**Project Design Phase**

**Proposed Solution Template**

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| Date | 26 june 2025 |
| Team ID | LTVIP2025TMID34781 |
| Project Name | Smart Sorting |
| Maximum Marks | 2 Marks |

**Proposed Solution Template:**

Project team shall fill the following information in the proposed solution template.

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| S.No. | Parameter | Description |
| 1 | Problem Statement (Problem to be solved) | HematoVision: Advanced Blood Cell Classification Using Transfer Learning  Manual identification of blood cells from microscopic slides is slow, error-prone, and requires expert supervision. There's a critical need for automated, real-time, and accurate classification for better diagnosis and treatment, especially in resource-limited settings. |
| 2 | Idea / Solution Description | • Preprocessing: Apply standard image enhancements such as histogram equalization, Gaussian blur for noise reduction, and contrast adjustment to normalize microscopic images. • Segmentation: Use classical image processing techniques like Otsu Thresholding, Watershed Algorithm, or deep learning models like U-Net to segment individual cells. • Classification: Use transfer learning (e.g., MobileNet, ResNet50) to classify blood cell types like RBCs, WBCs (neutrophils, lymphocytes, monocytes, eosinophils), and platelets from annotated datasets. |
| 3 | Novelty / Uniqueness | 1. 🧠 AI-Driven Real-Time Cell Detection • Uniqueness: Real-time classification directly from digital slides without major preprocessing delays. • Value: Enables instant diagnostics at the point of care.  2. 🔬 Intelligent Detection of Blood Cell Abnormalities • Uniqueness: Identifies morphological abnormalities such as atypical lymphocytes, blast cells, hypochromic RBCs. • Value: Enables early screening for leukemia, anemia, infections.  3. 📊 Visual Blood Health Dashboard • Uniqueness: Interactive graphs, heatmaps, and reports summarizing blood cell health. • Value: Helps clinicians make quick, data-driven decisions. |
| 4 | Social Impact / Customer Satisfaction | 🏥 Improved Access to Diagnostics in Underserved Areas • Impact: Deploys affordable, AI-powered hematology tools to rural clinics, mobile labs, or developing regions with limited lab infrastructure. • Result:  - Early detection of critical conditions (e.g., anemia, infections)  - Better patient outcomes with timely diagnosis  - Reduced patient load on urban hospitals |
| 5 | Business Model (Revenue Model) | 1. Value Proposition • Real-time AI-based blood cell classification • Works offline or hybrid for remote clinics • Compatible with various microscope cameras • Supports custom model training for hospitals/labs • Explainable AI to support medical staff • Subscription-based access or licensing  2. Revenue Streams • Hospital SaaS subscriptions • Pay-per-analysis API integration for labs • White-labeled version for OEM integration |
| 6 | Scalability of the Solution | • Multi-language UI for global accessibility (English, Hindi, French, Swahili) • Offline/Hybrid Deployment ensures usability in poor connectivity zones (rural Africa, South Asia) • Regulatory Modularization: Modular architecture to adapt to CE, FDA, CDSCO standards • Public Health Partnerships: Scale via collaboration with UNICEF, WHO, GAVI for mass diagnostics (e.g., anemia, malaria) campaigns in underserved populations. |