

# Internship Report At 3rdiTech

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# Acknowledgement

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I extend my deepest gratitude to Mr. Aakash Sir, who not only mentored me throughout my internship but also provided the guidance and encouragement needed to explore complex challenges. His expertise was invaluable in shaping my approach to both software development and research. I am equally grateful to Mr. Ritwik Sir, who guided me through the intricacies of machine learning research, helping me navigate through advanced concepts and their applications.

I also appreciate the entire technical team at 3rdiTech for their support and for generously sharing their insights and expertise. Their collaborative spirit significantly enhanced my learning experience. Special thanks to Ms. Vrinda Kapoor, the CEO, whose visionary leadership and commitment to innovation set the tone for a truly transformative internship experience. Additionally, I thank all the staff at 3rdiTech who contributed to creating a welcoming and productive work environment.

This internship has been a pivotal step in my career, and the knowledge and skills I have gained are largely attributed to the exceptional individuals who surrounded me.

# Information about the Internship

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During my tenure as a front-end and back-end developer intern at 3rdiTech, I was involved in a wide array of projects that spanned the creation and enhancement of web applications, as well as pioneering research in the field of artificial intelligence and machine learning.

My responsibilities included developing responsive and dynamic web interfaces, ensuring seamless integration of front-end and back-end functionalities, and employing cutting-edge AI models for object detection and image processing.

This role required a robust understanding of web technologies, software engineering principles, and a keen insight into AI-driven data analysis and application.

Through projects like the implementation of YOLO V8 for advanced computer vision tasks and comparative analysis of object detection models using various image embedding architectures, I expanded my technical expertise and developed a nuanced understanding of practical AI applications in real-world scenarios.

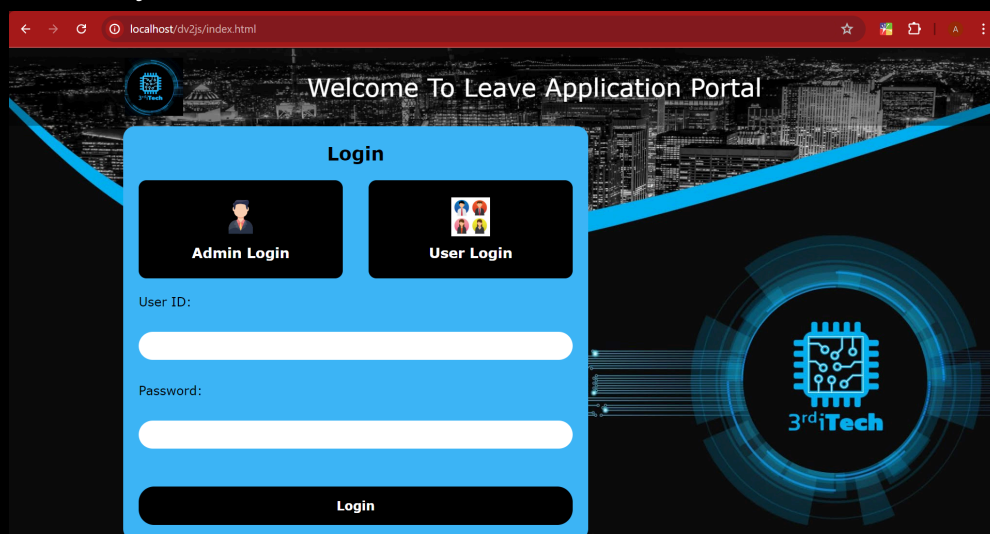
# Content

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## 1. WEB PORTAL DESIGN & IMPLEMENTATION :

