IJMSERH

International Journal of Multidisciplinary and Scientific Emerging ResearcH (IJMSERH)

Volume 14, Issue 2, April-June 2026

Impact Factor: 9.274

International Journal of Multidisciplinary and Scientific Emerging ResearcH (IJMSERH)

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 14, Issue 2, April-June 2026 ||

DOI: 10.15662/IJMSERH.2026.1402023

Migrantconnect: A Digital Platform for Efficient Migrant Worker Management

Mrs. M.Arockia Princia Mary[1], Mrs. D. Saroj Priyadharsini [2]

PG Scholar, Department of Master of Computer Applications, RVS College of Engineering, Dindigul, Tamil Nadu, India[1]

Assistant Professor, Department of Master of Computer Applications, RVS College of Engineering, Dindigul, Tamil Nadu, India[2]

ABSTRACT: Migrant workers form a significant part of Tamil Nadu's labor force, yet they continue to face challenges such as lack of official identification, language barriers, fragmented job information, and limited access to welfare support. Current labor management practices rely heavily on manual processes, leading to inaccurate records, delayed verification, and poor visibility of workforce distribution. To overcome these gaps, this project introduces an intelligent Migrant Worker Registration and Support Platform that digitally manages worker information, employment details, and welfare accessibility. The system enables fast and inclusive registration through a multilingual interface and generates a unique Migrant ID (MID) for each worker. QR-based identity verification allows employers and authorities to authenticate worker profiles quickly and securely. To analyze workforce concentration across Tamil Nadu, the OPTICS clustering algorithm is applied to location data, enabling the system to identify high-density migrant zones and emerging labor clusters in real time. The platform also supports document uploads, employer reporting, and role-based profile access to improve reliability and accountability. By combining digital identification, intelligent clustering, and centralized workforce mapping, the proposed system enhances transparency, strengthens labor governance, and ensures timely support for migrant workers across the state.

I. INTRODUCTION

Migrant work refers to employment undertaken by individuals who relocate from their usual place of residence, either within their own country or across international borders, in search of job opportunities. These individuals, commonly known as migrant workers, often move to areas where labor demand is high and opportunities are more accessible. Despite their crucial contribution to local and global economies, migrant workers often face vulnerabilities, including the risk of exploitation, unfair wages, and a lack of legal protections, especially when working under informal or irregular conditions.

The rapid growth of smart digital governance systems and mobile technology presents a significant opportunity to modernize migrant labor management. Traditional approaches relying on paper-based registration, manual verification, and fragmented state portals have proven inadequate for addressing the complex and dynamic challenges of tracking and supporting migrant workers across Tamil Nadu. There is a pressing need for a unified, intelligent, and inclusive digital platform that can provide real-time registration, secure identification, geo-spatial workforce analysis, and timely welfare communication.

This project presents MigrantConnect, a comprehensive web-based platform that addresses these challenges by integrating multilingual registration, unique Migrant ID (MID) generation, QR code-based verification, document management, employer verification, OPTICS density-based geo-spatial clustering, and a real-time notification system into a unified and scalable framework developed using Python, Flask, MySQL, and Bootstrap.

II. EXISTING SYSTEM

The traditional systems currently in place for managing migrant workers in India, including Tamil Nadu, are fragmented, region-specific, and lack a cohesive framework for centralized tracking and support. State labor registration portals are not integrated nationally, making it difficult to track a migrant worker who moves across state boundaries. Each state maintains separate records, leading to duplication, loss of data, or inability to access a worker's history in a new location.

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 14, Issue 2, April-June 2026 ||

DOI: 10.15662/IJMSERH.2026.1402023

Aadhaar-based identification, while widely used, only serves as proof of identity and residence. It does not contain employment status, skill sets, work history, or migration patterns. Government-run employment exchanges are largely outdated and paper-based with limited outreach, particularly among informal sector workers and migrants. NGO and welfare organization support, while crucial, remains fragmented and localized with no central mechanism to integrate their data into a government database. Employer-led registrations are proprietary and non-standardized, preventing broader workforce analysis and policy implementation.

