\*\*\* a/tasks.md

--- b/tasks.md

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-- [ ] 7. Create schema evolution and governance system

- - Implement SchemaEvolutionManager class for detecting and queuing new fields

- - Add database schema for tracking field candidates and evolution history

- - Create governance rules engine for automated and manual schema evolution approval

- - Implement schema validation against baseline structure

- - Add schema migration functionality for existing PALD data

- - Write unit tests for schema evolution detection, governance rules, and migration

- - \_Requirements: 2.4, 2.5, 8.1, 8.2, 8.3, 8.4, 8.5\_

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-- [ ] 8. Implement UI response structure and status reporting

- - Create PALDProcessingRequest and PALDProcessingResponse dataclasses

- - Update UI components to handle new response structure (pald\_light, pald\_diff\_summary, defer\_notice)

- - Add status indicators and progress feedback for PALD processing

- - Implement error message display with user guidance

- - Create user-friendly notifications for deferred bias analysis

- - Write UI integration tests for response handling and status display

- - \_Requirements: 9.1, 9.2, 9.3, 9.4, 9.5\_

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-- [ ] 9. Add comprehensive error handling and monitoring

- - Create PALDProcessingError hierarchy with specific exception types

- - Implement ErrorRecoveryManager for graceful degradation strategies

- - Add PALDPerformanceMonitor for tracking processing metrics

- - Create PrivacyManager for data protection and compliance

- - Implement logging and monitoring for all PALD enhancement components

- - Write error handling tests and performance monitoring validation

- - \_Requirements: All requirements - error handling and monitoring cross-cuts all functionality\_

-

-- [ ] 10. Create database migrations and update data models

- - Create database migration for pald\_processing\_logs table

- - Add bias\_analysis\_jobs and bias\_analysis\_results tables

- - Create schema\_field\_candidates table for evolution tracking

- - Update existing PALD data models to support new functionality

- - Add database indexes for performance optimization

- - Write database migration tests and data model validation

- - \_Requirements: 5.3, 5.4, 5.5, 5.6, 6.7, 8.1, 8.2\_

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-- [ ] 11. Implement background job processing for bias analysis

- - Create background worker process for processing bias analysis queue

- - Implement job scheduling and retry logic with exponential backoff

- - Add dead letter queue for failed bias analysis jobs

- - Create job status tracking and progress reporting

- - Implement batch processing with configurable batch sizes

- - Write integration tests for background job processing and error recovery

- - \_Requirements: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 7.4, 7.5\_

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-- [ ] 12. Add configuration management and feature flag integration

- - Update config.py with PALDEnhancementConfig settings

- - Add environment variable overrides for all PALD enhancement settings

- - Implement runtime configuration validation and error reporting

- - Create configuration management UI for administrators

- - Add feature flag controls for enabling/disabling analysis components

- - Write configuration management tests and validation

- - \_Requirements: 7.1, 7.2, 7.3, 7.4, 7.5\_

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-- [ ] 13. Create comprehensive test suite and documentation

- - Write unit tests for all new classes and methods

- - Create integration tests for end-to-end PALD processing workflows

- - Add contract tests for service interfaces and data models

- - Implement performance tests for bias analysis and queue processing

- - Create API documentation for new PALD enhancement components

- - Write user documentation for new features and configuration options

- - \_Requirements: All requirements - comprehensive testing ensures all functionality works correctly\_

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-- [ ] 14. Integrate with existing UI components and workflows

- - Update chat\_ui.py to use enhanced PALD processing

- - Modify image\_ui.py to integrate with PALD Light extraction for prompt compression

- - Update embodiment logic to use new bias analysis capabilities

- - Integrate schema evolution with existing PALD management workflows

- - Add user notifications for bias analysis completion

- - Write end-to-end integration tests for complete user workflows

- - \_Requirements: 3.1, 3.2, 3.3, 4.1, 4.2, 8.1, 8.2, 9.1, 9.2, 9.3\_

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-- [ ] 15. Final validation and deployment preparation

- - Run comprehensive test suite and fix any failing tests

- - Perform security audit of bias analysis and data storage components

- - Validate privacy compliance and pseudonymization implementation

- - Test schema loading from external file path in deployment environment

- - Verify all configuration flags work correctly in production settings

- - Create deployment documentation and rollback procedures

- - \_Requirements: All requirements - final validation ensures complete implementation\_

+## Bundled, cost-efficient tasks

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+- [ ] 7. Schema Governance & Config Baseline (bundles former 7, 10, 12)

+ - Deliverables: `SchemaEvolutionManager` (detect/queue fields), DB migrations (`schema\_field\_candidates`, `pald\_processing\_logs`, `bias\_analysis\_jobs/\_results`, indexes), model updates, `PALDEnhancementConfig` incl. ENV-overrides, runtime validation, minimal docs & migration tests.

+ - \_Requirements: 2.4, 2.5, 5.3, 5.4, 5.5, 5.6, 6.7, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2\_

+

+- [ ] 8. Background Bias Worker (MVP) + Job Lifecycle (bundles former 11)

+ - Deliverables: Worker with retry (exponential backoff), DLQ, status tracking, batch-sizes config, structured logs, CLI entrypoint; integration tests for recovery paths.

+ - \_Requirements: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 7.4, 7.5\_

+

+- [ ] 9. UI Response Contract & Wiring (bundles former 8 + 14)

+ - Deliverables: `PALDProcessingRequest/Response` dataclasses; UI handles `pald\_light`, `pald\_diff\_summary`, `defer\_notice`; status/progress + user-guidance; notifications; E2E UI tests.

+ - \_Requirements: 3.1, 3.2, 3.3, 8.1, 8.2, 9.1, 9.2, 9.3, 9.4, 9.5\_

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+- [ ] 10. Quality Gate, Monitoring & Final Validation (bundles former 9 + 13 + 15)

+ - Deliverables: Error hierarchy + recovery manager; performance/processing metrics; privacy checks; extensive unit/integration/perf tests; API + user docs; security review; deployment & rollback docs; final production checks for config flags and external schema path.

+ - \_Requirements: cross-cutting (all)\_