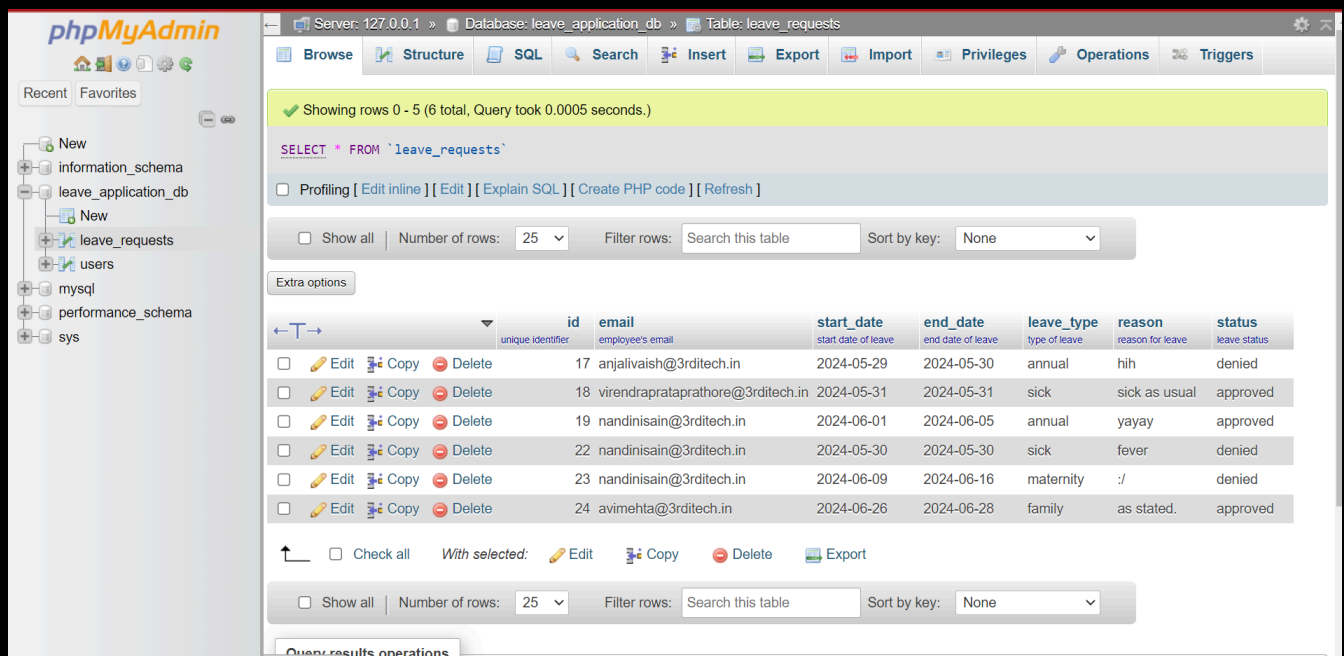
### Custom Login Page Development

- Structured the HTML for the login page to ensure semantic clarity and accessibility.
- Implemented CSS for responsive design, ensuring compatibility across different devices.
- Added JavaScript validation for input fields to enhance security and user experience.
- Integrated backend authentication logic using PHP to manage user sessions.
- Employed AJAX for seamless user experience without reloading the page.
- Designed error handling mechanisms for login failures to guide users effectively.
- Tested cross-browser compatibility of the login functionality.
- Documented the development process and challenges for future reference.
- Conducted user feedback sessions to refine interface and functionality.



## User Dashboard Interface Design

- Designed a dynamic user dashboard with interactive elements using React.js.
- Utilized Redux for state management to maintain consistency across the application.
- Integrated API calls to fetch user-specific data and display on the dashboard.
- Developed custom widgets like progress bars and data charts using D3.js.
- Implemented a theme toggle feature for light and dark modes.
- Ensured GDPR compliance in handling user data and displaying privacy notices.
- Performed unit testing with Jest to ensure component reliability.
- Adapted the layout using CSS Grid and Flexbox for optimal space utilization.
- Added accessibility features to support screen readers and keyboard navigation.

