Leveraging Large Language Models (LLM) Agents for Explainable Healthcare Decision Support

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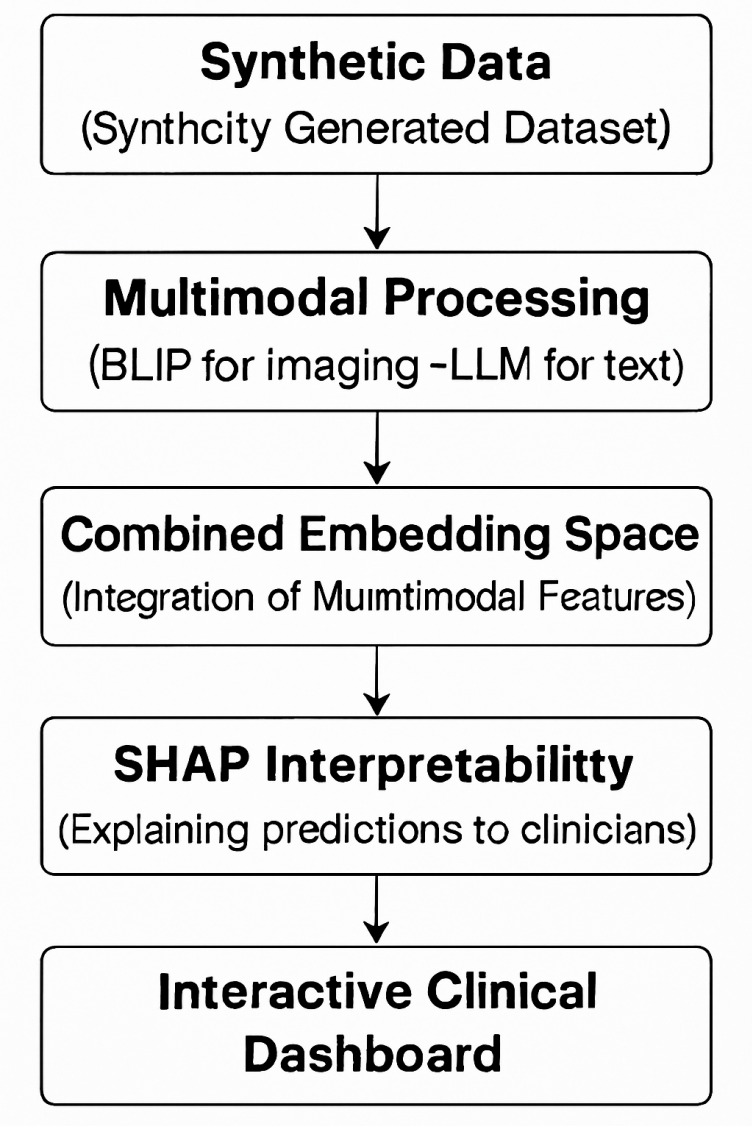
Problem Statement

- Healthcare decision-making depends on complex multimodal data (text + imaging).
- Traditional AI lacks transparency, limiting clinical trust.
- **Goal**: Build an interpretable clinical decision-support system.

