

# Augmented Knowledge Base Creation

## LLM-Based Implementation

Joshua Cook

December 2024

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

# Problem

# Knowledge Management Crisis

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

- 19% of time spent searching information (Chui et al., 2012)
- Exponential data growth (Taylor, 2023)
- Departmental silos impair decision-making (Deloitte, 2020)
- Currency challenges in rapidly evolving fields (Tamayo et al., 2023)

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

**Solution**

Implementation

Challenges

Results

Future

Solution

# The Chelle Knowledge Model (CKM)

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

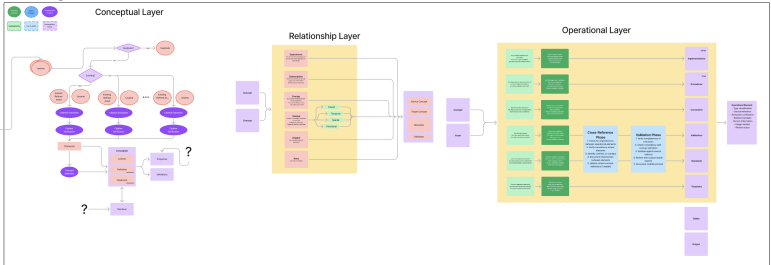
Implementation

Challenges

Results

Future

## Knowledge Model



# The Chelle Knowledge Model (CKM)

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

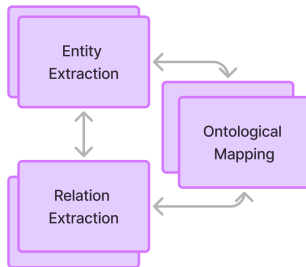
Future

- Three-layer architecture:
  - 1 Conceptual Layer
  - 2 Relationship Layer
  - 3 Operational Layer
- Mathematical formalism
- Human-in-the-loop validation
- Automated knowledge extraction

# Core Operations

Three fundamental knowledge processing operations:

- 1 Entity extraction
- 2 Relationship extraction
- 3 Ontological mapping



Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

# Implementation



# Architecture

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

- Docker + Microservices
- FastAPI + Redis Queue
- MongoDB storage
- Next.js frontend
- AWS Bedrock integration
- Langfuse monitoring

# Architecture

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

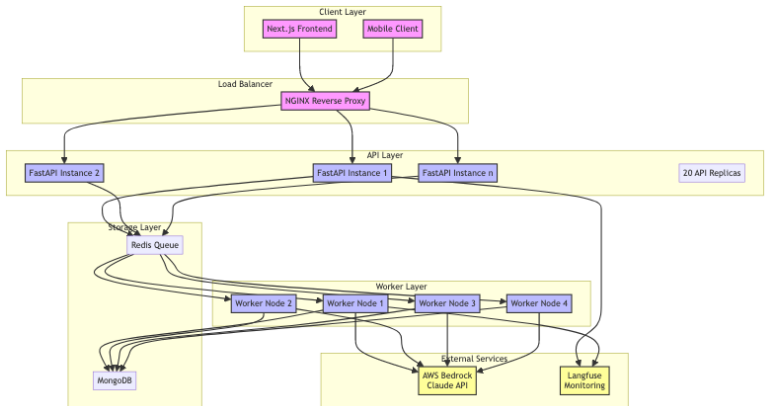
Solution

Implementation

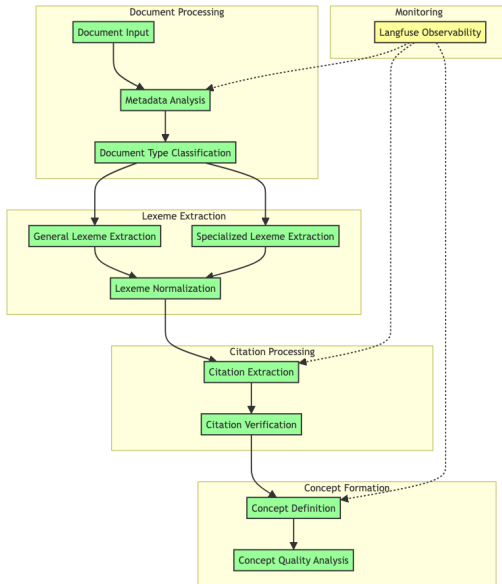
Challenges

Results

Future



# Processing Pipeline



Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

**Challenges**

Results

Future

# Challenges

# Technical Hurdles

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

- Asynchronous processing at scale
- Worker load balancing complexity
- Debug complexity in distributed systems
- Performance bottlenecks with rich documents

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

**Results**

Future

Results

# Implementation Status

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

## Component Status:

- Core functionality proven viable
- Document processing pipeline complete
- Storage and queue management implemented
- Several features remain theoretical

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

**Future**

Future



# Next Steps

Augmented  
Knowledge  
Base Creation

Joshua Cook

Problem

Solution

Implementation

Challenges

Results

Future

- Complete relationship extraction system
- Implement validation framework
- Optimize worker performance
- Expand monitoring capabilities
- Develop assessment framework
- Deploy learning structure