



Final Year Project Showcase Batch-2019 Year 2023

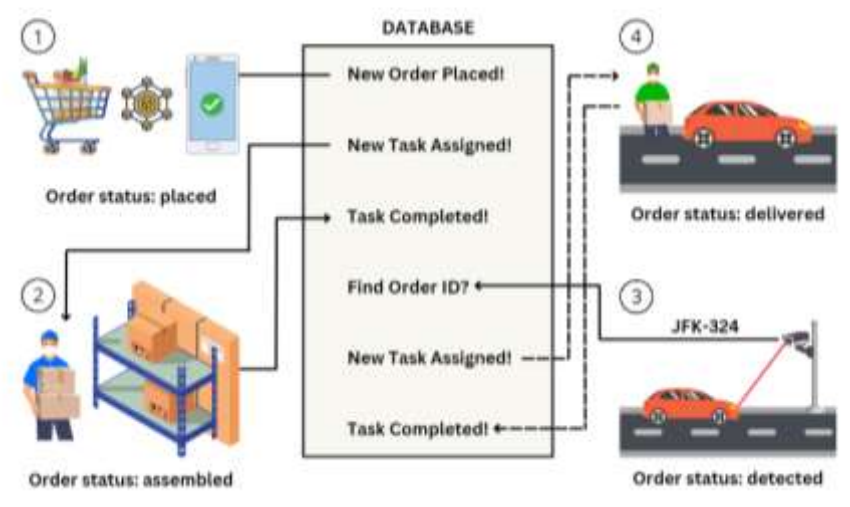
Department: Computer Science & Information Technology Programme: Computer Science	
1	<p>Project Idea:</p> <p>The main problem with the traditional model of drive-thru is that during peak hours, the long line of cars waiting cause traffic disruptions, delays, and disorder. We offer an innovative solution by utilizing Automatic Number Plate Recognition (ANPR) technology to remove bottlenecks and streamline the drive-thru shopping experience.</p> <p>Rather than using traditional payment gateways which introduce another set of problems like data insecurity and high fees, our system uses on-chain transactions involving decentralized storage of data which allows for secure, transparent, and tamper-proof record-keeping of transactions.</p>
2	<p>Process:</p> <p>Our methodology works in four main steps:</p> <p>Step one: Customers place the order online and pay in crypto through a metawallet such as metamask.</p> <p>Step two: After the transaction has been verified, a task to assemble the order is created in the database. This task is assigned to an assembler employee. Assemblers pack all the order items together and mark the task as completed.</p> <p>Step three: Once the order has been assembled, customers are informed to pick up their order. ANPR camera is installed at a distance of a few minutes from pick-up point. The camera detects the car's license plate and ANPR data is generated that can be automatically connected to the relevant order ID stored in the database. Upon this trigger, another task to deliver the order is created and assigned to a carrier employee.</p> <p>Step four: Carrier identifies the customer's vehicle by reading ANPR data within the web application and loads the shopping bags in the car's trunk. Finally, the customer is required to confirm the delivery</p>
3	<p>Outcome:</p> <p>The cutting-edge technology of ANPR will not only reduce the time it takes to deliver the order to clients waiting in their cars, but it will also enhance staff efficiency. The workers can be used elsewhere in the company outside of rush hours since they are engaged only when customers arrive at the pickup location.</p> <p>The system is not only extremely convenient, but it is also just as it follows the first-come, first-serve principle. This means that rather than by the order in which customers park outside the store, the staff attends to customers in the order in which the ANPR camera registered them.</p>



	<p>Additionally, by using blockchain technology, drive-through stores can reduce errors and build trust with customers.</p> <p>Our approach uses modern ANPR technology to minimize physical contact, hence reducing the risk of spreading of infection in case of any pandemic.</p>
4	<p>Evidence (Theoretical Basis):</p> <p>At the core of our solution lies the implementation of ANPR technology, specifically through the use of ANPR IP cameras for real-time streaming and license plate recognition. By leveraging these technologies, we significantly reduce customer waiting times by notifying store staff in advance of an incoming customer.</p> <p>One of the key advantages of our system is the utilization of on-chain transactions, which provide secure and transparent record-keeping of transactions without the need for traditional payment gateways. This decentralized storage of data ensures data security and reduces the risk of data breaches or high transaction fees.</p> <p>All modules of the web application (ANPR Module, Payment Module, Employee Management, Order Management, Task Management, Attendance Management, Inventory Management, Report Charts, Machine Learning Module) work together to make the system functional and to support the various stakeholders.</p> <p>Prototype system tested delivered high accuracy in recognizing license plates. Furthermore, Machine Learning models evaluated proved effective for sales forecasting and item recommendation.</p> <p>Our comprehensive literature review has revealed a gap in the exploration of ANPR technology's potential in minimizing service time within retail sectors. While there is extensive research on ANPR models, algorithms, and technical advancements, its diverse applications in reducing service time have been underdeveloped.</p> <p>Our proposed model explores new topics for researchers to work on. For instance, how this model could be applied to those stores or supermarkets that deal with real-estate problems of having a drive-thru, security policies and practices on inappropriate use of license plate data by employees without the customer's consent.</p>
5	<p>Competitive Advantage or Unique Selling Proposition</p>
a	<p>Attainment of any SDG: <u>SDG#08: Decent Work and Economic Growth:</u> The proposed drive-thru methodology can contribute to this SDG by potentially creating job opportunities, improving staff productivity, and reducing delays and disruptions during peak hours, thus fostering economic growth and decent work in the region.</p> <p><u>SDG#09: Industry, Innovation and Infrastructure:</u> Our model relies on innovative technologies such as Automatic Number Plate Recognition (ANPR) and decentralized storage of data for secure transactions. These innovations not only enhance the efficiency of the drive-thru process but also align with this SDG, which promotes</p>



