Prithvi Raj Singh *ML Research Engineer*

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SUMMARY

- Machine Learning researcher with two years of experience in implementing ML algorithms for Computer Vision and Data Science tasks.
- Three-plus years of experience in software system design using various tools and programming languages like Python, C#, and VB.NET.
- Excited to work as an AI researcher and ML software engineer to learn and contribute to the technical and application-level advancement of AI.

EDUCATION

Masters of Science, Computer Science 2021 – 2023 | Lafayette, LA
University of Louisiana at Lafayette
Relevant Coursework: Deep Learning, Data Mining, Image Processing, Pattern Recognition, Design and Analysis of Algorithms, Neural Networks, Reinforcement Learning.
Thesis:- "*Real-time object detection and tracking of fast-moving small objects using RGB-D camera and computer vision techniques*."

Bachelors of Science, Computer Science 2017 – 2021 | Lake Charles, LA
McNeese State University
***Minor*: Mathematics**
Relevant Coursework: Software-Engineering I/II, Object-Oriented Design, Database Design and implementation, Structure of Programming Language, Advanced Calculus I/II, Mathematical Statistics and Probability, Advanced Geometry, Fundamentals of Artificial Intelligence

SKILLS

Programming Languages and Tools
- ***Languages*** - Python, C#, VB.NET, ASP.NET, Java, SQL, R, C++, BASH, Shell Scripting.
- ***Machine Learning Tools*** - PyTorch, Tensorflow, Numpy, Pandas, Scikit-learn, Seaborn, SciPy, OpenCV.
- ***DevOps/MLOps Tools*** - Tableau, Colab, GitHub, Docker, Trello, Linux, Azure, Visual Studio, MLFlow.

Core Competencies
- 3D Computer Vision, Software Engineering, Data Analysis and Visualization, Data Engineering, Robotics Design, MLOps, Machine/Deep Learning, Reinforcement Learning, Data Science, Statistical Programming, Project Management, Unit Testing, CI/CD, Machine Learning Operations, ML Engineering.

PROFESSIONAL EXPERIENCE

Associate Software Engineer Louisiana Transportation Research Center

- Developed and maintained multiple projects over two years.
- Designed and developed Windows and web form applications using C# and Visual Basic on the .NET framework.
- Implemented CI/CD on the Azure DevOps pipeline to ensure software quality and reliability.
- Prepared annual reports by retrieving project data from institutional databases using SQL queries.
- Led an extensive training seminar to train Geotech Engineers on newly developed software and new features in existing software.
- Documented software design approach and all reviews and changes made.

- Engaged with Geotech Engineers to collect feedback and implemented software modifications to improve user experience and meet DOTD standards.
- Led the transition of legacy system code to a modern architecture using up-to-date .NET tools and frameworks, enhancing system performance and maintainability.

Research Assistant Cyber-Physical and Human Systems Lab

- Conducted research and implementation of computer vision models tailored for Robotics Implementation.
- Collected, labeled, and pre-processed data for advanced tasks like Optimization, Feature Engineering, Outlier Detection, Predictive Modeling, 3D Object detection, and tracking.
- Implemented AI algorithms to analyze large datasets, improving the efficiency and accuracy of research outcomes.
- Reviewed extensive literature in the fields of Computer Vision and Robotics to stay abreast of the latest trends.
- Advanced original research, leading to the creation of scientific publications.

THESIS AND CAPSTONE PROJECT

Real-time object detection and tracking of fast-moving small objects using RGB-D camera and computer vision techniques.
Masters Thesis

- Designed and implemented a computer vision model using a stereo camera to track small and fast-moving objects like tennis balls and racquetballs using MLOps principles.
- Optimized the model for deployment on limited resource devices like JetsonTX and implemented state-of-the-art techniques for object detection and tracking.
- Experimented and Improved the performance of various object detection models like FasterRCNN, TrackNetv2, YOLOv5, YOLO7, and YOLOv8 in detecting fast-moving small objects by hyperparameters tuning.
- Improved the tracking performance of SORT tracking methods (DeepOCSORT, BotSORT, StrongSORT, ByteTrack) by implementing novel techniques that use Kinematics to predict the ball's position.

Bidirectional Autonomous Robot for path finding.
Bachelors Capstone Project

- Designed a small robot from scratch powered by Raspberry Pi 4B and implemented a heuristic search algorithm for optimal path planning.
- Worked on the fusion of lidar and camera stream for better obstacle avoidance and motion.

PUBLICATIONS AND RESEARCH

- Restart-with-Delayed-Retransmission Scheme for Reliable Live Video Streaming at the Edge. (In Review)
- Object tracking and trajectory forecasting in robotics application with physics-based Deep Neural Network. (In progress)
- 3D object detection and tracking of fast-moving small objects (In progress).

PROJECTS

Learning with Limited Data

- Explored different Neural Networks (CNN, Transformers) efficiency working with a small dataset like CIFAR-10/100, FMNIST, and MNIST.
- Used Data Augmentation and Transfer Learning methods to reduce the training and validation loss of the model.

NLP and Computer Vision with Transformer

- Explored the effectiveness of the Transformer models for NLP and CV tasks.
- Studied the use of the case of Transformers for NLP tasks like Sentiment Analysis, named entity recognition, and neural machine translation.

- Inquired about the efficiency of Vison Transformer (ViT) for image recognition and classification.

Object Tracking with Deep Reinforcement Learning
- Investigated ways to implement prominent reinforcement learning (RL) algorithms like Q learning, and MDP in the detection and tracking of small objects.

Error backpropagation algorithm and predictive coding
- Led a comprehensive investigation into the bio-plausibility of the backpropagation algorithm and deep neural networks.
- Explored innovative applications of predictive coding and assembly calculus in designing a brain emulator that replicates the learning pattern of the human brain.

Drillobotics: Automated Drill Rig
- Lead role in close collaboration with the distinguished Petroleum Engineering department.
- Pioneered the design and development of an automated drill rig, a project at the forefront of innovation.
- Integrated a diverse range of sensors into the rig's architecture, enabling real-time data collection and analysis.
- Championed the prototype of automation in Oil field drilling operations, enhancing efficiency and precision.

Omnidirectional Vision System for Continuous Object Tracking
- Utilized PAL 360 and ZED 2i cameras to achieve continuous 3D object detection and tracking.
- The system is geared towards enhancing obstacle avoidance capabilities

Prompt Engineering for Developers
- Finished a guided course on deeplearning.ai about necessary techniques to get the most out of LLMs.
- Studied how LLMs can be used for summarizing, inferring, transforming text, and expanding to create customized chatbots.

LangChain for LLM Application Development
- Experimented with the application of LLMs to propriety data to build customized assistants and specialized chatbots.
- Used agents, and chained prompts to expand the use of LLM for large-scale use.
- Trained and created a chatbot to interact locally with personal documents.

ONLINE COURSES

- Introduction to Data Engineering
- MLOps Fundamentals
- SQL Fundamentals
- Data Analyst with Python
- Data Scientist with Python (Datacamp Certification Prep)
- Machine Learning (Coursera)
- Introduction to Mathematical Thinking (Coursera)

RESEARCH INTERESTS AND HOBBIES

Research Interest
- Computer Vision, Robotics, NLP, LVM, LLM, Artificial General Intelligence (AGI), Algorithm Design and Optimization, Small Data, Data Science, Reasoning, Reinforcement Learning for Robotics, Automation, and IoT.

Personal Hobbies
- Running, Music (Classical Composition), Soccer, Cricket, Badminton, Tennis, Physical Sports, Piano, Geopolitics and National Economics, Finance, Engineering, and Farming.