System Architecture



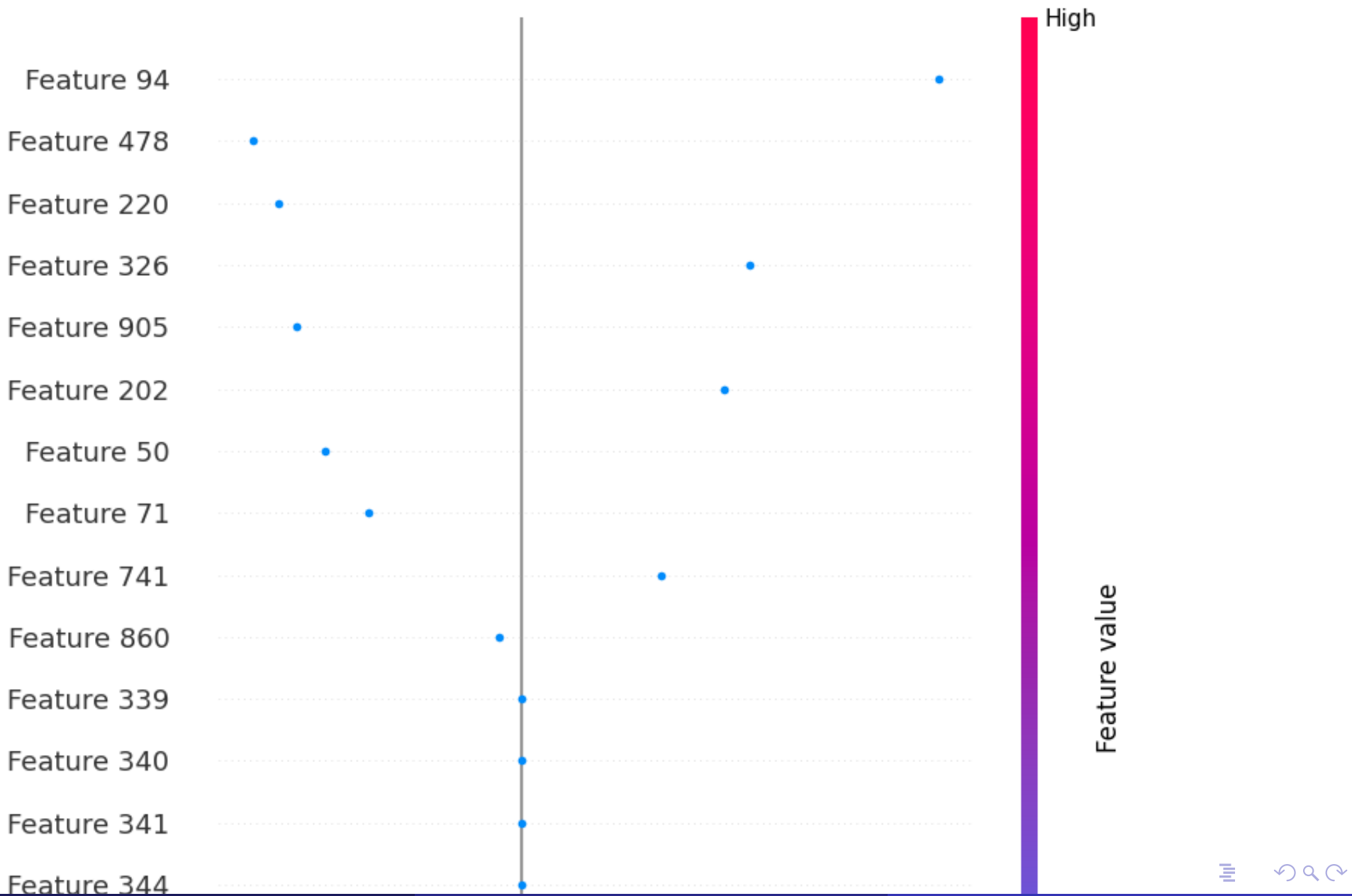
Methodology

- **Data**: Synthetic clinical notes (Faker) + public medical images.
- **Model**: CLIP for joint multimodal embeddings.
- **Explainability**: SHAP KernelExplainer for feature interpretation.

