

PATHOGENIUS

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TODAY'S SCHEDULE

01

MOTIVATION

02

OUR SOLUTION

03

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04

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05

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DEMO

MOTIVATION



Especially in **disaster areas**, water and food samples contain genetic traces of harmful pathogens that cause illnesses.



Early detection of **pathogens** is critical for timely public health interventions.



Centralized laboratories and continuous internet access are often unavailable in these resource-restricted crisis areas.



In the aftermath of such events, there is a need for **portable** and **offline-capable** system that can analyze genetic samples (e.g. from water and food samples).



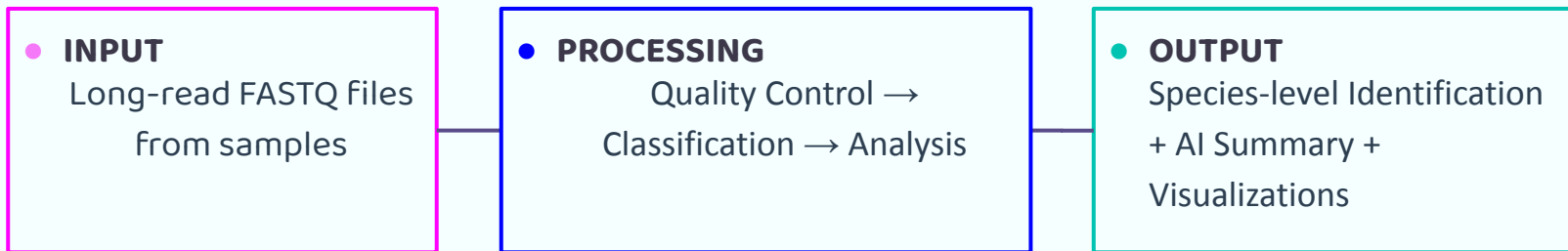
A **user-friendly** system that removes the need for bioinformatics expertise can enable practical pathogen surveillance.



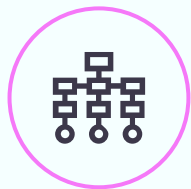
OUR SOLUTION: PATHOGENIUS

A portable, offline-capable metagenomic platform for species-level pathogen identification.

- Offline operation
- Consumer grade system requirements
- No bioinformatics expertise needed
- Confidence-aware outputs



WHY OFFLINE?



Field Deployment:

- Emergency response scenarios
- Remote clinics and field hospitals
- Water surveillance in rural infrastructure-limited areas

Reliability:

- No dependency on internet availability or connection quality
- Zero recurring subscription or cloud service costs

Privacy:

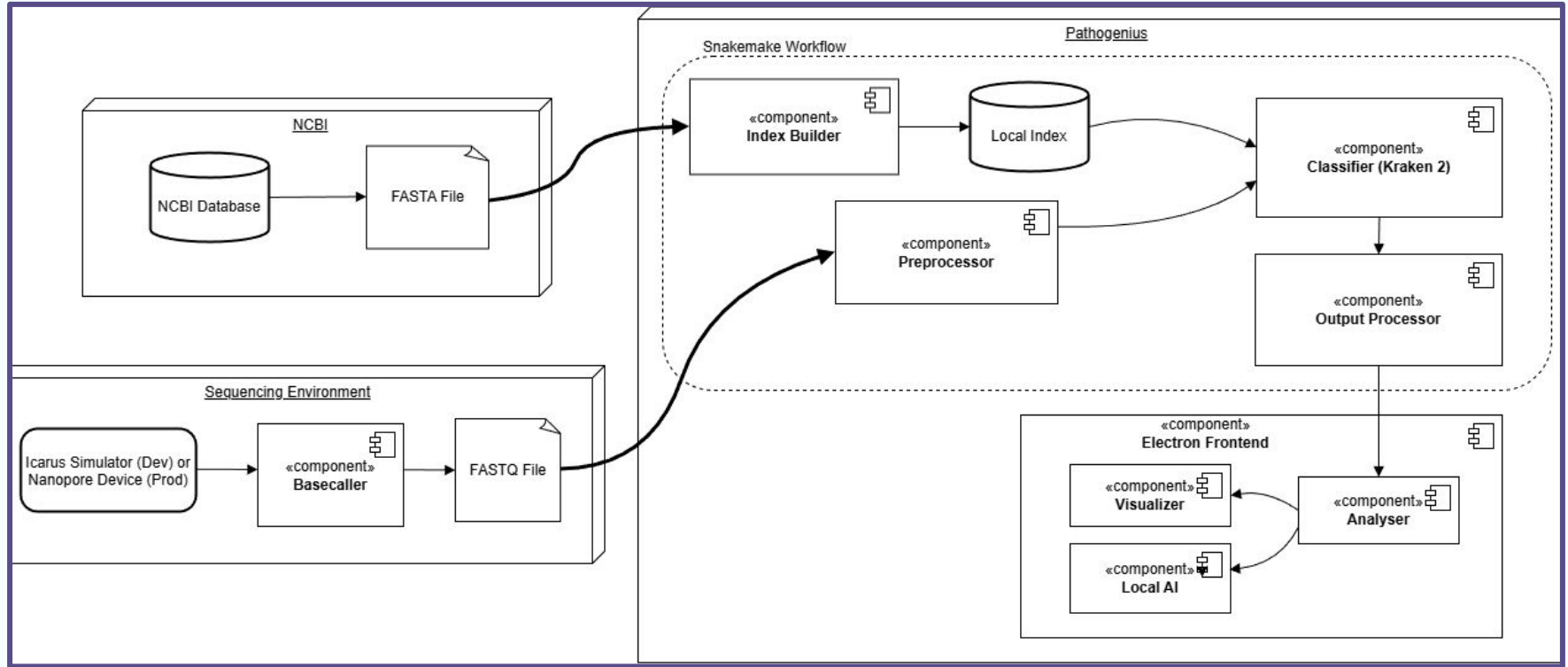
- Sensitive genomic data remains fully on the local device



OFFLINE ARCHITECTURE

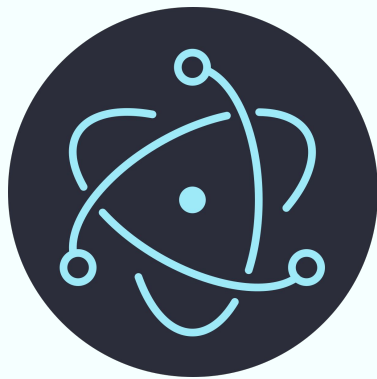
- ✓ Local Reference Database
NCBI genomes + **Kraken2** index
- ✓ **Snakemake** Pipeline
Reproducible workflow, no external calls
- ✓ Local **AI** Assistant
Quantized LLM for interpretation
- ✓ **Electron** Interface
Bundled with all dependencies

HIGH LEVEL SYSTEM ARCHITECTURE



• Fig. 1. High Level System Architecture of Pathogenius

TECHNOLOGY STACK



Electron.js



National
Center for
Biotechnology
Information



Snakemake



nVIDIA.