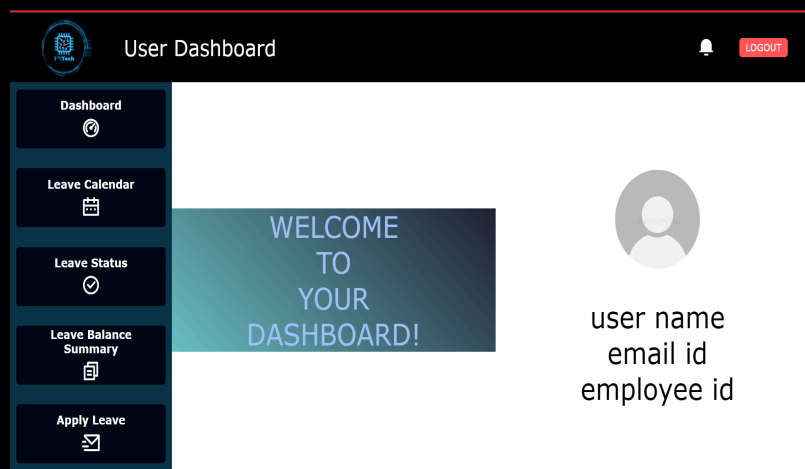


The screenshot shows the phpMyAdmin interface for a database named 'leave\_application\_db'. The 'leave\_requests' table is selected, and the SQL query 'SELECT \* FROM `leave\_requests`' is executed. The table contains 6 rows of data. The interface includes a sidebar with a database structure tree, a top navigation bar with various tools, and a main content area with a table view and query results.

		id	email	start_date	end_date	leave_type	reason	status
		unique identifier	employee's email	start date of leave	end date of leave	type of leave	reason for leave	leave status
<input type="checkbox"/>	Edit Copy Delete	17	anjalivaish@3rditech.in	2024-05-29	2024-05-30	annual	hih	denied
<input type="checkbox"/>	Edit Copy Delete	18	virendrapratapathore@3rditech.in	2024-05-31	2024-05-31	sick	sick as usual	approved
<input type="checkbox"/>	Edit Copy Delete	19	nandinisain@3rditech.in	2024-06-01	2024-06-05	annual	yayay	approved
<input type="checkbox"/>	Edit Copy Delete	22	nandinisain@3rditech.in	2024-05-30	2024-05-30	sick	fever	denied
<input type="checkbox"/>	Edit Copy Delete	23	nandinisain@3rditech.in	2024-06-09	2024-06-16	maternity	:/	denied
<input type="checkbox"/>	Edit Copy Delete	24	avimehta@3rditech.in	2024-06-26	2024-06-28	family	as stated.	approved

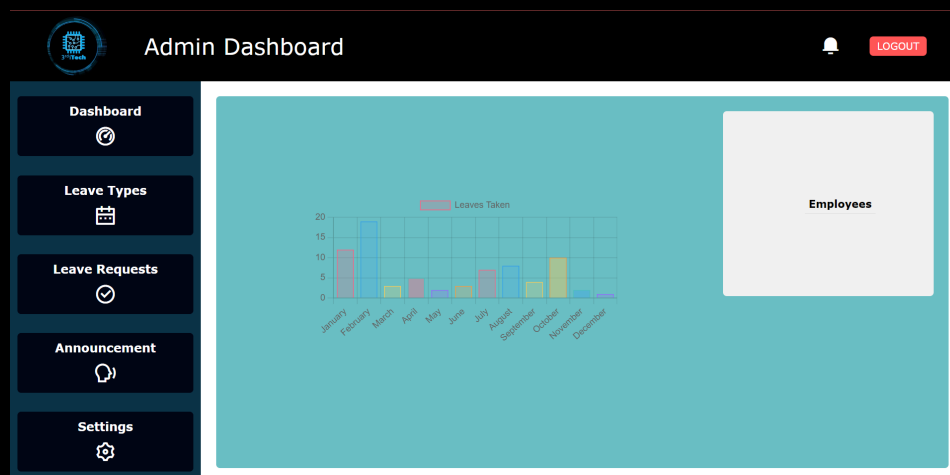
## Real-Time Data Visualization

- Implemented real-time data fetching using WebSockets for live updates.
- Created interactive charts using Plotly to visualize complex datasets dynamically.
- Integrated server-side data processing with Node.js to handle large volumes of data efficiently.
- Designed a dashboard layout that adjusts automatically based on the data volume and type.
- Employed caching strategies to reduce load times and server requests.
- Developed data filters and aggregators to view customized data views.
- Encoded security features to protect data integrity and confidentiality.
- Performed stress testing to ensure stability under high traffic.
- Documented all APIs and libraries used, providing examples and usage scenarios.