DISADVANTAGES:

1. Manual registration is time-consuming and prone to data loss.
2. No centralized tracking system for migrant workers across state boundaries.
3. Verification of worker credentials is slow, manual, and unreliable.
4. Workers face job mismatches due to lack of skill documentation and matching.
5. Limited access to government welfare schemes due to poor information dissemination.
6. High risk of worker exploitation and wage fraud without transparent records.
7. Language barriers make communication difficult for interstate migrant workers.
8. Dependence on intermediaries leads to misinformation and job insecurity.

III. PROPOSED SYSTEM

The proposed system is a comprehensive digital platform designed to manage, monitor, and verify migrant workers across Tamil Nadu. The system combines digital registration, QR-based authentication, multilingual support, document validation, and geo-spatial analysis using OPTICS clustering to ensure accurate worker identification, real-time verification, and actionable workforce insights. This platform also provides notifications to workers regarding job opportunities and welfare schemes, making labor management more transparent, efficient, and data-driven.

The OPTICS (Ordering Points To Identify the Clustering Structure) clustering algorithm is applied to worker location data, enabling the system to identify high-density migrant zones, emerging labor clusters, and underpopulated areas in real time. This geo-spatial intelligence empowers government authorities and policymakers with data-driven tools for resource allocation, welfare distribution, and labor demand forecasting across the state.

ADVANTAGES:

1. Enables real-time tracking of migrant workers across regions with centralized data.
2. Provides secure digital identification through unique MID and QR code generation.
3. Reduces errors and delays associated with manual record-keeping and verification.
4. Ensures inclusive access with multilingual registration support for interstate workers.
5. Supports workforce planning and welfare scheme allocation through analytics dashboards.
6. Enhances employer accountability and prevents fraudulent or unauthorized recruitment.
7. Facilitates document verification and skill validation for reliable worker profiling.
8. Provides geo-spatial insights using OPTICS clustering to identify labor trends and high-demand zones.
9. Scalable for future integration with state or national labor management systems.

IV. SYSTEM ARCHITECTURE

The proposed system follows a structured client-server architecture in which a web frontend communicates with a Flask-based backend through HTTP API requests. Upon receiving a user request, the system routes it through role-based access control to determine the appropriate processing module. The outputs of all processing stages are aggregated by the central application layer, which produces the final response and records all activities in the MySQL database. Government authorities, migrant workers, and employers each interact with the system through dedicated role-specific dashboard interfaces.

At the entry point, a registration and authentication module handles user onboarding through OTP-based validation and session management. Approved workers receive a unique Migrant ID and associated QR code.

International Journal of Multidisciplinary and Scientific Emerging ResearcH (IJMSERH)

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 14, Issue 2, April-June 2026 ||