CUDA



Hugging Face

ROADMAP

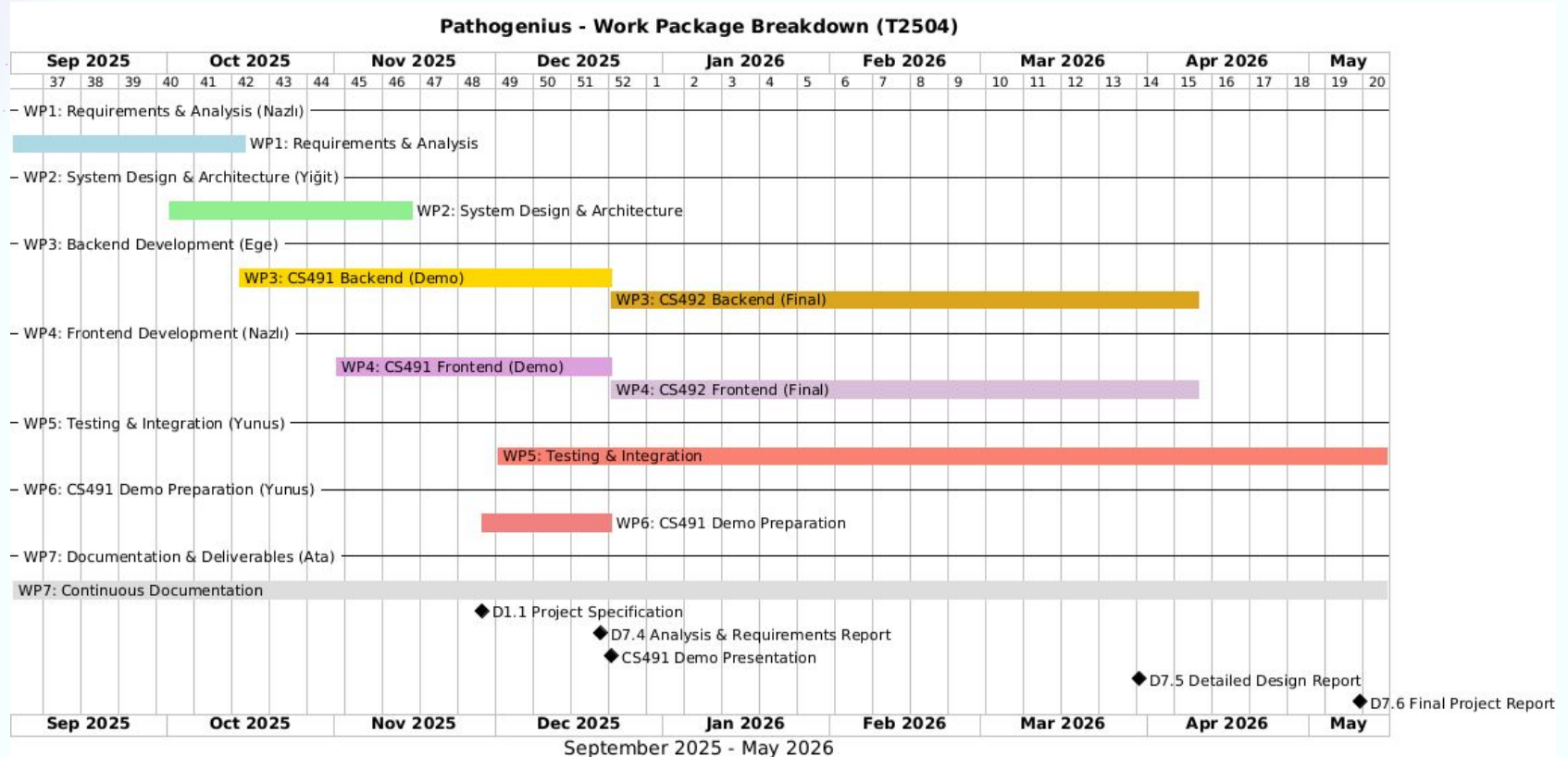
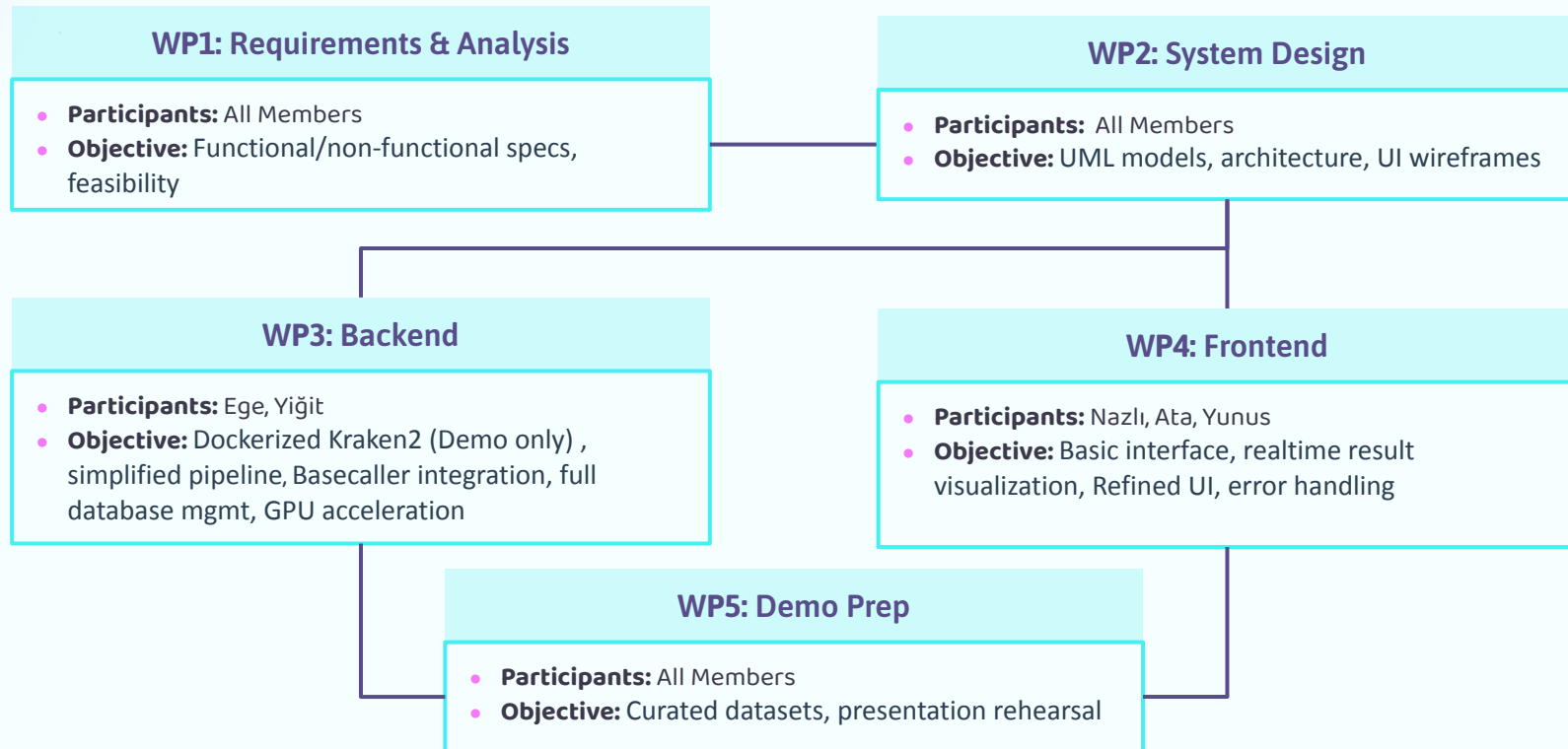