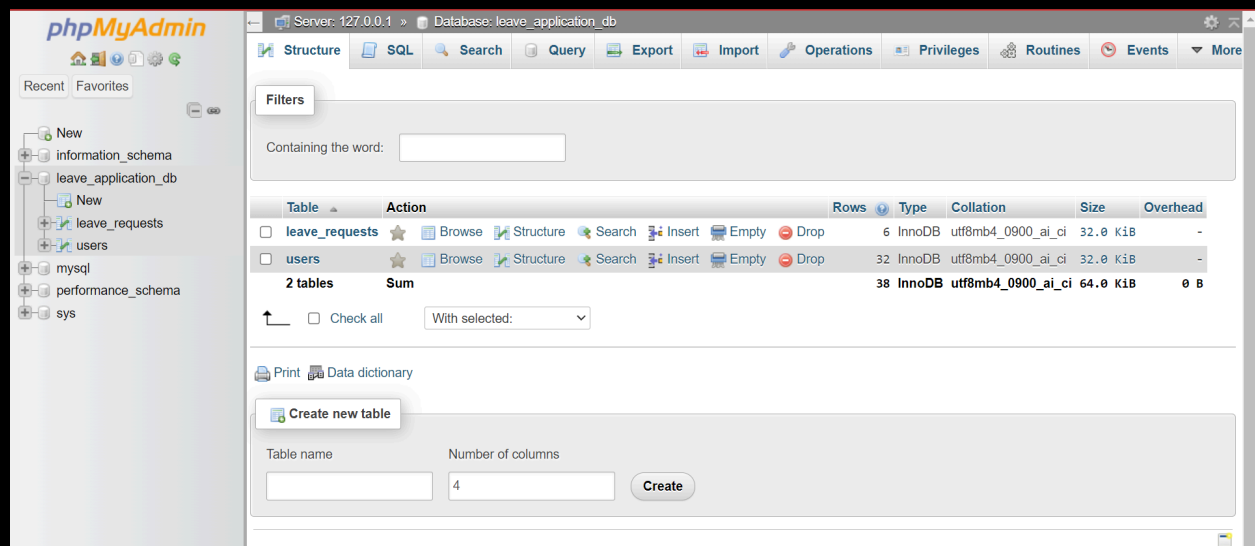
## Interactive Calendar Implementation

- Set up the basic structure and included necessary libraries such as jQuery and Evo Calendar.
- Customized the calendar's appearance with CSS to match the company's branding.
- Enabled event addition, modification, and deletion through user interaction.
- Integrated Google Maps API for event locations, allowing users to view event locations directly on the calendar.
- Provided options for importing and exporting calendar data in iCal format.
- Added notifications for upcoming events using browser notifications.
- Implemented recurring event functionality to support regular meetings and activities.
- Conducted performance optimization to ensure smooth operation with large numbers of events.
- Created comprehensive documentation on calendar maintenance and user guide.



## Dynamic Leave Management System

- Designed the database schema for leave requests using MySQL.
- Developed a form for submitting leave requests with validation to ensure data accuracy.
- Implemented approval workflows with email notifications to approvers and requesters.
- Created a dashboard for admins to view, approve, or reject leave requests in real-time.
- Added filtering options to sort leave requests by date, status, or employee.
- Integrated calendar views for better visibility of leave schedules.
- Established role-based access controls to secure sensitive information.
- Utilized AJAX for smooth page updates without reloading.
- Documented the system architecture and code for future maintenance and upgrades.





## Multi-Page Dashboard with Navigation

Leave Requests

Pending0

Approved0

Denied0

Filter by Status: 

All

Filter by Date: 