DOI: 10.15662/IJMSERH.2026.1402023

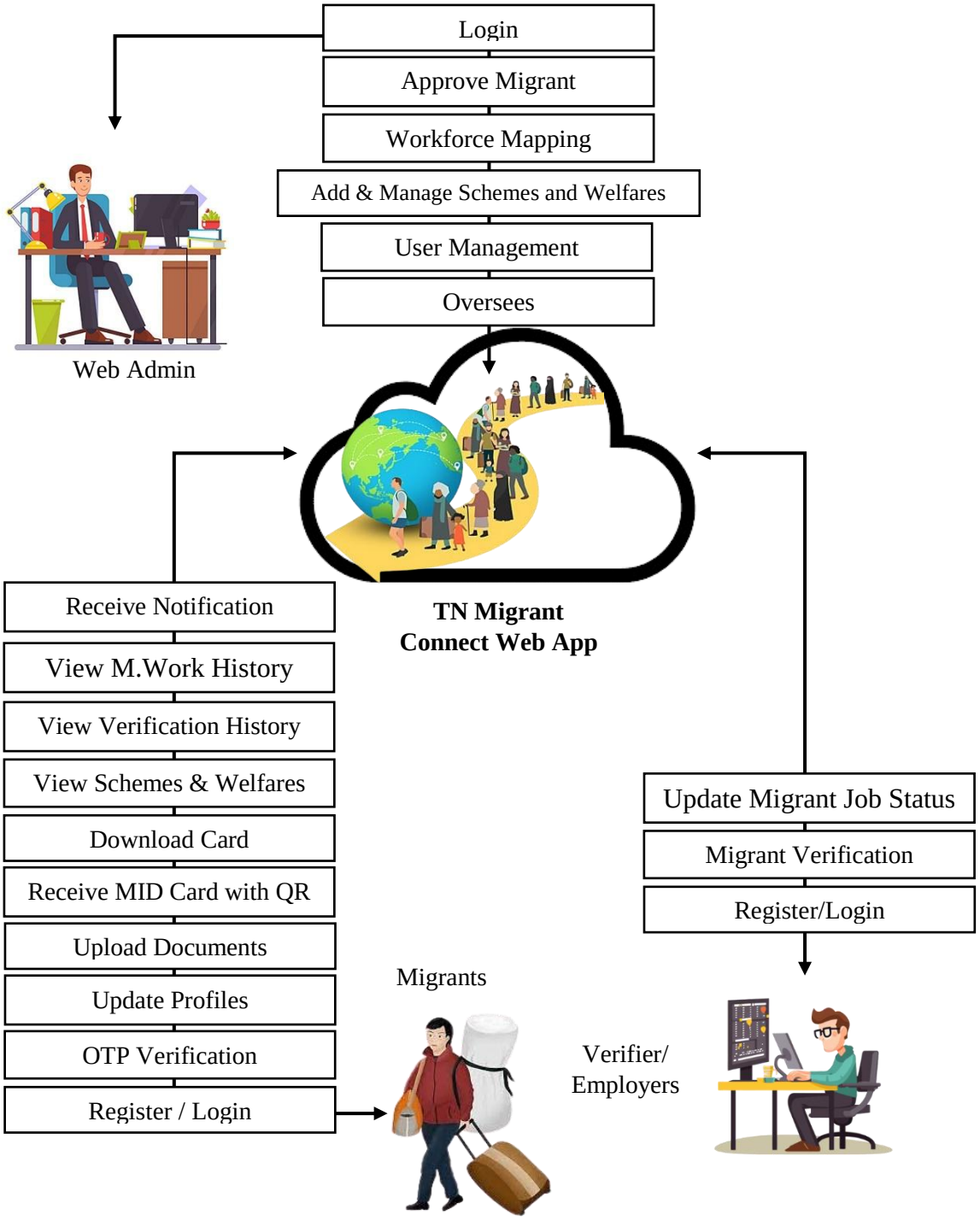

Figure 4.1 System Architecture: Migrant Workers / Employers / Web Admin → TN MigrantConnect Web App → [Registration | MID & QR | Document Management | OPTICS Clustering | Notification & Support | Workforce Mapping] → MySQL Database

MODULES:

1. Migrant Worker Registration and Multilingual Support Module
2. Unique Migrant ID (MID) Generation and QR Code Verification Module
3. Document Upload and Validation Module
4. Employer Verification and Workplace Mapping Module

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 14, Issue 2, April-June 2026 ||

DOI: 10.15662/IJMSERH.2026.1402023

5. OPTICS-Based Geo-Spatial Workforce Clustering Module
6. Real-Time Notification and Welfare Support Module
7. Government Authority Analytics and Dashboard Module

V. MODULE DESCRIPTIONS

MIGRANT WORKER REGISTRATION AND MULTILINGUAL SUPPORT: The registration module allows migrant workers to register their personal details, work experience, and skill sets through an intuitive multilingual interface supporting Tamil, Hindi, English, and Bengali. Mobile-friendly and accessible to semi-literate users, the module performs OTP-based phone verification using Aadhaar and contact number validation before allowing profile completion. Worker data including name, gender, address, state of origin, occupation, and skill is stored securely in the MySQL database. This module ensures inclusive onboarding and maintains a reliable centralized worker database for government and employer use.

UNIQUE MIGRANT ID (MID) AND QR CODE GENERATION: Once a worker completes registration and receives administrative approval, the system generates a unique Migrant ID (MID) in a PAN-card-style alphanumeric format using a uniqueness-verified random generation algorithm. A QR code linked to the MID is automatically created and stored, encoding the worker's ID, name, email, and contact details. Employers and government authorities can scan the QR code for instant profile retrieval and authentication. This module eliminates identity fraud, enables fast verification, and provides a portable digital identity for each migrant worker.

