Arpon Kapuria

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Research Interests

Computer Vision, Natural Language Processing, Self-Supervised 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

Programming Languages: C, C++, Python, Dart, HTML/CSS, JavaScript, SQL
Frameworks: Flutter, PyTorch, TensorFlow, 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)
Standarized Test Scores: GRE - 307 (Q 157, V 150), IELTS - 7.5

Honors and Awards

2020 Indian Council for Cultural Relations (ICCR) Scholarship for Undergraduate Study at NIT Trichy, India
2017 SSC Board Merit Order Scholarship from the Chamber of Commerce, Kushtia, Bangladesh
2015 JSC General Grade Scholarship from the Government of Bangladesh

References

1. Dr. M. Brindha, Associate Professor
   Department of Computer Science & Engineering
   National Institute of Technology Trichy
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