

# Sentiment Analysis Approach in Healthcare Data Assessment

**Objective: Convert unstructured patient feedback into structured, high-confidence insights including overall sentiment, domain-specific entity extraction, and entity-level sentiment to improve operational and clinical decision-making.**

1

## Core Techniques - click here to access the code : [Github](#)

Hybrid Transformer-Based NLP Architecture:

- BioBERT for medical entity recognition
- Clinical NER for healthcare terminology
- Rule-based entity patterns for domain precision
- BERT multilingual sentiment classifier for overall feedback
- FLAN-T5 for aspect-based sentiment analysis
- Zero-shot classification for adaptive entity detection
- Lexicon fallback for robustness

2

## Entity-level sentiment detection for:

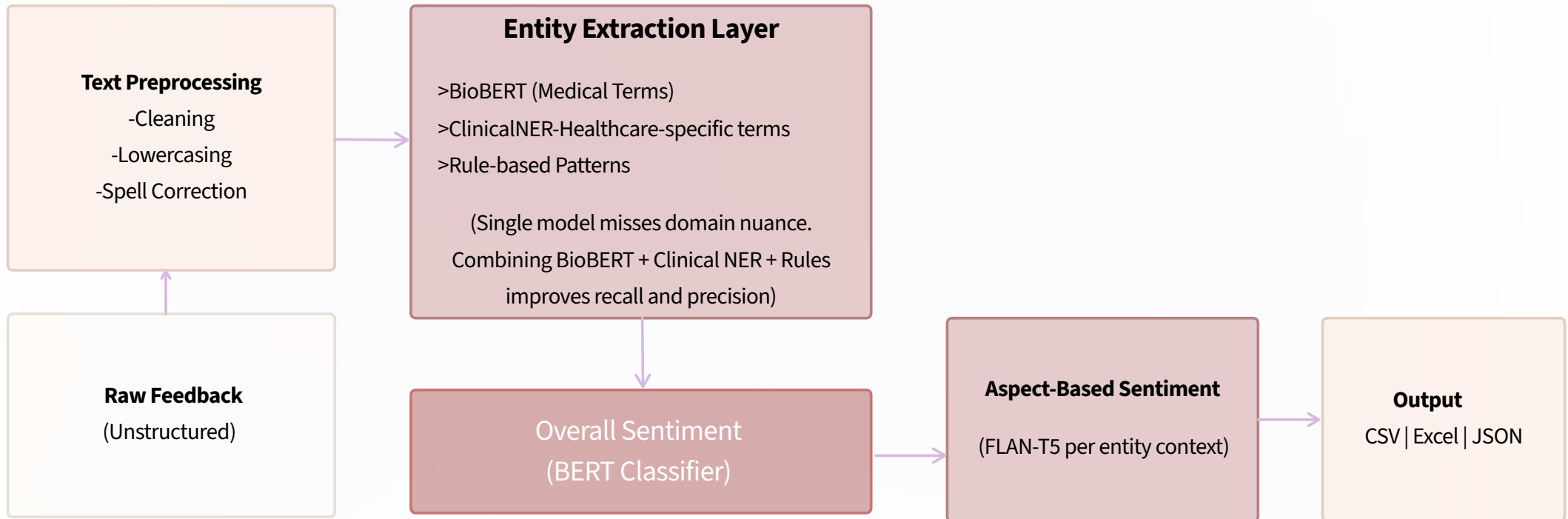
- Doctor
- Nurse
- Facility
- Surgery / Procedure
- Appointment
- Parking

