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(57) Abstract :
FEDERATED ADAPTIVE TRANSFORMER-BASED SYSTEM FOR PRIVACY-ENHANCED AND REAL-TIME NATURAL LANGUAGE PROCESSING ABSTRACT A federated adaptive transformer-based system (100) for privacy-enhanced and real-time natural language processing is disclosed. The system (100) comprises a plurality of distributed client devices (110) that locally process natural language data without transmitting raw data to a centralized server. A federated learning module (112) coordinates the training of a transformer-based deep learning model across the client devices (110), transmitting only model updates to a central server. An adaptive transformer model (114) dynamically updates based on language variations and contextual data. A privacy-preserving mechanism (116), integrated with the federated learning module (112), secures local model updates using differential privacy or homomorphic encryption. The system (100) also includes a real-time inference engine (118), which processes natural language queries and delivers privacy-compliant responses. This architecture continuously optimizes model performance while ensuring data privacy across the distributed network, providing scalable, real-time, and privacy-enhanced natural language processing. FIG. 1

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