Saumya Bhandari

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ABOUT ME

A proficient programmer with knowledge in Machine Learning - Deep Learning, Data Science, and Computer Vision.

Languages: Python, Java, C

I share efficient teamwork skills, speaking and presentation along with a dedicated share of interest in leadership and management.

WORK EXPERIENCE

Machine Learning Engineer (Jr.)
Wiseyak Inc. [09/2022 – 05/10/2023]

City: Kathmandu
Country: Nepal

1. Chest X Ray Diagnosis
Multi-Label Disease Classification and Report Generation

Curated a comprehensive knowledge base document encompassing all aspects of AI-driven chest X-ray diagnosis.
Phase-I
  • Developed a multi-label chest X-ray classification model using PyTorch, achieving an impressive AUROC of 0.9083.
  • Successfully addressed the challenge of handling an imbalanced dataset through the utilization of class-weights metrics for loss calculation.
  • Implemented advanced visualization techniques such as GradCAM and PCAM pooling to create class activation maps.
Phase- II
  • Extended the model to generate comprehensive medical reports [Findings and Observations] (near to the level of a radiologist) using LLM (GPT-2) as a report generator.
  • Deployed both versions of the model on Wiseyak's local server via Flask API.

2. CNN-X-Transformer Hybrid Network for Video Processing (Research Project during Internship)
Learns the information of whole video footage (all the frames), instead of just learning the spatial information of one image frame

Phase I (Abnormality Detection)
  • Successfully replicated the paper Fully Convolutional Transformer for precise endoscopic abnormality segmentation.
  • Acquired proficiency in understanding the spatial context of medical images and abnormality localization in those images
Phase II (Temporal Understanding)
  • Pioneered the development of a CNN-Transformer Hybrid Network for video processing
  • Intuition of the research was CNN learning spatial information per frames, and transformer learning the temporal relation between those frames
  • The **results** effectively handled temporal relations between video frames, enabling applications like **video de-noising**, **corrupt frame correction**, **next frame prediction** and smoother transitions between video frames.
Phase III (Ongoing Research)
  • Currently exploring the integration of the Fully Convolutional Transformer and the CNN-Transformer Hybrid Network for enhanced abnormality segmentation in endoscopy videos to master the art of learning from entire video footage, preserving temporal information for more accurate results.

3. Plant Disease Diagnosis
Classification using CNN adapting a Domain Adversarial Neural Network (DANN)

Phase I (Classification Enhancement)
  • Engineered a robust CNN model based on Efficient-Net architecture, achieving a remarkable accuracy rate of 99% for the classification of tomato plant leaf diseases.

Phase II (Domain Adaptation)
- Introduced a series of manual image preprocessing steps to align the raw data (collected from Nepali farmers) with the established Plant-Village dataset.
- Innovatively designed and trained a Domain Adversarial Neural Network (DANN) for domain-invariant feature learning.
- Established a data annotation pipeline utilizing Meta's Segment Anything Model for preprocessing and labeling, storing and training DANN using images sent by Nepali farmers.

Curated a comprehensive knowledge base document encompassing all aspects of tomato diseases diagnosis.

Machine Learning Intern
Namespace.jp / Chulo Solutions [05/2022 – 08/2022]

City: Lalitpur
Country: Nepal

- Worked with visualizations (2D and 3D) including and performing different statistical modeling tricks in given data in Numpy, MatplotLib, Seaborn and Pandas.
- Performing PCA, Eigen Interpretation and Transformation, VC dimension-analysis, etc. with practical implementation.
- Built an object detection model using PyTorch from scratch referencing from different versions of YOLO V1, V2 and V3; used in waste management system.
- Implemented multiple deep learning topics like Artificial Neural Network, Convolutional Neural Network, Support Vector Machines, Eigen Value Decomposition from scratch with in depth mathematical intuition and understanding.

Leader at Herald UI Visuals Community
Herald College Kathmandu

City: Kathmandu
Country: Nepal

Engaged in team collaboration, project planning, and formulation of community. This experience has been playing an evident role in polishing my interpersonal skills, research, planning and modeling.
- Key role in planning and organizing the **Code Brisk - Highest Altitude Hackathon 2023**

EDUCATION AND TRAINING

BSc. (Hons) Computer Science
Herald College Kathmandu

Address: Naxal, Kathmandu,
Field(s) of study: Computer Science
Final grade: First Class Honors – **Level in EQF:** EQF level 6
Thesis: Pathfinder: An image segmentation based navigation system for self driving systems.

- Student Academic Representative **(StAR)** 2019-2020 and 2020-2021. (2 Years)
- Hult Prize 2021 On Campus Winner
- Given multiple sessions/presentations and lectures on Machine Learning algorithms and concepts in different classes
- Organized informal mathematics lecture sessions combining willful learners across different semesters
- Market Sensei 2022 Winner
- Head of Research | Steering Member | Leader at Herald DevCorps UI Visuals Community
- Leader at Herald DevCorps Biz Core Community
- Leader at Herald DevCorps Creators Community

Higher Secondary
Uniglobe College

Field(s) of study: Mathematics and Computer Science
Final grade: 3.29

- IT Club President
- High School Hackathon-2018 winner (android application development)
- High School Hackathon-2019 organizer
- Organized an participated in different events related to computer science and robotics throughout 2 years of high school

Secondary Level Education
The New Summit School

Final grade: 3.55

- School CCA Captain
- Student of the Year : 2015-2016
- Core Student Council Committee Member of year 2016

PROJECTS

CNN-Transformer Based Network for video Processing

[Current]

Supervised by: Prof. Suresh Manandhar, Mr. Suraj Prasai

Developing a deep learning model which uses transformers to process sequence of image frames in a video, which can be applied in multi-task video processing like: De-Blurring video frames, Handling Frame Breakages, Tracking Objects etc.

Detecting Different Findings and Diseases in Chest X Ray Images.

Supervised by: Mr. Suraj Prasai

The system incorporates a powerful multi-label classification model that can accurately identify various findings and diseases in a single image. Additionally, I have implemented a sophisticated GradCAM and PCAM visualization system. Handling a large image dataset with multiple labels per image and addressing class imbalance challenges has been a focal point of my work. Through iterative improvements, I have enhanced the system's performance and achieved remarkable diagnostic capabilities and generate radiology reports using LLM.

Plant Disease Detection and Diagnosis

Supervised by: Prof. Suresh Manandhar

1. Creating a comprehensive knowledge graph of tomato and its different diseases, including the causes and symptoms of each disease.
2. Using this knowledge graph, I developed a Domain Adversarial CNN model that can accurately diagnose a plant's disease and provide feedback to farmers.
3. The goal of this project is to provide farmers with a reliable and efficient tool for diagnosing tomato plant diseases, which can help to improve crop yields and reduce losses due to disease.

Other Sample Machine Learning Projects Including:

- Music Genre Prediction
- Object Detection System using Different Architectures of YOLO
- CNN based Image Super-Resolution System
- Optimization Methods from scratch
- Support Vector Machines
- PCAs and Dimensionality Reduction using Eigen Decomposition and SVD
- Movies Recommendation System using Spark
- and much more here.

ORGANISATIONAL SKILLS

Skills that come in handy:

- Excellent Public Speaking Skills
- Presentation Skills
- Communication
- Brainstorming and Critical Thinking
- Planning and Decision Making

Saumya Bhandari