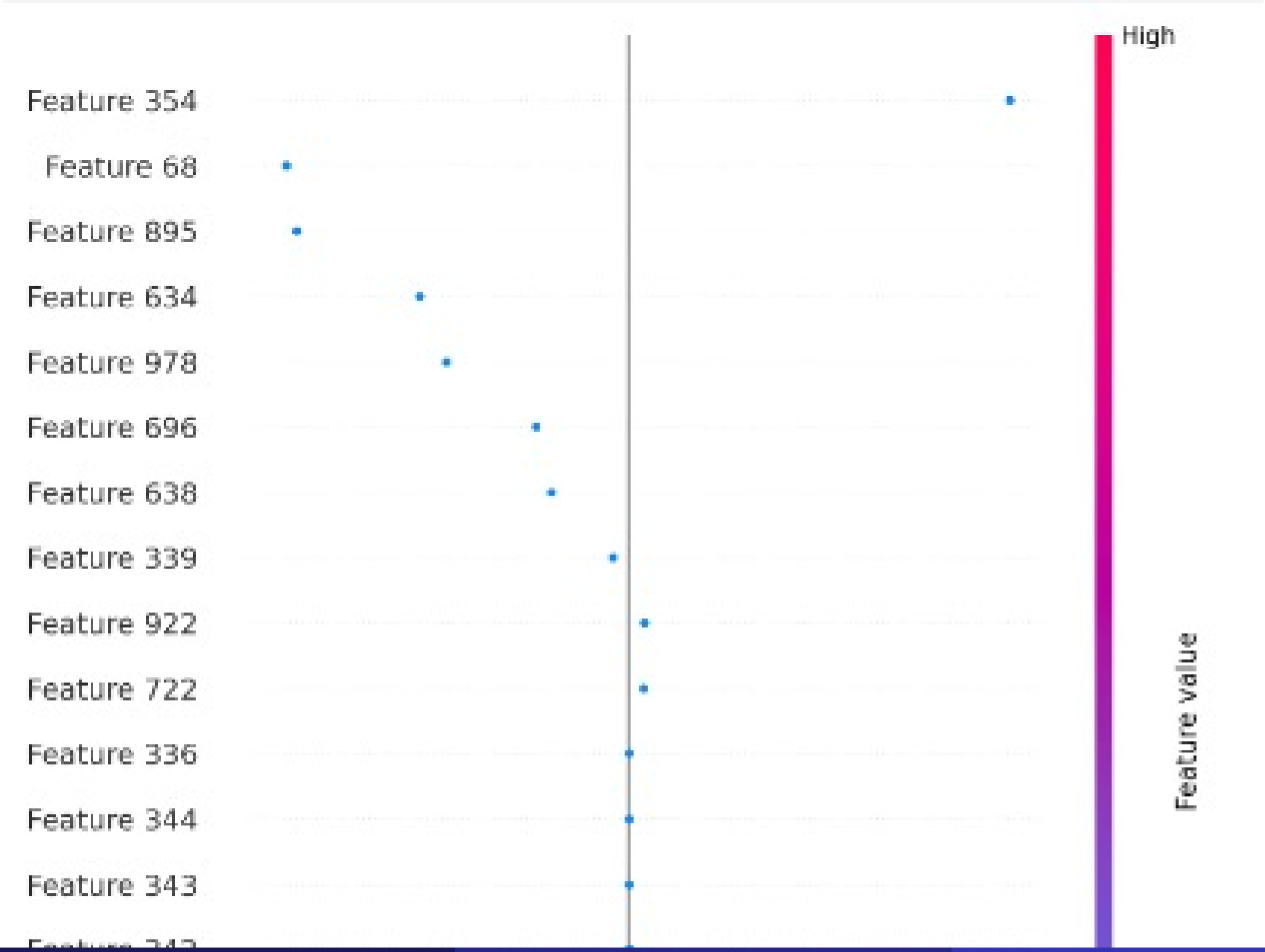
Code Workflow Summary

1. Generate synthetic notes/images.
2. CLIP embedding extraction.
3. Risk score calculation (mean over embeddings).
4. SHAP explainability visualization.

Results: Normal Patient



Results: Pneumonia Patient



Comparative Analysis

- Normal patient: Minimal feature contribution.
- Pneumonia patient: Significant feature impact.
- Model successfully distinguishes healthy vs diseased patterns.

Conclusion

- Multimodal LLM integration (CLIP) effectively processes clinical data.
- SHAP interpretability improves AI transparency.
- Framework enhances clinician trust and decision support.

Future Work

- Use real clinical datasets (e.g., MIMIC-III, CMS).
- Expand embedding interpretation into clinical terms.
- Clinical setting validation.