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(71)Name of Applicant :

1)Dr. S. Semmalar
Address of Applicant :Associate professor/ECE, Manakula Vinayagar Institute of Technology, Kalitheerthalkuppam, Madagadipet – Puducherry-605107, India Puducherry -----

2)Dr.Raghavi K Bhujang
3)Dr. Ramadevi Chappala
4)Dr. Bikash Ranjan Debata
5)Sivarajan E
6)Ramya R
7)Reshma B
8)Dr. Jebathangam
9)Vimala B.S
10)Nazreen. M

Name of Applicant : NA
Address of Applicant : NA

(72)Name of Inventor :

1)Dr. S. Semmalar
Address of Applicant :Associate professor/ECE, Manakula Vinayagar Institute of Technology, Kalitheerthalkuppam, Madagadipet – Puducherry-605107, India Puducherry -----

2)Dr.Raghavi K Bhujang
Address of Applicant :Associate Professor, Department of Business Analytics and Data Science, MS Ramaiah Institute of Management, Bengaluru – 560054, Karnataka, India Bengaluru Urban -----

3)Dr. Ramadevi Chappala
Address of Applicant :Assistant Professor Department of CSE KLEF Vaddeswaram Guntur (Dt) pin-522502, Andhra Pradesh, India Guntur -----

4)Dr. Bikash Ranjan Debata
Address of Applicant :Professor, Department of Marketing and International Business, MS Ramaiah Institute of Management, Bengaluru - 560054, Karnataka, India Bengaluru Urban ----

5)Sivarajan E
Address of Applicant :Assistant Professor Of CSE Department, Sri Shanmugha College Of Engineering and Technology, No.45B, Pillaiyar Kovil St, Tharmapuri, Damanur, Gingee TK, Viluppuram Dt 604210, Tamil Nadu, India Viluppuram -----

6)Ramya R
Address of Applicant :Ramaiah College Of Arts Science And Commerce, Assistant Professor, Department Of Commerce And Management, # 4 Shree Malleshwara, Shivanapalya Main Road Opposite To Swarnakamamma Apartment Kengeriupanagar, Bangalore 560062, Karnataka, India Bangalore Urban -----

7)Reshma B
Address of Applicant :Ramaiah College of Arts Science and Commerce, Assistant Professor, Department of Commerce and Management, #22, 2nd Cross Subbanchari Lane Cottonpet, Bengaluru-560053, Karnataka, India Bengaluru Urban -----

8)Dr. Jebathangam
Address of Applicant :Professor, Department of Computer Applications (UG), Vels Institute of science Technology and Advanced Studies (VISTAS), Chennai, 600117, Tamil Nadu, India Chennai -----

9)Vimala B.S
Address of Applicant :SJR College Of Science Arts And Commerce, Assistant Professor Department Of Commerce #21/1.9th A Main, Shri Lakshmi Venkateshwaranilaya, Byraveshwaranagar, Bangalore 560072, Karnataka, India Bengaluru Urban -----

10)Nazreen. M
Address of Applicant :Coordinator, Kindergarten, SNS Academy 538, Thudiyalur-Saravanampatti Road, Vellakinar (Post), Coimbatore-640129, Tamil Nadu, India Coimbatore --

(57) Abstract :

The present invention relates to a predictive customer behavior modeling system and method that leverages real-time multimodal data collected from a distributed network of Internet-of-Things (IoT) sensors deployed in physical environments such as retail stores, airports, and public venues. The system comprises a combination of sensor modalities including motion detectors, facial expression analyzers, biometric signal processors, and environmental monitors, all integrated with an edge-based computing device referred to as the Behavioral Intelligence Node (BIN). The BIN is configured to perform on-device preprocessing, feature extraction, and short-term behavior inference using deep learning models, while a cloud-based orchestration engine performs long-term pattern analysis and federated model updates. The invention enables dynamic, context-aware prediction of customer intent and decision-making behavior by unifying diverse sensor data streams into a cohesive behavior modeling framework. Additionally, it incorporates a privacy-preserving learning protocol to ensure compliance with data protection standards while maintaining high model adaptability.

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