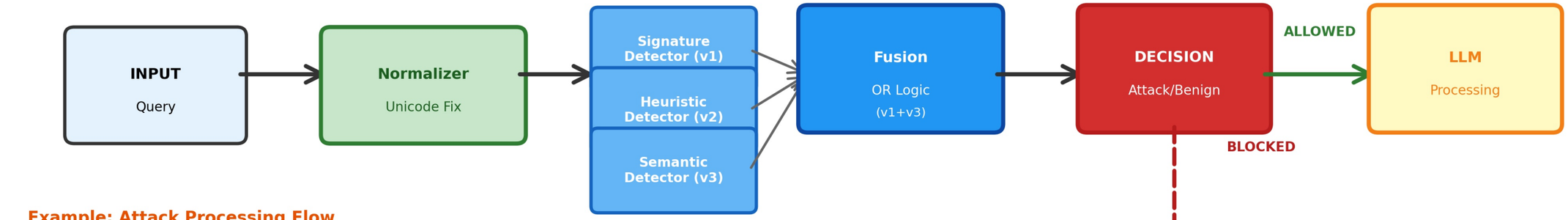
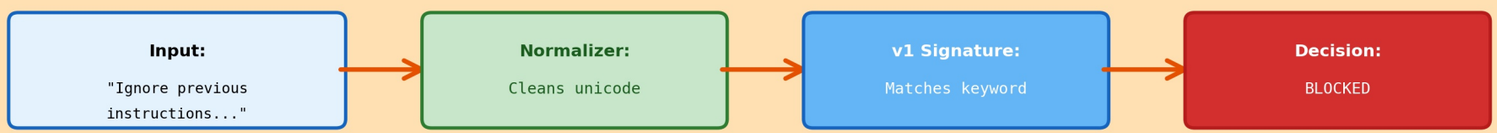
Figure 16: Prompt Injection Detection Pipeline Architecture

Input-Side Detection Before LLM Processing



Example: Attack Processing Flow



Performance: 87% TPR on known attacks | 0.77% FAR on benign | <0.1ms latency

Production Configuration: Normalizer + v3

```
True Positive Rate (TPR): 87%
False Alarm Rate (FAR): 0.77%
Latency: <0.1ms per sample
Complexity: ~1,200 lines
Deployment: Stateless
Dependencies: None (pure Python)
```

Component Specifications

```
Signature Detector (v1):
  • 80% TPR, 0% FAR
  • Keyword matching
Semantic Detector (v3):
  • 57% TPR, 0% FAR
  • Pattern analysis
Fusion: OR Logic (v1+v3)
  • Combined: 87% TPR, 0% FAR
```

Key Design Principles

1. INPUT-SIDE DETECTION: Attacks blocked BEFORE reaching the LLM
2. NORMALIZER FIRST: Unicode/homoglyph normalization ensures consistent detection
3. COMPLEMENTARY DETECTORS: v1 (signature) + v3 (semantic) catch different patterns
4. THRESHOLD-INVARIANT: Binary OR logic eliminates threshold tuning complexity
5. PRODUCTION-READY: <0.1ms latency, CPU-only, no external dependencies

Legend: Input | Normalizer | Detector | Fusion | Decision | LLM