Balakumaran Murugesan

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Technical Proficiency in Projects

- **Data Warehousing Analytics:** Used Python, AWS, Spark, and Snowflake to architect solutions for large-scale data processing.

- **Machine Learning Development:** Built ML models, including logistic regression, decision trees, and ensemble models, performing fine-tuning and scenario analysis for optimal results.

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- **Python Development API Design:** Developed scalable APIs using FastAPI and Flask, optimizing LLM-driven applications with efficient code practices.

- **Generative AI with Lang Chain RAG:** Implemented Lang Chain to support document summarization, leveraging vector databases (e.g., Pinecone, Chroma) to enhance real-time query accuracy.

- **AWS Cloud Deployment:** Managed cloud-based applications on AWS (Lambda, EC2, S3), ensuring reliability and scalability.

- **DevOps CI/CD:** Employed Jenkins and GitHub for CI/CD, implemented Docker containers, and followed agile development practices for improved deployment speed and application resiliency.

Experience

SLK Software Private Ltd   Apr 2024 – present
Research Engineer   *Bangalore, India*
- * Leading sales module development in the llm erp design.
- * Created a chatbot to insert, update, modify multiple module databases using **Multi-Agent System (MAS) Large Language Model** with coordination module, module level agents, Agent specialization, inter agent communication.
- * Designing entire sales database, trigger functions, sales api's using FastAPI

Vijna Labs Private Ltd   Jan 2023 – Apr 2024
Product Engineer   *Bangalore, India*
- * Worked on a project to study on various Autoencoders for unsupervised representation learning. To visualize and analyzed the learned feature representation, used dimensionality reduction technique like t-SNE, PCA.
- * Worked on finetuning stable diffusion using LORA technique to generate class specific realistic images
- * Worked on training various diffusion inpainting techniques for road top damage.
- * Worked on Finetuning the pretrained LLM using Parameter-Efficient Fine-Tuning (PEFT) methods, which includes multiple reparameterized fine-tuning techniques of LORA derivative methods consisting Delta-LoRA, QLoRA, AdaLoRA.
- * Worked on confidence score analysis of LLM's using ensemble techniques and consistency checks by varying query prompts including syntactical rephrasing, semantic rephrasing, seed variation, temprature variations.
- * Build a software tool using python for annotating computer vision object segmentation using Django, Flask, Requests.
- * Build a GUI tool using python tkinter, pyqt and multithreading, multiprocessing technique to efficient annotation evaluation tool.

Pavo and Tusker Innovation Pvt Ltd   Aug 2021 – Dec 2022
Associate AI Research Engineer   *Chennai, India*
- * Worked on semi-supervised image classification technique using contrastive learning technique. Finetuned on curated huge mixture of dataset, improved unsupervised classification accuracy to 90% on respective test data.

* Build, tested, and deployed in the cloud, a no-code end-to-end pipeline for the image classification, object detection, instance and semantic segmentation models.(Link)
* Build image processing Engines including Image super-resolution using a GAN-based model (Link).
* Image Denoising engine using a pre- trained U-Net-based model (Link).
* Build 5+ Engines in Kandula.ai using python librairies, AI modules: Image super-resolution using a GAN-based model, Image Denoising engine using a pre-trained U-Net-based model.
* Created a real-time bounding box to instance segmentation engine using a fully-convolutional model(Link).
* Let a team of engineers in the development and deployment of AI based design for planogram tracking of sku's by an end to end SOTA unsupervised approach which incudes object detection, unsupervised clustering, text detection, vector search models .

Education

Indian Institute of Technology Kharagpur   July 2019 - May 2021
Masters of Technology in Aerospace Engineering (GPA: 8.40 / 10.00)   *Kharagpur, India*
  * Relevant Coursework: **Advances in AI and Robotics for high impact outdoor applications**

Anna University   July 2015 - May 2019
Bachelors of Engineering in Aeronautical Engineering (GPA: 7.40 / 10.00)   *Chennai, India*
  * Relevant Coursework: **Engineering Mathematics, Technical english, Computer Programming, Communication and soft skills**

Position of Responsibility

Module Lead — SLK Software Pvt Ltd   Apr 2024 – present
Lead the Sales module on llm based erp design.   *Bangalore, India*

Module Lead — Vijna Labs Private Ltd   Jan 2023 – Dec 2023
Lead the GenAI module   *Bangalore, India*

Teaching Assistant — Indian Institute of Technology, Kharagpur   Dec 2019 – May 2021
                                                      Kharagpur, India

M.Tech Thesis

Stacking Sequence optimization of a composite C section using MCDM and Deep Neural Network | *Prof.Anup Ghosh*

· **Physics Informed Neural Network design to automate Finite Element Analysis (FEA)**.
· A Non-Linear Optimization technique called **Generalized Reduced Gradient Method (GRG)** to determine the composite ply sequences matches the strength requirement.
· **Multi Criteria Decision Making (MCDM)** is used for choosing the best structure based on various strength, Stifness and failure mode factors.
· A decision making theoretical concept called **Analytical Hierarchical Process (AHP)** is used to give a single score from the multiple criteria for selecting the best design.
· This single AHP score for different strength, Stifness and failure mode factors is predicted using deep neural network for other composite stacking sequences, as there are thousands of possible stacking sequence to make a composite structure.

Technical Skills

Languages: C, C++, Python, Java, Matlab, R, MySQL, SQL, PostgreSQL.
Python Libraries: Numpy, Pandas, Seaborn, cuda, CPython.
Technologies: Django, Flask, Anaconda, GiT, SSH, VSCode, Docker, Kubernetes, Redis, Jenkins, MongoDB.
Concepts: Artificial Intelligence, Machine Learning, Neural Networks, API, Agile Methodology, Cloud Computing **Deep Learning Frameworks**: Pytorch, Tensorflow, Keras, Scikit-Learn, PaddlePaddle, Nltk, Amazon SageMaker

Achievements

GATE — Graduate Aptitude Test in Engineering – Eligible for scholarship and postgraduate admission to the most premier research institutes in India. All India Rank – **151.**
District First and Division Second on **Triple Jump Event**