DOCUMENT UPLOAD AND VALIDATION: The document management module enables workers to upload essential identity and skill documents including Aadhaar proof, PAN proof, and ration card proof in supported formats (PDF, JPG, PNG). A document validation algorithm verifies file format, size, and completeness before storage. Uploaded files are stored securely in the server's uploads directory with structured filenames. Employers and authorities can access these documents during verification to confirm worker authenticity, support skill matching, and facilitate welfare eligibility assessment.

EMPLOYER VERIFICATION AND WORKPLACE MAPPING: The employer verification module allows registered and approved employers to validate migrant workers using their Migrant ID or QR code. Employers can update worker job status, record workplace GPS coordinates, and link workers to specific industry sectors and locations. The workplace mapping feature provides a geographic visualization of labor deployment across Tamil Nadu, enabling real-time tracking of workforce distribution by industry, district, and employer. Government authorities use this data to monitor labor compliance and enforce employment regulations.

OPTICS GEO-SPATIAL CLUSTERING: The OPTICS (Ordering Points To Identify the Clustering Structure) density-based clustering algorithm is applied to worker location data extracted from the registration and workplace mapping databases. Unlike DBSCAN, OPTICS can detect clusters of varying densities without requiring a fixed epsilon parameter, making it well-suited for the diverse geographic distribution patterns of migrant labor. The algorithm generates a reachability plot and identifies high-density migrant zones, emerging labor clusters, and underpopulated areas. Cluster outputs are visualized on interactive Folium maps for administrators and policymakers to inform resource allocation and welfare planning decisions.

NOTIFICATION AND WELFARE SUPPORT: The notification module ensures continuous communication between the platform and all registered users. Workers receive automated alerts regarding registration approval, MID issuance, job opportunities, and available government welfare schemes. The module supports multilingual message dispatch and provides access to legal aid, grievance redressal, and employment guidance in the worker's preferred language. Government authorities can add and manage welfare schemes, which are immediately made visible to eligible registered workers through the schemes portal.

VI. RESULTS

1. PERFORMANCE METRICS

The system was evaluated through comprehensive functional, integration, and performance testing covering all major modules. All fifteen test cases across worker registration, MID generation, QR verification, document validation, employer verification, OPTICS clustering, multilingual support, concurrent access, and security testing returned passing results. The OPTICS clustering module accurately identified high-density migrant zones from location datasets, with only a slight processing delay observed for very large datasets, which is scheduled for optimization. The system

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 14, Issue 2, April-June 2026 ||

DOI: 10.15662/IJMSERH.2026.1402023

demonstrated consistent performance and stability under concurrent multi-user load without crashes or data inconsistencies.