Fig. 2. Gantt Chart of the Work Packages

Project Work Plan



Project Work Plan

WP3: Backend

- **Participants:** Ege, Yiğit
- **Objective:** Parallelized classifier, simplified pipeline, Basecaller integration, full database mgmt, GPU acceleration

WP4: Frontend

- **Participants:** Nazlı, Ata, Yunus
- **Objective:** Basic interface, realtime result visualization, Refined UI, error handling

WP7: Documentation

- **Participants:** All Members
- **Objective:** Logbooks, reports, user manual, tech docs

WP5: Testing & Integration

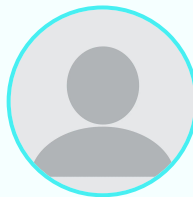
- **Participants:** All Members
- **Objective:** 50+ test cases, system/performance testing

WORK ALLOCATION



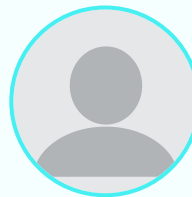
NAZLI APAYDIN

Frontend development



EGE ATEŞ

Backend and workflow,
scalability



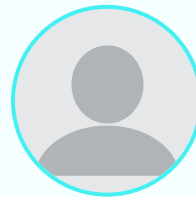
YİĞİT ALİ DOĞAN

Backend and workflow, CUDA
GPU mapping



YUNUS GÜNAY

Frontend development and
testing



ATA UZAY KUZEY

Frontend development and
LLM integration



THANKS

Now, Demo!

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Project Website: <https://patho-genius.github.io>

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