Automated Rental Cycle Management System

Team: Syeda Hoorain Imran, Sameez Sarfaraz Sajwani

Instructor: Sir Faisal Alvi – Data Structures II

Introduction to the Problem

Inefficient tracking

Difficulty in real-time bike availability updates

Poor load balancing

Stations often overcrowded or empty

Routing challenges

Suboptimal paths for bike returns and rentals

Our Proposed Solution

Locate nearby stations

Find bikes available quickly

Flexible returns

Rent and return at any station

Optimized routes

Key Features & Algorithms

Card-based login

User validation with hash table

Shortest path routing

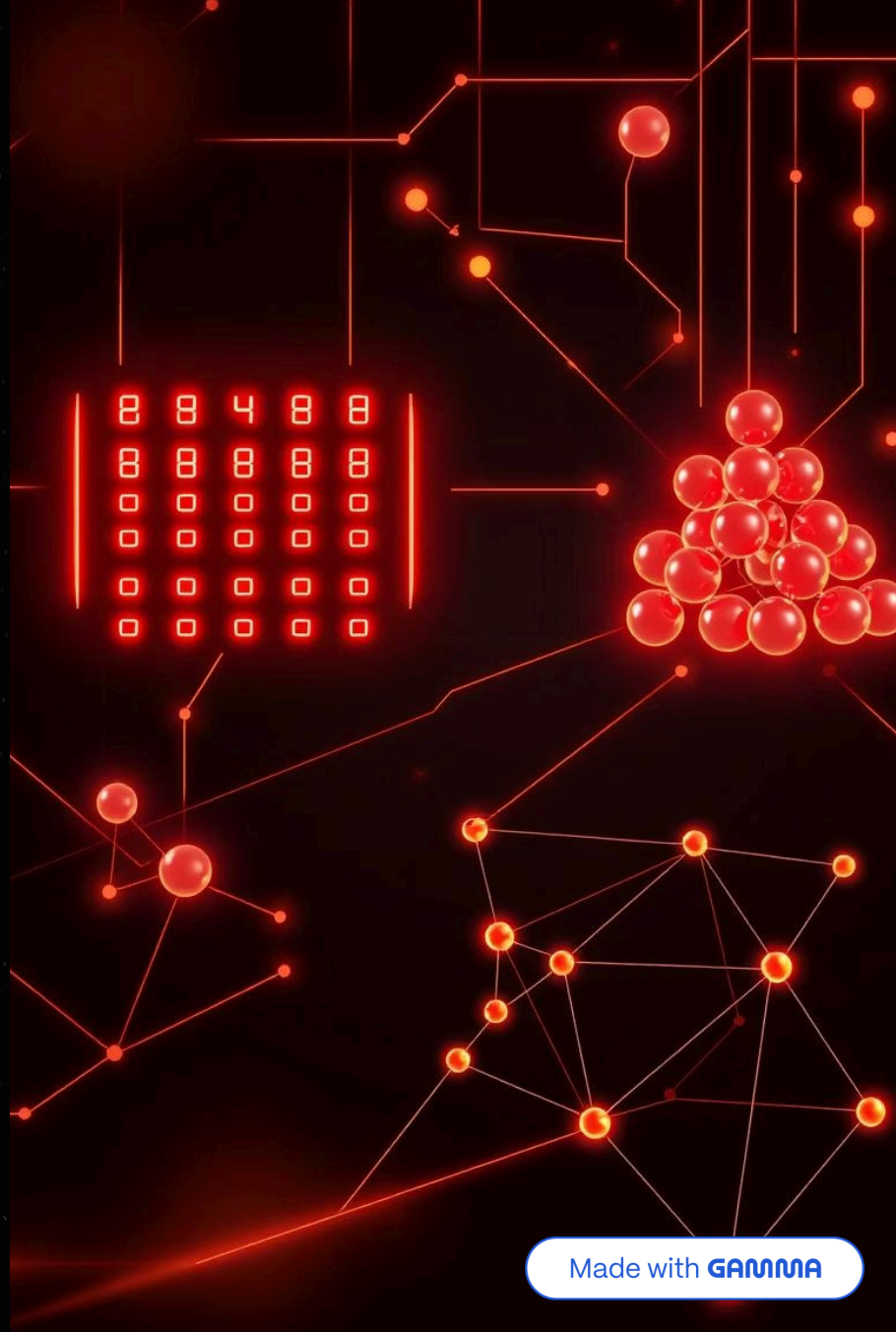
Efficient navigation via Dijkstra’s algorithm

Heap prioritization

Manage stations by bike availability

File I/O logging

Track all rental and return transactions



Data Structures in Use

Data Structure	Purpose
Hash Map	User authentication & lookup
Max Heap	Locate stations with most bikes
Min Heap	Recommend low-occupancy drop-off points
Graph (Adjacency List)	Route pathing with Dijkstra’s algorithm
Vectors + CSV I/O	Store station, user, and log data

Applications

- Public bike-sharing systems (Uber Bike, Careem Bike)
- University and campus shuttle systems
- Green urban mobility initiatives
- Smart city IoT transport planning
- Tourist cycling route planners