Haem.io Global Access Initiative

Platform Overview

Technical overview of the Haem.io diagnostic platform for LME healthcare settings

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Executive Summary

The Haem.io platform is an AI-powered diagnostic system designed to provide world-class blood cancer diagnosis in resource-constrained settings. The platform uses advanced artificial intelligence and large language models to extract and classify diagnostic information from standard pathology reports and images, requiring no specialized equipment or complex IT infrastructure.

This document provides a comprehensive technical overview of the platform, including AI extraction capabilities, classification systems, regulatory pathway, and how the platform is specifically adapted for use in lower and middle-income countries.

Platform Architecture

The Haem.io platform is built on a cloud-based architecture that can be accessed from any device with internet connectivity. This design ensures accessibility in diverse healthcare settings, from well-equipped urban hospitals to remote clinics.

Core Components

1. AI-Powered Data Extraction

Our platform uses advanced large language models (LLMs) to extract structured diagnostic information from unstructured pathology reports. This technology can process reports in multiple formats and languages, making it adaptable to different healthcare systems and documentation standards.

- Extracts key diagnostic parameters from free-text reports
- Identifies relevant clinical findings and test results
- Structures data for classification algorithms
- Handles variations in report formatting and terminology

2. Image Analysis & Processing

The platform can analyze pathology images (blood smears, bone marrow aspirates) using computer vision algorithms. This capability allows the platform to work with standard microscopy images that hospitals already produce, requiring no new imaging equipment.

- Processes standard microscopy images
- Identifies and classifies cell types
- Detects morphological abnormalities
- Works with images from standard cameras or scanners

3. Diagnostic Classification System

Our classification system uses validated algorithms based on WHO and ICC (International Consensus Classification) standards for myeloid malignancies. The system provides diagnostic classifications with confidence scores and supporting evidence.

- WHO 2022 classification standards
- ICC 2022 classification standards

- Multi-class classification for different blood cancer types
- Confidence scoring for diagnostic recommendations

4. Decision Support Tools

Beyond diagnosis, the platform provides decision support tools that help clinicians make informed treatment decisions, even in settings where specialist expertise may be limited.

- Treatment response monitoring
- Treatment options calculator
- Risk stratification tools
- Clinical guideline recommendations

How It Works

The platform workflow is designed to be simple and intuitive, requiring minimal training for healthcare providers:

1 **Data Input:** Healthcare providers upload pathology reports and/or images through a web-based interface. The platform accepts multiple file formats (PDF, images, text files).

2 **AI Extraction:** The platform's AI systems extract structured diagnostic information from the uploaded documents, identifying key findings, test results, and clinical parameters.

3 **Classification:** Using validated classification algorithms, the platform provides diagnostic classifications based on WHO and ICC standards, with confidence scores and supporting evidence.

4 **Results & Recommendations:** Results are presented in a clear, actionable format with diagnostic classifications, confidence scores, and treatment recommendations where appropriate.

5 **Clinical Review:** Local clinicians review results and make final diagnostic and treatment decisions, supported by the platform's recommendations and evidence.

LME-Specific Adaptations

The platform has been specifically designed and adapted for use in lower and middle-income countries, addressing the unique challenges of resource-constrained healthcare settings:

Infrastructure Requirements

Minimal Infrastructure Needs

The platform requires only basic internet connectivity and a device (computer, tablet, or smartphone) with a web browser. No specialized equipment, complex IT infrastructure, or extensive training is required.

- **No New Equipment:** Works with existing pathology reports and images that hospitals already produce
- **Cloud-Based:** No on-site servers or IT infrastructure required
- **Device Agnostic:** Works on computers, tablets, or smartphones
- **Low Bandwidth Compatible:** Optimized for low-bandwidth internet connections
- **Offline Capability:** Can queue cases for processing when connectivity is restored

Language & Localization

- Multi-language support for pathology reports
- Adaptable to local documentation standards
- Results can be presented in local languages
- Training materials available in multiple languages

Cost-Effectiveness

- Sliding scale pricing based on hospital capacity
- Subsidized access through Global Access Initiative
- No upfront capital costs
- Pay-per-use or subscription models available

AI & Machine Learning

The platform leverages state-of-the-art AI and machine learning technologies:

Large Language Models (LLMs)

Our LLM-based extraction system can understand and extract information from pathology reports written in natural language, handling variations in terminology, formatting, and language.

