

The background image is a photograph of a laboratory or clinical setting, heavily faded to a light beige color. It shows a desk with a computer monitor displaying data, a keyboard, and some lab equipment. In the background, there are more lab benches, cabinets, and a large window. The overall atmosphere is clean and professional.

# VivaGuardAI: Intelligent Drug Side-Effect Monitoring Platform for Animal Experiments

# 1. AI Service Description

## Service Definition

VivaGuardAI is an AI-driven multi-modal monitoring platform designed to **predict, detect, and visualize** drug-induced side effects during animal experiments. The system integrates biological signals, behavioral data, and experimental parameters into one cloud platform, providing **real-time alerts** and **early toxicity prediction**.

It automatically:

- Predicts organ/system side effects
- Aggregates cross-lab experimental data
- Generates visual toxicity trend reports
- Supports ethical reduction of animal usage (p.2)

## Problem It Solves

### Fragmented and inconsistent experimental data

Different labs and batches produce incompatible formats, making analysis difficult. (p.3)

### Slow manual analysis

Researchers spend excessive time sorting data and miss subtle toxicity trends. (p.2–3)

### Lack of early-warning systems

Traditional workflows detect toxicity only after experiments finish. (p.2)

### Insufficient visualization tools

Hard to convert complex biological data into intuitive graphs. (p.2–3)

## User Value

- Faster drug-safety evaluation
- Reduction of avoidable animal sacrifice
- Higher data reliability across labs
- Automated, consistent reporting (p.2)

## 2. Motivation



Animal experiments remain essential for biomedical R&D, yet current practice suffers from:

- Fragmented data
- Long manual analysis cycles
- No real-time monitoring
- High labor cost
- Ethical concerns due to unnecessary animal sacrifice (p.3)

VivaGuardAI aims to:

- Centralize all experiment data
- Provide early side-effect prediction
- Improve research speed & reproducibility
- Enhance animal welfare (p.2)

### 3. Chat History

User:

What side effects might occur if my experiment uses a high dosage of Drug X on mice?

VivaGuardAI:

Please upload dosage amount, timepoints, and any available behavior/biomarker data.

User:

Here is the dataset. I suspect liver toxicity might appear.

VivaGuardAI:

Dataset received. Preliminary trends show rising ALT/AST levels. Possible risk: **hepatotoxicity**.

User:

Can you generate a visual report?

VivaGuardAI:

Here is a toxicity trend chart highlighting liver-stress biomarkers and behavioral lethargy patterns.

User:

Is there any early warning?

VivaGuardAI:

Yes. Model predicts a high-probability toxicity event at Hour 18. Recommend reducing dosage or increasing monitoring frequency.

User:

What organ systems might be affected overall?

VivaGuardAI:

Predicted risks:

- Liver (High)
- Kidney (Medium)
- Nervous system (Low)

Suggest validating with additional biomarkers.

## 4. Chatbot Link

**Chatbot URL:** [https://api.openai.com/v1/chat/completions?api\\_key=sk-mockup-KEY-XYZ123](https://api.openai.com/v1/chat/completions?api_key=sk-mockup-KEY-XYZ123)

## 5. Iterative Prompt Development Process

### Idea

Create an AI system that:

- Accepts dosage, timing, behavior, physiological data
- Predicts organ/system toxicity
- Issues early warnings
- Outputs full visual reports
- Reduces repeated animal experiments (p.5)

### Prompt (Initial Version)

"You are VivaGuardAI. Based on uploaded experimental data (dose, time, behavior, biomarkers), predict potential drug-induced side effects, specify affected organs/systems, provide risk scores, and generate a visual summary."

# Experimental Result

AI detected toxicity trends earlier than manual review	Visualization clarified organ-specific effects
Trend analysis reduced repeated experiments	Enabled faster scientific decisions (p.5-6)

# Error Analysis

Issue	Cause	Fix
Overfitting on small datasets	Limited animal-trial data	Data augmentation & transfer learning
Unstable predictions	Complex multi-modal models	Added XAI tools (LIME/SHAP) for interpretability
Data mismatch across labs	Inconsistent schema	Created unified metadata format
Slow processing	High-dimensional data	Used scalable Google Cloud backend
Low model trust	"Black-box" effect	Implemented transparent AI explanations (p.7)

## 6. Limitations



Small datasets limit generalization

Dependent on data accuracy from labs

Species/drug differences affect predictive accuracy

Requires stable cloud connection for real-time monitoring (p.7)