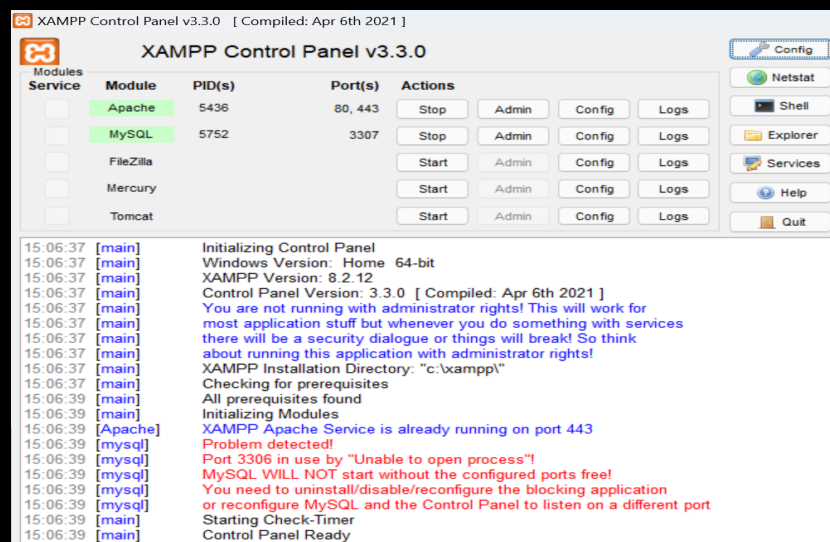
dd-mm-yyyy

Email	Leave Type	Start Date	End Date	Status	Actions	Reason
anjalivaish@3rditech.in	annual	2024-05-29	2024-05-30	denied	<div>Approve</div> <div>Deny</div>	hih
virendrapratapathore@3rditech.in	sick	2024-05-31	2024-05-31	approved	<div>Approve</div> <div>Deny</div>	sick as usual
nandinisain@3rditech.in	annual	2024-06-01	2024-06-05	approved	<div>Approve</div> <div>Deny</div>	yayay
nandinisain@3rditech.in	sick	2024-05-30	2024-05-30	denied	<div>Approve</div> <div>Deny</div>	fever

- Designed a consistent user interface across multiple dashboard pages using Bootstrap.
- Implemented routing with React Router to manage navigation between components.
- Developed lazy loading for pages to enhance performance and decrease initial load time.
- Set up user-specific navigation bars based on roles and permissions.
- Integrated chart components for statistical data on each page.
- Created a breadcrumb navigation system to enhance user orientation within the application.
- Added search functionality to quickly navigate between different sections of the dashboard.
- Conducted usability tests to ensure intuitive navigation and ease of use.
- Prepared a user manual and online help documentation for new users.

## Frontend and Backend Integration

- Designed RESTful APIs using Node.js to facilitate communication between frontend and backend.
- Implemented token-based authentication using JWT for secure data exchange.
- Configured CORS settings to enable safe cross-origin requests.
- Optimized SQL queries for performance and security.
- Utilized Redux-Saga for handling asynchronous requests and managing side effects.
- Set up continuous integration and deployment pipelines using Jenkins.
- Conducted integration testing to ensure all parts of the application work cohesively.
- Documented integration points and setup procedures for system administrators.
- Provided training sessions for developers on maintaining and extending the system.



## 2. ADVANCED COMPUTER VISION RESEARCH WITH YOLO V8 :

Objective: Initiated a project to enhance object recognition capabilities in varied lighting and backgrounds using the latest computer vision techniques.

Selection of Dataset: Collected a dataset comprising images of tanks in diverse environments, lighting conditions, and backgrounds to create robust training data.

Image Preprocessing:

- RGB to Grayscale Conversion: Utilized Roboflow software to convert RGB images to grayscale. This step reduces the computational complexity by minimizing the color channels processed, focusing the model's learning on structural and textural features rather than color information.
- Benefits: Grayscale conversion simplifies the model's tasks, potentially improving its speed and efficiency in recognizing patterns and shapes without the influence of color variations.

Image Annotation:

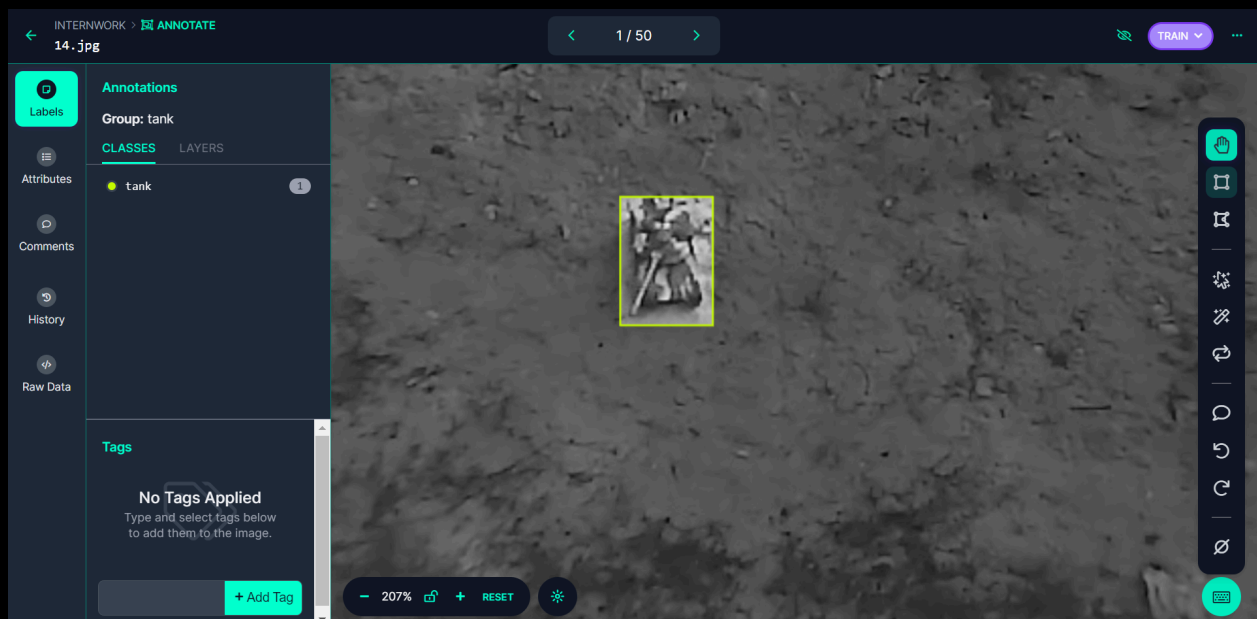
- Using Roboflow: Employed Roboflow's annotation tools to label the images accurately, defining various attributes and positions of tanks within the images. This step is crucial for training the YOLO V8 model to detect and recognize the specified objects accurately.
- Challenges: The manual annotation process was time-consuming and required precise attention to detail to ensure high-quality training data. Differentiating tanks from complex backgrounds posed a significant challenge due to their camouflage.

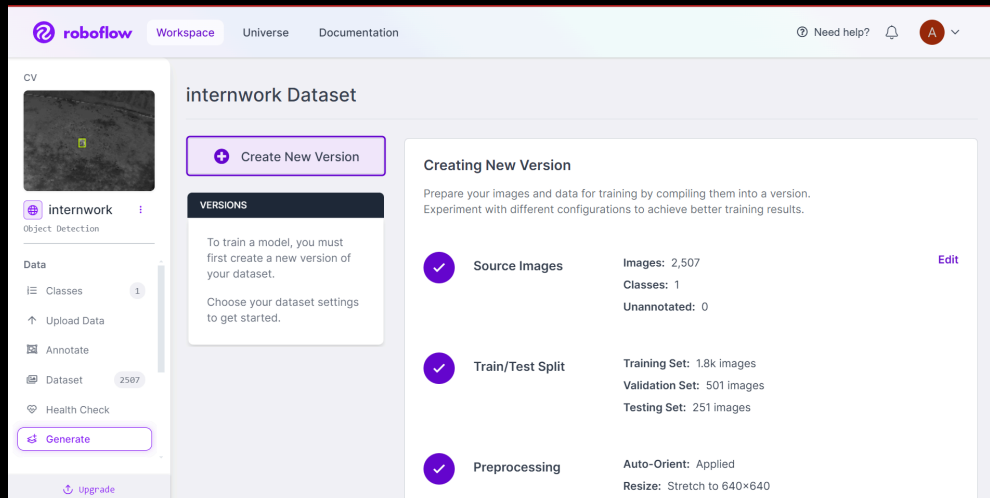
Model Training with YOLO V8:

- Configuration: Configured the YOLO (You Only Look Once) V8 model to detect objects based on the annotated greyscale images. YOLO V8 is known for its speed and accuracy in real-time object detection.
- Training Process: Trained the model using a split of training and validation data to evaluate its performance and make necessary adjustments. This iterative process helps in optimizing the detection accuracy.