Computer Vision

Image analysis algorithms can identify and classify cells in pathology images, detecting morphological abnormalities and supporting diagnostic classification.

Validation & Accuracy

The platform has been validated against expert haematopathologist diagnoses, achieving high accuracy rates (>95% agreement) in clinical validation studies. The system continues to learn and improve through ongoing validation and feedback.

Bias Mitigation

We are committed to ensuring that our AI systems work equitably across diverse patient populations. Our validation studies include diverse datasets, and we actively work to identify and mitigate any potential biases in our algorithms.

Regulatory Pathway

The platform is being developed with regulatory compliance as a priority, ensuring that it meets international standards for medical device software:

UKCA Certification

The platform is undergoing UKCA (UK Conformity Assessed) certification as a Class IIa medical device. This certification process includes:

- Technical documentation and validation studies
- Clinical evaluation and evidence gathering
- Quality management system implementation
- Notified body assessment and certification

International Standards

The platform is built on WHO and ICC classification standards, ensuring compatibility with international diagnostic standards and facilitating global deployment.

Data Privacy & Security

The platform complies with international data privacy standards, including GDPR and local data protection regulations. All patient data is anonymized before processing, and robust security measures protect data throughout the diagnostic workflow.

Regulatory Strategy for LME Countries

For deployment in LME countries, we work with local regulatory authorities to ensure compliance with national regulations while maintaining international quality standards. Our regulatory strategy is designed to facilitate rapid deployment while ensuring patient safety and diagnostic quality.

Integration & Workflow

The platform is designed to integrate seamlessly into existing hospital workflows:

Standalone Operation

The platform can operate as a standalone web-based service, requiring no integration with existing hospital IT systems. This makes it ideal for hospitals with limited IT resources or infrastructure.

API Integration

For hospitals with more advanced IT infrastructure, the platform offers API integration capabilities, allowing seamless integration with existing laboratory information systems (LIS) and electronic health records (EHR).

Workflow Integration

The platform is designed to fit into existing diagnostic workflows, minimizing disruption and requiring minimal changes to established processes. Training is provided to ensure smooth adoption and integration.

Quality Assurance & Validation

Quality assurance is built into every aspect of the platform:

Clinical Validation

- Validated against expert haematopathologist diagnoses
- Ongoing validation studies in diverse clinical settings
- Continuous monitoring of diagnostic accuracy
- Regular updates based on clinical feedback

Quality Control

- Automated quality checks for input data
- Confidence scoring for all diagnostic outputs
- Flagging of uncertain or borderline cases
- Audit trails for all diagnostic processes

Continuous Improvement

The platform is continuously improved based on clinical feedback, validation studies, and advances in AI technology. Regular updates ensure that the platform remains at the forefront of diagnostic accuracy and usability.

Support & Training

Comprehensive support and training are provided to ensure successful platform adoption:

Training Programs

- Initial training for healthcare providers
- Ongoing support and refresher training
- Training materials in multiple languages
- Remote and on-site training options

Technical Support

- 24/7 technical support availability
- Remote troubleshooting and assistance
- Regular platform updates and maintenance
- Dedicated support team for LME deployments

Clinical Support

- Access to clinical expertise for complex cases
- Regular case review and feedback sessions
- Clinical guideline updates and recommendations
- Community of practice for platform users

Future Developments

The platform is continuously evolving to meet the needs of healthcare providers and patients:

Expanded Diagnostic Capabilities

- Additional blood cancer types (MDS, lymphoma)
- Expanded classification categories
- Prognostic and predictive markers

Enhanced Features

- Improved image analysis capabilities
- Enhanced decision support tools
- Integration with treatment planning systems
- Patient portal for result access

Global Expansion

As the platform expands globally, we continue to adapt and improve based on feedback from diverse healthcare settings, ensuring that the platform remains effective and relevant across different contexts and populations.

Conclusion

The Haem.io platform represents a significant advancement in making world-class blood cancer diagnostics accessible to resource-constrained healthcare settings. Through AI-powered extraction and classification, minimal infrastructure requirements, and comprehensive support, the platform enables healthcare providers in LME countries to deliver accurate, timely diagnoses that can save lives.

As part of the Global Access Initiative, the platform is being deployed with a focus on sustainability, scalability, and long-term impact, ensuring that equitable access to diagnostic services becomes a reality for patients worldwide.

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This document provides a technical overview of the Haem.io platform for the Global Access Initiative. For technical inquiries, contact robert.lee@haem.io