2. OUTPUT SCREENSHOTS

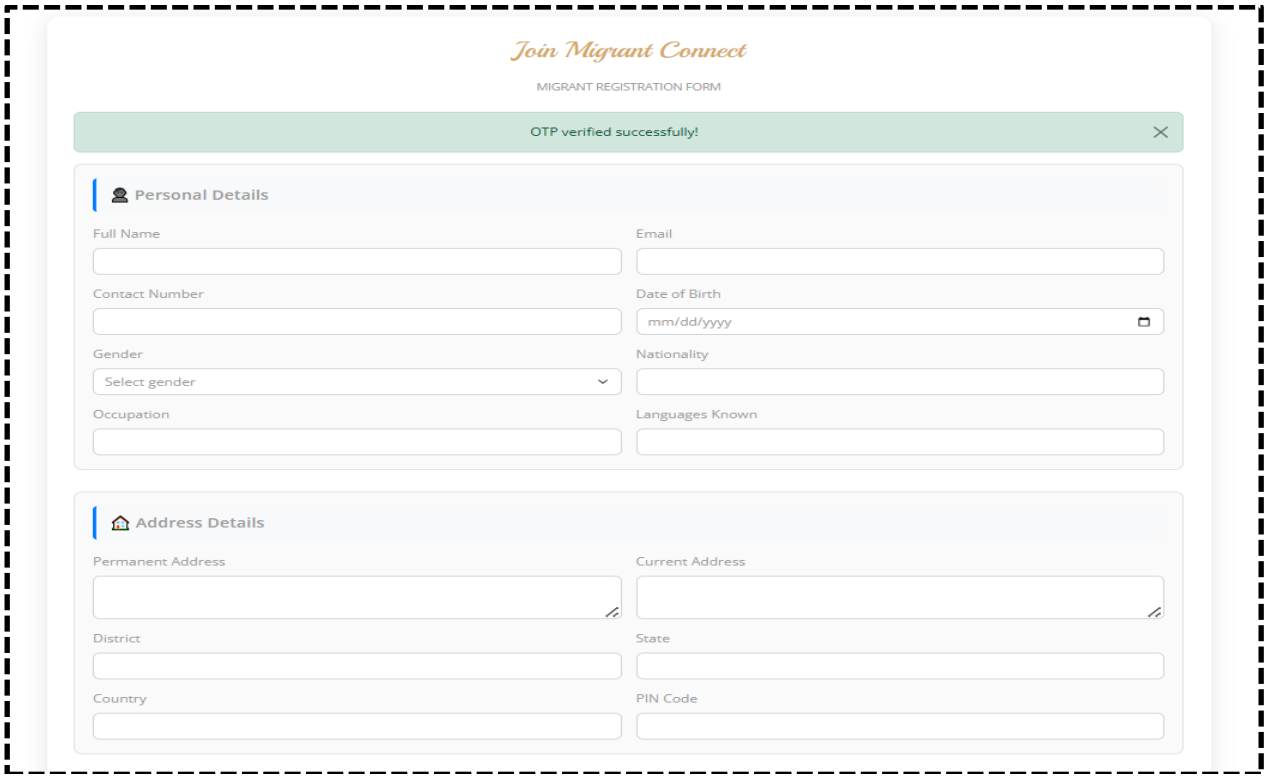

Figure 6.1 System Output: Worker Registration and MID Generation

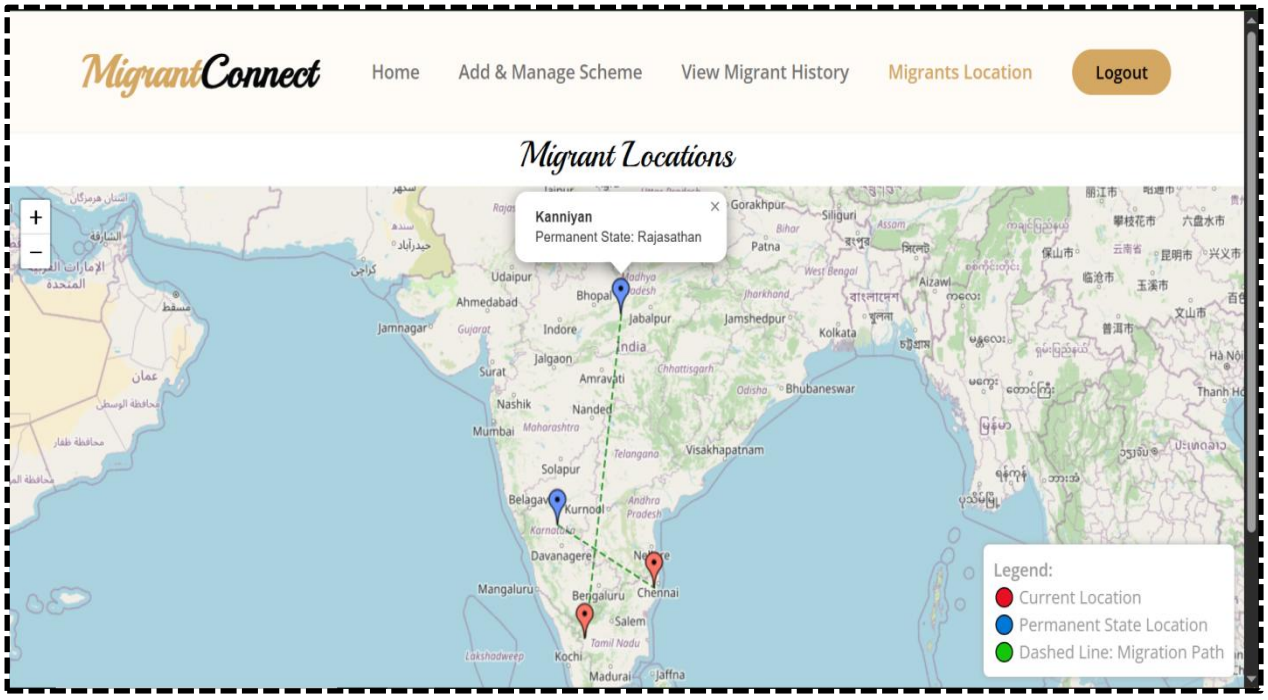

Figure 6.2 System Output: QR Code Scanning and Worker Profile Verification

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 14, Issue 2, April-June 2026 ||

DOI: 10.15662/IJMSERH.2026.1402023

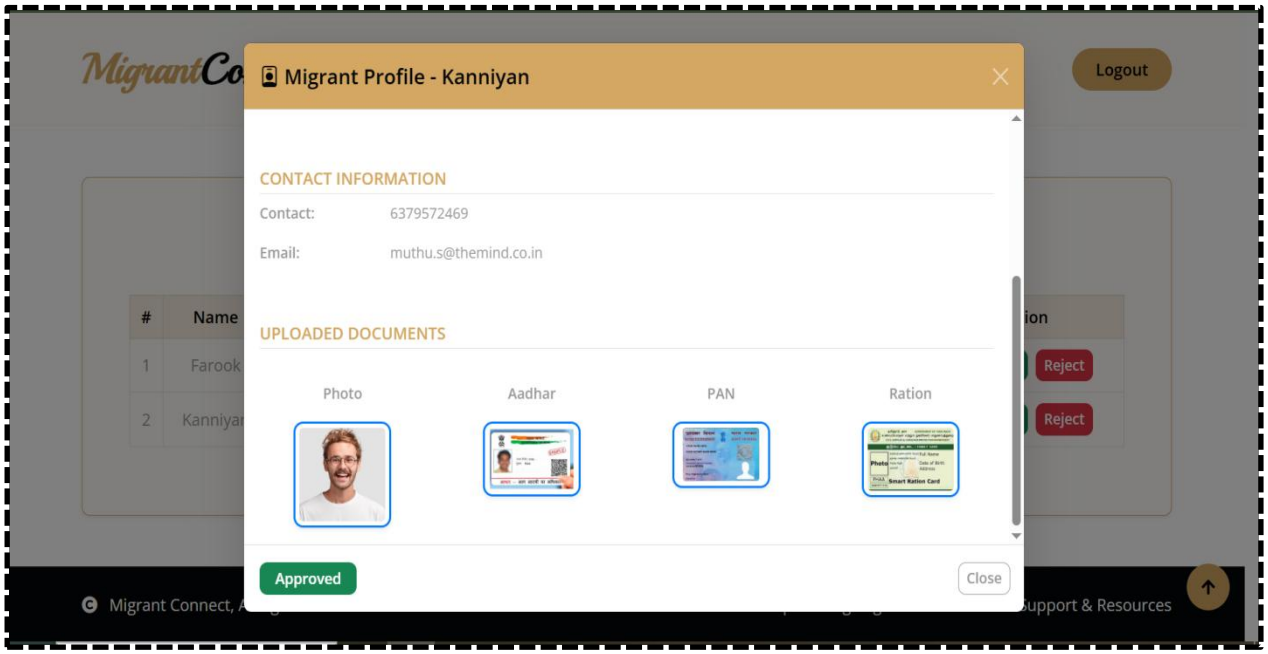

Figure 6.3 OPTICS Clustering Output: Geo-Spatial Migrant Density Map across Tamil Nadu

VII. CONCLUSION

This paper has presented MigrantConnect, a comprehensive digital platform for efficient migrant worker management in Tamil Nadu that integrates multilingual registration, secure MID generation, QR-based verification, document validation, employer verification, OPTICS geo-spatial clustering, and a real-time notification system into a unified and scalable web application. The proposed system successfully addresses the limitations of existing fragmented approaches by providing a centralized, transparent, and data-driven framework for migrant labor governance.