### Testing and Validation:

- Real-World Testing: Conducted field tests by applying the trained model to new sets of images under similar varied conditions to assess its real-world applicability.
- Performance Metrics: Analyzed the model using standard metrics such as precision, recall, and IoU (Intersection over Union). These metrics help in quantifying the model's accuracy and reliability in detecting tanks.





## Integration into Larger Systems:

- **System Deployment:** Explored integration possibilities of the trained model into surveillance systems and autonomous vehicles where real-time object recognition is crucial.
- **Challenges:** Addressed challenges related to system integration, including hardware limitations and real-time processing requirements.

## Future Work:

- **Enhancements:** Plans to refine the model by expanding the dataset and including more complex scenarios. Additionally, exploring the use of color once the model achieves high accuracy in greyscale.
- **Research Expansion:** Aiming to extend research to other military and civilian applications where object recognition plays a critical role, such as unmanned aerial vehicles (UAVs) and traffic monitoring systems.

### **3. COMPARATIVE ANALYSIS OF OPEN SOURCE OBJECT DETECTION MODELS WITH IMAGE EMBEDDING ARCHITECTURE :**

- Research Objective:
  - Aimed to evaluate and compare various open source models and frameworks capable of handling object detection tasks with a focus on image embedding architectures, which are essential for enhancing feature extraction capabilities in complex images.
- Overview of Key Technologies:
  - PyTorch and TensorFlow: Investigated these popular frameworks for their flexibility and extensive support for convolutional neural networks, critical for processing spatial hierarchy in images.
  - Hugging Face Transformers: Explored transformer models, particularly for their ability to handle vast amounts of data and their effectiveness in parallel processing, which is vital for training large models efficiently.
  - Fastai: Utilized Fastai for its high-level functionalities built on top of PyTorch, which simplify the training process and allow for easy implementation of modern best practices in deep learning.
  - Detectron2: Delved into Facebook AI's Detectron2 for its state-of-the-art algorithms for object detection tasks, including features that support image segmentation and custom dataset integrations.
- Image Embedding Architecture:

- Studied the concept of image embeddings which transform visual information into a vector space, representing images in a form that can be effectively processed by machine learning models.
- Analyzed different embedding techniques and their applications in enhancing the accuracy and speed of object detection models.
- Methodological Approach:
  - Conducted a comparative analysis by implementing several models on standardized datasets to benchmark their performance.
  - Experimented with various hyperparameters and architectural adjustments to optimize model accuracy and processing time.
- Challenges Encountered:
  - Faced challenges related to compatibility and integration of different frameworks and tools.
  - Addressed issues with computational resource limits, particularly when experimenting with large transformer models and complex image datasets.
- Key Findings:
  - Identified specific strengths and limitations of each framework and model in handling different types of image data and object detection tasks.
  - Determined that transformer models, while resource-intensive, provide significant improvements in model performance for datasets with a high variability in object scale and context.
- Practical Applications:

- Suggested potential applications of optimized models in real-world scenarios such as surveillance, autonomous driving, and medical imaging, where precision and reliability are paramount.
- Future Research Directions:
  - Proposed further exploration into hybrid models that combine CNNs and transformers to leverage the strengths of both architectures.
  - Recommended ongoing adaptation and testing with emerging datasets to continually evaluate model robustness and scalability.



# Links/code files attachment

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- Link to my github repository :  
<https://github.com/anjali-vaish/leave-portal-3rdiTech->
- Link to Google drive :  
<https://drive.google.com/drive/folders/1aJw694jjbvFaltsaWI-weRdgFiBX4WbX?usp=sharing>
- Link to documentation of working procedure :  
<https://docs.google.com/document/d/1Y8Qipez078K1SuXeCQwPXgJxvhtxE8OE4nYoPLw1Ci8/edit?usp=sharing>

# Conclusion

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The internship provided me with a profound insight into the lifecycle of software development projects and introduced me to the cutting-edge field of artificial intelligence and machine learning. I learned to navigate through various phases of development, from planning and designing to testing and deployment. This experience not only enhanced my technical skills and understanding of web technologies but also enriched my capabilities in AI-driven research and applications, preparing me for future challenges in technology and innovation.