3

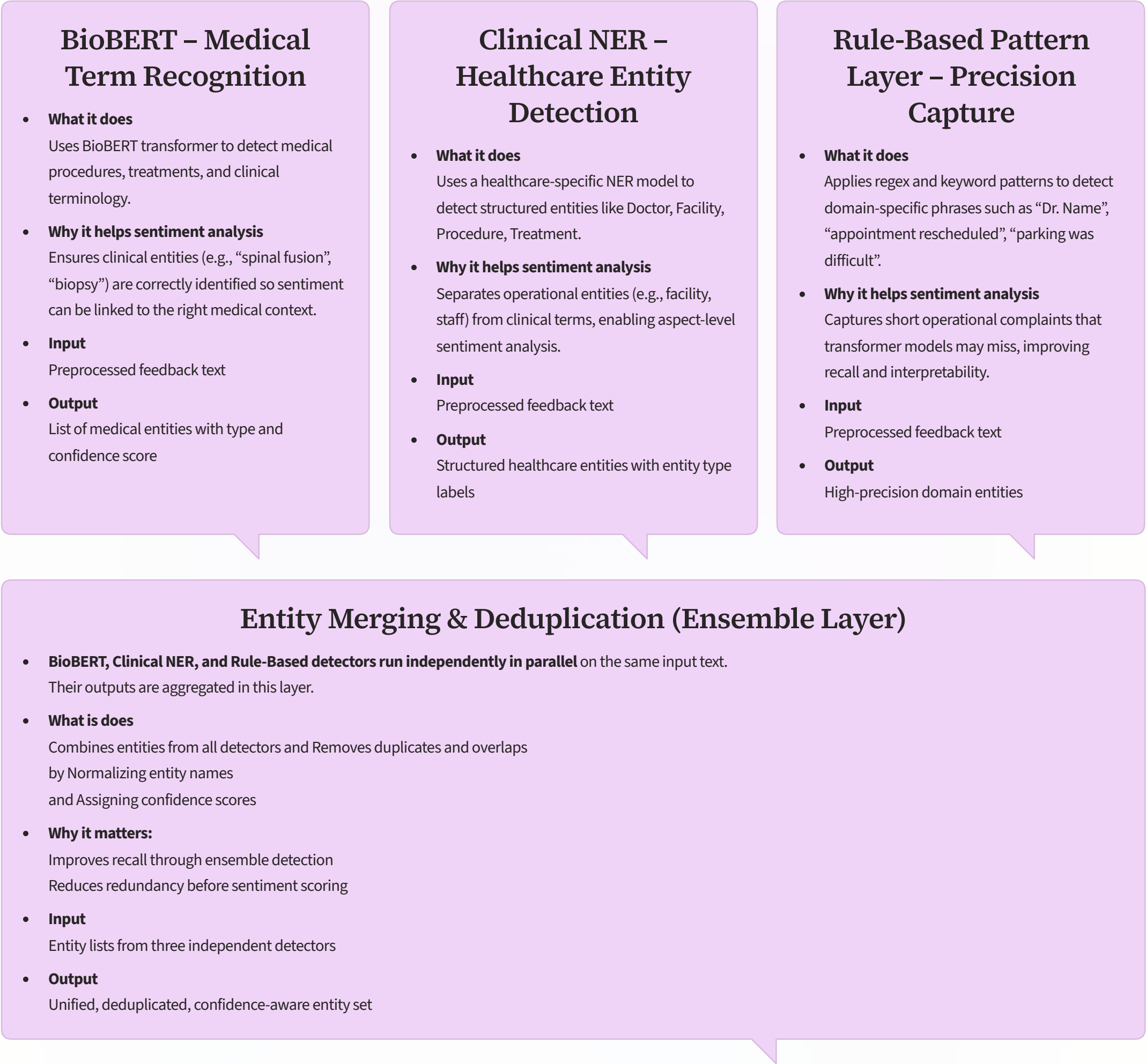
## Key Challenges

- No labeled training dataset
- Mixed sentiment within same feedback
- Healthcare terminology variability
- Misspellings
- Overlapping entity mentions
- Need for confidence-aware outputs

# System Architecture: NLP Pipeline Flow



# Entity Extraction Layer – Hybrid Detection Architecture

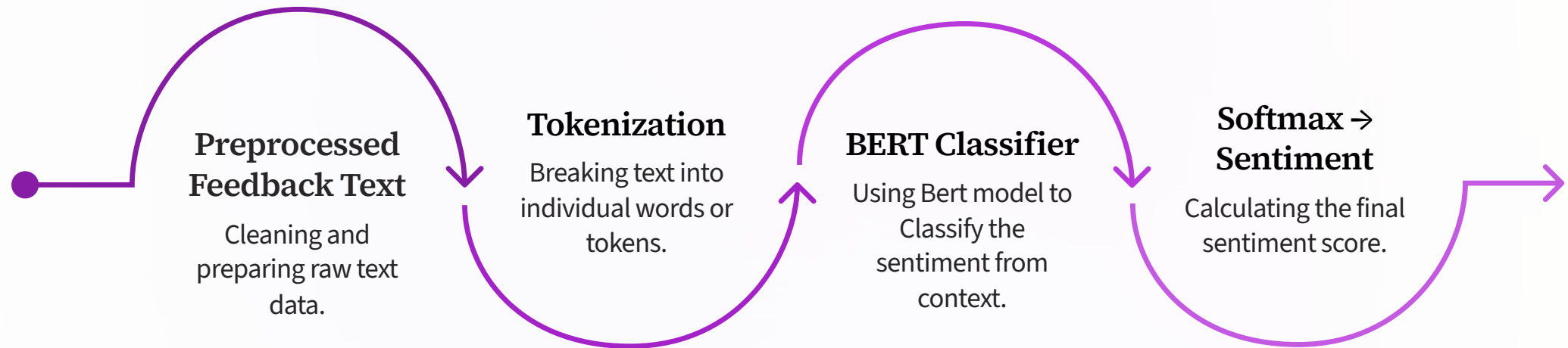


# Overall Sentiment Layer (Transformer-Based)

Uses a pretrained BERT-based sequence classification model to analyze the full feedback text and predict overall sentiment.

