. **D**ecomposing the Environmental Changes & Actions into fundamental physical and chemical principles (**LlamaIndex**)
4. **U**sing **RAG** fed with scientific data on stress/benefit/diseases to predict the plant state and write a prompt on how to change the photo (**Marker, *Langchain*, Qdrant, LlamaIndex**)
5. **AI Image editing**: modifying the original photo using the prompt generated before.

- Challenges:
  - finding images to train the model => **web scraper**
  - finding datasets for **RAG** => relied on scientific papers + markdown + slicing
  - limited hardware => pre-computed model + fine-tuning

Biggest challenge: AI Image Generation

- **Change approach in prompt engineering:** Describe how to change the baseline.
- **Cost vs Quality (Veo3, STB, STB fine-tuned+criminal, VertexAI)**





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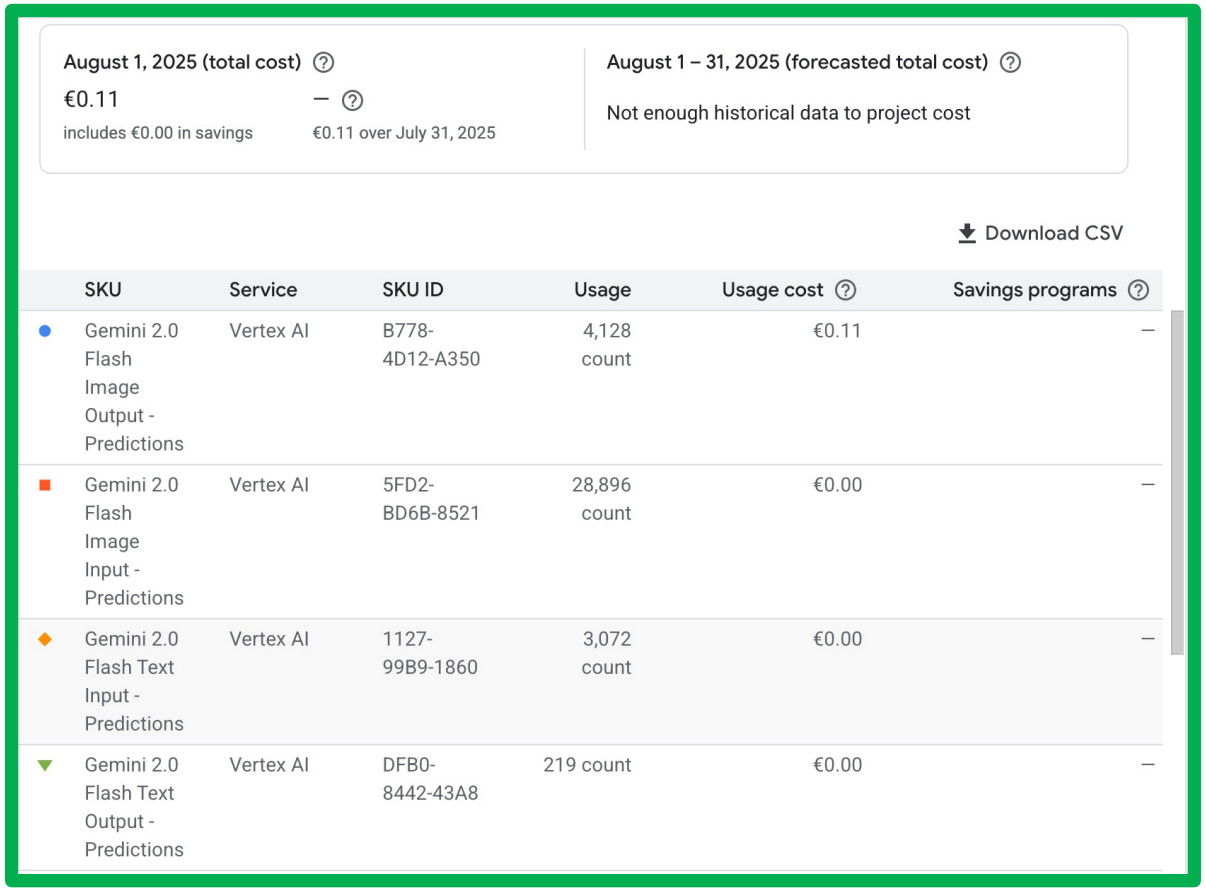

August 1, 2025 (total cost)
€0.11
includes €0.00 in savings
–
€0.11 over July 31, 2025

August 1 – 31, 2025 (forecasted total cost)
Not enough historical data to project cost

Download CSV

SKU	Service	SKU ID	Usage	Usage cost	Savings programs
Gemini 2.0 Flash Image Output - Predictions	Vertex AI	B778-4D12-A350	4,128 count	€0.11	–
Gemini 2.0 Flash Image Input - Predictions	Vertex AI	5FD2-BD6B-8521	28,896 count	€0.00	–
Gemini 2.0 Flash Text Input - Predictions	Vertex AI	1127-99B9-1860	3,072 count	€0.00	–
Gemini 2.0 Flash Text Output - Predictions	Vertex AI	DFB0-8442-43A8	219 count	€0.00	–

Demo


Hello! Share your plant with us and we'll tell you all about it!
+ Choose
× Cancel
Drag and drop files to here to upload.