

# ARPON KAPURIA

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## Research Interests

Computer Vision, Natural Language Processing, Representation Learning, Medical Image Analysis

## Education

**National Institute of Technology, Tiruchirappalli**

**December 2020 – June 2024**

B.Tech in Computer Science and Engineering

*Tamil Nadu, India*

## Relevant Courseworks

- Linear Algebra and Calculus
- Data Structures and Algorithms
- Operating Systems
- Computer Networks
- Database Management Systems
- Augmented and Virtual Reality
- Technical Writing
- Artificial Intelligence
- Machine Learning
- Deep Learning
- Image Processing and Applications
- Natural Language Processing

## Experience

**Indian Institute of Technology Bombay**

**May 2023 – July 2023**

Research Intern | MeDAL Lab

*Mumbai, India*

### Project 1: Enhancing Self Supervised Learning framework - BYOL

- Conducted an extensive literature survey on self-supervised learning, emphasizing contrastive learning principles and frameworks like simCLR, MoCo, and BYOL.
- Reproduced the BYOL framework using PyTorch, replicating the original work to establish a solid foundation for subsequent modifications.
- Introduced innovative changes to BYOL, such as formulating a new algorithm, incorporating a novel loss function, and architecture adjustments for a better representation learning. Hyperparameter tuning was conducted to optimize the training procedure.

### Project 2: Radiology DICOM Image Anonymization

- Created a user-friendly system for DICOM image upload and processing using Flask, along with a Python script using Pydicom for efficient anonymization, addressing medical data privacy concerns.
- Performed a testing using the CRAFT model for text detection and extraction from X-ray images, enhancing the interpretability and utility of medical imaging data.

**National Institute of Technology Tiruchirappalli**

**October 2022 – February 2023**

UG Research Assistant | Industrial Automation Lab

*Tiruchirappalli, India*

### Project: Centralized Power Cluster Home Automation

- Developed a Flutter app to automate the operations and billing for a power cluster in Assam, India, serving 200 homes.
- Integrated Flutter front-end with API developed in Django and used an MQTT server for IoT communication.
- This project was supported by Department of Science and Technology and Ministry of Science and Technology, Government of India under the project SUSTENANCE - Sustainable Energy System for Achieving Novel Carbon Neutral Energy Communities.

## Projects

**NoSmokeZone – AI for Smoker Detection in Public Spaces**

**December 2023 – January 2024**

Python, TensorFlow, Keras, OpenCV

- Automated a real-time smoker detection system with minimal human intervention leveraging advanced CNN models (EfficientNetV2, VGG16, ResNet-50) and Vision Transformer, achieving 93% accuracy.
- Fine-tuned models and applied data augmentation techniques, enhancing robustness and reducing false positives/negatives by 7% compared to baseline models, significantly minimizing misclassifications.

## 9 Box Puzzle - Android App

December 2022

Java, A\* Algorithm

- Designed and programmed an engaging 9-puzzle game in Java, featuring a 3x3 grid of numbered boxes from 1 to 8, with a missing 9th box in random order.
- Provided comprehensive in-app resources, including a home menu, how-to-play guide, optimal solution visualization, and a performance tracking system for user statistics and puzzle difficulty based on the minimum moves required.
- The optimal solution window displays step-by-step moves needed to solve the puzzle most efficiently, utilizing an AI-based algorithm (A\* Algorithm).

## Malicious Website Detection Using Machine Learning

September 2022 – November 2022

Python, Flask, HTML/CSS, JavaScript

- Implemented a machine-learning model with around 94% accuracy to detect malicious websites.
- Trained and compared different models using K-Nearest Neighbor, Support Vector Machine, Logistic Regression, and Multi Layer Perceptron to obtain a better performance.
- Built a chrome extension using JavaScript to extract the features from the webpage to test the website against the trained model to classify if it is malicious or not. Added a feature to receive user feedback.
- Adopted a continual learning approach to store the user feedback and retrain the model daily to improve performance.

## Skills

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**Programming Languages:** C, C++, Python, Dart, HTML/CSS, JavaScript, SQL

**Frameworks:** Flutter, PyTorch, Flask, Unity, Tailwind CSS

**Miscellaneous:** Linux, Docker, VS Code, Android Studio, Git, Google Colab, Latex

**Languages:** Bengali (Native), English (Advanced), Hindi (Verbal), German (A1.1)

**Standardized Test Scores:** GRE - 307, IELTS - 7.5 (2024)

## Achievements

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| <b>2020</b> | Recipient of the prestigious ICCR Scholarship by the Ministry of External Affairs, Govt. of India, for fully funded undergraduate studies, awarded for academic excellence and promoting cultural exchange. |
| <b>2017</b> | SSC Board Merit Order Scholarship from the Chamber of Commerce, Kushtia, Bangladesh.  |
| <b>2015</b> | JSC General Grade Scholarship from the Government of Bangladesh.  |
| <b>2012</b> | 1st position, Zilla Shilpakala Academy Kushtia organized Art competition for Independence Day.  |
| <b>2011</b> | 2nd position, Bangladesh Udichi Shilpigoshthi Kushtia organized Art competition for Bengali New Year ' 1418.  |
| <b>2011</b> | 2nd position, MEDHA (Medical Education & Health Development Association) organized Art competition.   |

## References

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