## What happens here:

**Preprocessed text → Tokenization → BERT classifier → Softmax probabilities → Sentiment label (Positive / Neutral / Negative) with confidence score**



## Why it matters

- Captures global emotional tone of the feedback
- Handles contextual language (e.g., “handled professionally despite delays”)
- Provides probability-based confidence score

**Input :** Preprocessed full feedback text

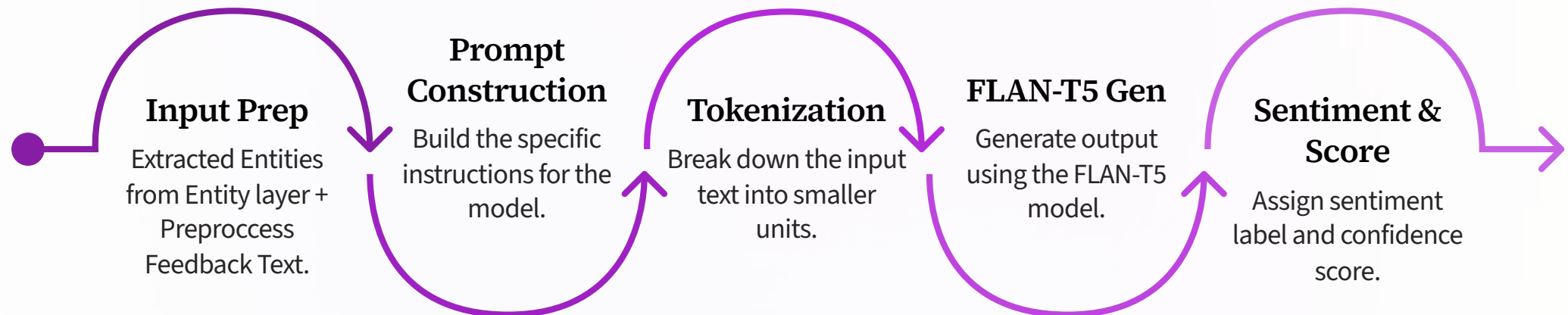
**Output :** Overall sentiment label + confidence score

# Aspect-Based Sentiment Layer(FLAN-T5 Prompt-Based)

Uses a pretrained sequence-to-sequence transformer (FLAN-T5) to assign sentiment to each extracted entity.

## What happens here:

**Extracted Entities (from Entity Extraction & Merging Layer) + Preprocessed Feedback Text → Prompt Construction → Tokenization → FLAN-T5 Sequence Generation → Sentiment Label (Positive / Neutral / Negative) → Confidence Score**



**Example Prompt:** “Analyze the sentiment about Doctor ‘Dr. Riya Patel’ in the following text...”

## Why it matters:

- Enables fine-grained entity-level sentiment
- Handles mixed feedback within a single comment
- Works without labeled aspect-based dataset

**Output :** Entity-level sentiment label + confidence score

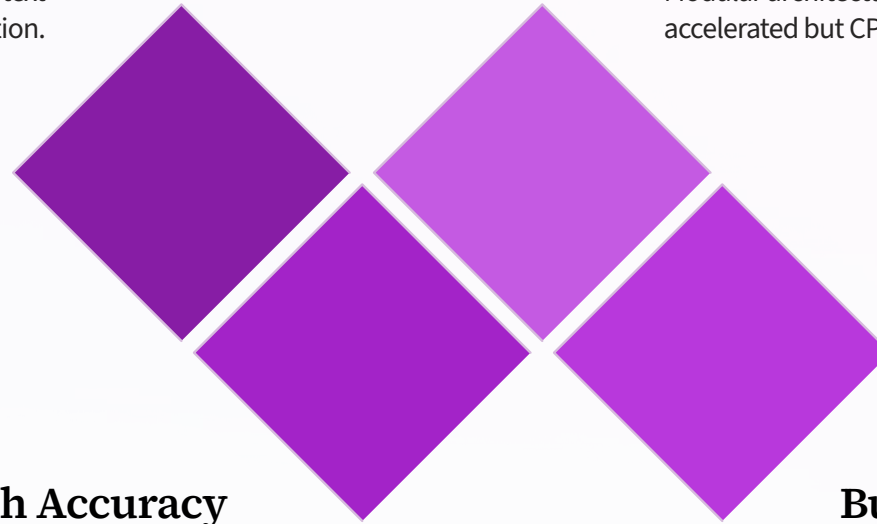
# Production-Ready & Robust Architecture

## Robustness

Handles Real-World Variability:  
Supports variable input lengths and text normalization.

## Operational Ease

Deployment Friendly:  
Modular architecture that is GPU-accelerated but CPU-compatible.



## High Accuracy

Intelligent & Reliable:  
Ensemble entity extraction combining transformers and rule-based logic.

## Business Value

Business-Ready Output:  
Generates normalized entities with confidence metrics for monitoring.