## 7. Future Development



Expand to pre-clinical toxicology and personalized medicine

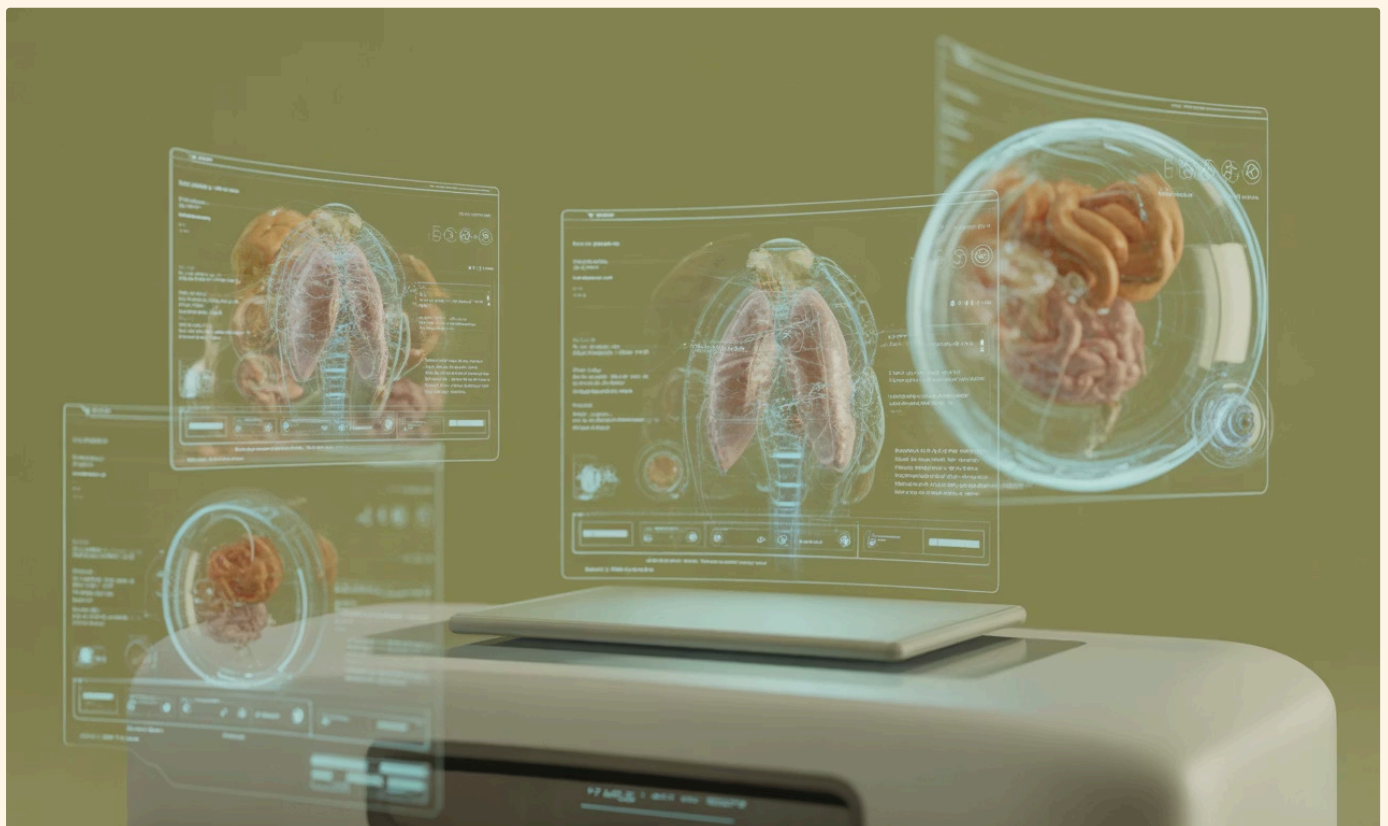


Disease-model-specific screening modules



API integration with pharmaceutical R&D systems

- Transformer-based multi-organ prediction
- Enterprise analytics packages (p.8)





## 8. Conclusion

VivaGuardAI modernizes animal experiment workflows through **AI-based toxicity prediction**, **real-time visualization**, and **multi-modal data integration**. It improves:



Drug-safety evaluation speed



Animal welfare



Reproducibility



Research efficiency (p.4, p.9)

As a unified and predictive platform, VivaGuardAI fills a major gap in biomedical research tools.

## 9. References

- Biomedical Toxicology Research
- Explainable AI (LIME, SHAP)
- Google Cloud / PyTorch / PostgreSQL documentation