The OPTICS-based geo-spatial intelligence provides government authorities with actionable workforce distribution insights, while the multilingual and mobile-friendly interface ensures inclusive access for interstate migrant workers from diverse linguistic backgrounds. The Flask, MySQL, and Bootstrap technology stack ensures secure data handling, reliable system performance, and an intuitive interface for all user groups including government authorities, employers, and migrant workers. The platform establishes a transparent, accountable, and worker-centric digital ecosystem that significantly strengthens migrant workforce management and governance across Tamil Nadu.

VIII. FUTURE ENHANCEMENTS

Several meaningful directions exist through which the proposed system can be further improved. The development of a dedicated mobile application for Android and iOS platforms would substantially enhance accessibility, allowing migrant workers and employers to register, verify, and access workforce data from any location without requiring a desktop browser. Integration of AI-based skill matching algorithms would enable the system to automatically recommend suitable job opportunities to registered workers based on their declared skills, experience, and geographic preferences, reducing dependency on intermediaries and improving employment outcomes.

The incorporation of blockchain-based data security mechanisms would ensure tamper-proof immutable records for all registration, verification, and transaction activities, providing enhanced forensic reliability and regulatory compliance for government audits. Adding AI-powered multilingual voice assistance would further extend accessibility for migrant workers with limited literacy, allowing them to interact with the platform through voice commands in their native regional languages. Integration with national labor management systems and predictive workforce analytics modules would expand the platform's utility for state-level and inter-state labor governance.

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 14, Issue 2, April-June 2026 ||

DOI: 10.15662/IJMSERH.2026.1402023

REFERENCES

[1]B. Peter and L. Johnson, "Inclusion of Migrant Workers in India: What Works at the Grassroots?", Labour & Development, vol. 28, no. 2, pp. 108-123, Dec. 2021.
[2]S. I. Rajan, P. Sivakumar and A. Srinivasan, "The COVID-19 pandemic and internal Labour Migration in India: A crisis of mobility", The Indian Journal of Labour Economics, vol. 63, no. 4, pp. 1021-1039, Nov. 2020.
[3]K. Rajput and S. I. Rajan, "Visibilising Invisible population: E-shram portal and Essentiality of Internal Migration Database in India", Journal of Social Inclusion Studies, vol. 9, no. 1, pp. 82-94, Jun. 2023.
[4]S. K. Sharma, B. Metri, Y. K. Dwivedi and N. P. Rana, "Challenges Common Service Centers face in delivering e-government services in rural India", Government Information Quarterly, vol. 38, no. 2, pp. 101573, Apr. 2021.
[5]M. Abbas et al., "Migrant and refugee populations: A public health and policy perspective on a continuing global crisis", Antimicrobial Resistance & Infection Control, vol. 7, no. 1, Sep. 2018.
[6]M. Carammia, S. M. Iacus and T. Wilkin, "Forecasting asylum-related migration flows with machine learning and data at scale", Scientific Reports, vol. 12, no. 1, pp. 1457, 2022.
[7]D. K. Wong, C. Y. Li and H. X. Song, "Rural migrant workers in urban China: living a marginalized life", International Journal of Social Welfare, vol. 16, no. 1, pp. 32-40, 2007.
[8]Ankist, M., Breunig, M., Kriegel, H. P., and Sander, J. OPTICS: Ordering Points To Identify the Clustering Structure. In Proceedings of the ACM SIGMOD International Conference on Management of Data, Philadelphia, USA, 1999.
[9]Flask Web Framework Documentation. Pallets Projects. Version 2.3. Available at: https://flask.palletsprojects.com (accessed February 2026).
[10]MySQL Community Server Documentation. Oracle Corporation. Version 5.7. Available at: https://dev.mysql.com/doc/refman/5.7/en/ (accessed February 2026).

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi cross ref

निस्केयर NISCAIR

International Journal of Multidisciplinary and Scientific Emerging Research (IJMSERH)

Impact Factor: 9.274

editor@ijmserh.com www.ijmserh.com