	building resilient infrastructure, fostering innovation, and promoting sustainable industrialization.
	<p>Any Environmental Aspect:</p> <p><u>Traffic Congestion and Air Pollution:</u> Prolonged waiting times in drive-thru lines can contribute to traffic congestion and increased vehicle emissions, leading to poor air quality. Our methodology contributes to a healthier environment by reducing vehicle idling and lowering emissions.</p> <p><u>Noise Pollution:</u> Traffic backups caused by long drive-thru lines often result in elevated noise levels, negatively impacting the neighborhood. Our proposed solution contributes to a quieter and more peaceful environment for residents and businesses alike.</p> <p>b <u>Preventing spread of Infectious Diseases:</u> By providing a safer shopping option, the methodology supports public health efforts to reduce the spread of infectious diseases, contributing to a healthier and more resilient community.</p>
	<p>Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency, Improvement of the Whole Process:</p> <p>c By streamlining the drive-thru ordering, payment and pickup process, it improves employee productivity and thereby reduces staffing costs, operational expenses, and customer wait times.</p>
	<p>Expanding of Market share:</p> <p>d The significance of the drive-thru model has become increasingly highlighted due to the COVID-19 pandemic, as it allows customers to minimize contact and maximize social distancing. It is reported that during the pandemic, the majority of the respondents (60%) preferred using drive-thru services. Our model can help drive-thru retailers expand their customer base.</p>
	<p>Capture New Market:</p> <p>e By effectively advertising and promoting our model's benefits, we can motivate retailers and supermarket owners to adopt the drive-thru model as part of their businesses.</p>
6	<p>Target Market / End Users:</p> <p><u>Business Owner:</u> Business owners benefit from increased customer satisfaction, potential cost savings, and a competitive edge in the market, driving profitability and growth.</p> <p><u>Employees:</u> Employees enjoy a less stressful work environment due to balanced workload, reduced customer frustration, leading to improved job satisfaction.</p> <p><u>Customers:</u> Customers enjoy convenience, reduced wait times, touch-free shopping, leading to high satisfaction and a safer shopping experience.</p> <p><u>Admin:</u> Admin monitors the system's performance, manages the inventory levels, monitors the performance of employees (task completion time, attendance etc) and takes appropriate actions to ensure effective continuity of the business.</p>

7	Team Members (Names along with email address)	<p>Adil Ahmed Siddiqui (CT-19025): madilas565@gmail.com</p> <p>Shahbaz Ali (CT-19034): shahbazalivk@gmail.com</p> <p>Muneeb ur Rehman (CT-19029): muneeburrehman250@gmail.com</p> <p>Syed Usama bin Iqbal (CT-19002): usamasyediqbal@gmail.com</p>
8	Supervisor Name (along with email address)	Dr. Muhammad Faraz Hyder: farazh@neduet.edu.pk
10	Pictures (If any)	<h2 style="margin: 0;">SYSTEM OVERVIEW</h2>  <p>The diagram illustrates a system workflow centered around a DATABASE. The process starts with an order being placed (1), which is then assembled (2). The database records these events as 'New Order Placed!' and 'Task Completed!'. A task is then assigned to a driver (3), who is shown with a car and a license plate 'JFK-324'. The driver's task is recorded as 'New Task Assigned!' and 'Task Completed!'. Finally, the order is delivered (4), recorded as 'New Order Placed!' and 'Task Completed!' in the database. The database also includes a 'Find Order ID?' query.</p>

		<h3 style="text-align: center;">ANPR Architecture</h3> <pre> graph LR subgraph Source CS[Camera Stream] V[Video] end subgraph Client DC[Docker Container] CM[Carmen Mobile] end subgraph API CV[Cloud Vehicle REST API] end subgraph Storage TCS[Temporary Cloud Storage] end subgraph Server DTS[Drive Thru Web Server] end Source --> Client Client -- "HTTP POST Selected Frames" --> API API -- "Response ANPR & MMR" --> Client API -- "Event Trigger" --> Storage Storage -- "Webhook" --> Server </pre> <h3 style="text-align: center;">Crypto Payment Architecture</h3> <pre> graph TD C[Customer] <--> B[Browser] B <--> I[Internet] B <--> FE[Frontend] FE <--> E[Ethers.js] FE -- "Data sent" --> SC[Smart contract] SC <--> EVM[Ethereum Virtual Machine] EVM -- "Data fetched" --> FE EVM --> B[Block] B --> B2[Block] B2 --> B3[Block] B3 --> B4[Block] subgraph Blockchain SC EVM B B2 B3 B4 end subgraph Wallet IW[injected wallet] end IW -- "Allows frontend to sign smart contract" --> FE </pre>
11	Video (If any)	Computer Vision assisted Drive-Thru Web Store with On-chain Transactions