



TRANSCONNECT

UR-CST

CSE Year III

Academic year: 2025 - 2026

Module code & title: Computing Intelligence and Applications [CE80561]

Date: On Thursday, September 25, 2025



# COMPUTING INTELLIGENCE & APPLICATIONS

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# TransConnect - A Computing Intelligence-Driven Public Transportation Platform

## Background

Transportation facilitates many economic and social activities, but commuters often experience inconveniences in terms of unreliable transport schedules, inefficient routing, and extended wait times. The need for smart mobility solutions is growing, and computing intelligence is an encouraging approach to the creation of adaptive, data-driven, and user-centered tools and platforms. This project entitled *TransConnect* is a web-based system that combines computing intelligence and modern-day applications to provide real-time public transportation information, optimized route planning, and future-focused functions such as passenger tracking and speed monitoring.

## PROPOSAL

### Computing Intelligence and Applications in the Solution

TransConnect addresses these challenges by employing computing intelligence techniques and advanced applications to create a seamless commuter experience:

- **Real-Time Intelligence:** Integrate external APIs and **machine learning models** (e.g., Google Maps, transit feeds) to provide live schedule updates, vehicle locations, and service alerts.
- **Dynamic Route Optimization:** Implement an intelligent route-planning engine that calculates the most efficient path based on real-time conditions, user preferences, and multi-modal options. By introducing **Computational Intelligence (CI)** & **Optimization** like Genetic Algorithms.
- **Predictive Analytics:** Historical and real-time data can be analyzed to forecast delays, waiting times, and traffic congestion. By using **Machine Learning** to predict bus arrival times more accurately and **time series forecasting models** to predict passenger demand on specific routes at different times.
- **Future Features via Computing Intelligence:** IoT sensors and AI models will enable passenger counting, car speed monitoring, and advanced transportation analytics for authorities. Mostly, by using **Deep Learning** and **Computer Vision**.

### PROPOSED FEATURE (among others)

Real-Time Intelligence: Live Schedule Updates

## Why This Feature?

### Feasibility:

We will use publicly available APIs (e.g., Google Transit and GPS Location) to get real-time bus/train locations and schedules.

### Time-Efficient:

Less complex than building a predictive model or implementing IoT sensors (we plan to implement this in embedded system module in future).

### Data Availability:

In Kigali city we have predefined route for each bus, but for our dataset test and training model we will use route data we have ([link to access the xlsx](#)).

### Clear Deliverable:

A web-app based platform showing live vehicle locations and schedule updates is a tangible and useful product.

## What CI will handle:

### 1. Predictive Arrival Time Refinement

- **What the API gives you:** The *scheduled* arrival time and the *current* bus location.
- **What the CI will do:** Use a **simple Machine Learning model** to predict the *actual* arrival time more accurately than just using the schedule.
  - It will analyze factors like:
    - Current traffic conditions (from a traffic API *if available*).
    - Time of day (rush hour vs. off-peak).
    - Historical delay patterns on that specific route.
- **Output:** A more reliable and accurate "5 minutes away" estimate instead of just "on time".

### 2. Anomaly Detection and Service Alert Generation

- **What the API gives you:** Basic data points.
- **What the CI will do:** Use an **anomaly detection algorithm** to identify unusual patterns that suggest a problem.
  - **Example:** If the system notices that three buses on the same route have not updated their location for 10 minutes, it could **infer a major disruption** (e.g., an accident, road closure) even before an official alert is issued by the transport authority.

- **Output:** Proactive alerts like: "Possible disruption on Route 12. Expect significant delays."

### 3. (Advanced but Feasible) Personalized ETA and Routing

- **What the API gives you:** Generic arrival times for all stops.
- **What the CI will do:** Incorporate the user's specific destination (if they provide it) to give a personalized travel update.
  - A simple rule-based system or a recommendation algorithm could calculate: "Your bus arrives in 5 mins. With walking time, you will reach your destination at 8:23 AM."
  - It could also suggest: "For a faster journey, walk to [Next Stop] and take Bus 45."

## Conclusion

TransConnect exemplifies how computing intelligence and applications can transform traditional public transport into a smarter, more reliable, and user-friendly system. The platform lays the foundation for future expansion into AI-powered predictive models and IoT-driven automation, making it a relevant and impactful contribution to intelligent transportation solutions.

### Revised Project Focus Statement:

*"TransConnect is a web-app based platform that uses real-time transit data to provide live schedule updates and vehicle locations, helping commuters make informed travel decisions with minimal wait."*