Mohana Murugan
Artificial Intelligence Researcher / Developer

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A diligent researcher in the field of Artificial Intelligence, developing new approaches to solving complex problems across various disciplines with the aim of actively contributing to high-quality scientific research and development.

SKILLS SUMMARY

- **Technical Skills:** Python | C | C++ | R | JAVA | MySQL | MongoDB | AWS Cloud
- **Frameworks:** TensorFlow | PyTorch | OpenCV | Scikit-Learn | NLTK | Langchain | Hugging Face
- **Research Areas:** Computer Vision | Machine Learning | Deep Learning | Data Analytics | Affective Computing | TinyML | Data Science | Mulsemedia | Medical Image Processing | Physiological Signal Processing | Natural Language Processing | LLMs | Brain Computer Interface
- **Platforms:** Jupyter Notebook | Google Colab | Visual Studio
- **Soft Skills:** Willing to learn new skills | Excellent Communication | Collaboration and Teamwork | Project Management

EDUCATION

2021-2024	**Avinashilingam University – Ph.D. in Computer Science**	India
	▪ Supervised by Prof.P.Subashini and Co- Supervised by Prof. George Ghinea	
	▪ Thesis topic: *Emotion Recognition in E-Learning and Mulsemedia*	
2018-2020	**Bharathiar University – Master of Philosophy (M.Phil.) in Computer Science**	India
	▪ Supervised by Prof.S.M.Jagatheesh	
	▪ Thesis topic: *Active Permission Identification for Android Malware Application Detection*	
2015-2018	**Bharathiar University – Master of Computer Application (MCA)**	India
	▪ GPA: 8.61 (10.0 scale)	
2012-2015	**Bharathiar University – Bachelor of Science in Computer Science**	India
	▪ GPA: 7.53 (10.0 scale)	

PROFESSIONAL EXPERIENCES

AI and Data Science Engineer   Aug 2024 – Present
Digitals AI | Hyderabad, India

Aspect-based Customer Review Sentimental Analysis
- Designed and implemented an **LLM-powered sentiment analysis system** to identify and evaluate customer opinions across specific product aspects (e.g., battery, display, service) in e-commerce reviews.
- Leveraged **prompt-based LLaMA3** and traditional NLP (spaCy/NLTK) for **aspect extraction** and **aspect-wise sentiment classification** with fine-grained accuracy.
- Developed **aspect ratio scoring models** to quantify sentiment distribution per feature, enabling structured business insights.

Agentic RAG Chat Agent
- Designing and developing a **personalized Chat Agent** for customer support using the **Agentic RAG (Retrieval-Augmented Generation) framework**.
- Integrating advanced tools and frameworks such as **LangChain**, **Hugging Face**, **LlamaIndex**, and **CrewAI** to enable dynamic tool use, memory, document retrieval, and reasoning.
- Implementing components like **long-term memory (pgvector/PostgreSQL)**, **vector search (Pinecone, Qdrant)**, and **multi-agent collaboration**, enhancing the agent's ability to understand, retrieve, and respond accurately to user queries.

- Optimizing agent performance with custom **document chunking**, **embedding models**, and **LLM-based document grading**, resulting in improved response accuracy and personalization.
- Contributing to scalable backend infrastructure and API design using **Django REST API** and experimenting with **Groq + LLaMA3** for high-speed inference.

Senior Research Scientist   Jan 2023 -Nov 2024
- Supervised by Prof.P.Subashini and Co-supervised by Prof. George Ghinea
- Co-mentor by Prof. Celso Alberto Saibel Santos, Federal University of Espírito Santo (UFES), Brazil.
- Conducted research on analyzing learners' Quality of Experience (QoE) using Mulsemedia in E-learning to enhance the learning experience.
- Developed a Facial Emotion Recognition model using Autoencoder and Explainable AI (XAI) techniques to recognize emotions from facial expressions, achieving a prediction accuracy of 2.5%, a significant improvement over the existing approach.

Junior Research Scientist   Jan 2021- Jan 2023
- Supervised by Prof.P.Subashini at Avinashilingam University.
- Co-supervised by Prof.Diksha Shukla at the University of Wyoming, USA
- Developing a Facial Emotion Recognition kit based on IoT and a proposed hybrid CNN-LSTM model for emotion recognition from facial expressions in an e-learning system, achieving significant accuracy compared to state-of-the-art techniques.
- Conducted research on adaptive learning to develop Kidbot 1.0, aimed at teaching primary school children AI concepts.

Programming Trainer at CSC Computer Education   Oct 2019- Jan 2020
- Providing training in a programming language (C, C++, Python, JAVA, PHP) to students who aim to secure industry placements.
- Constructing syllabi, courses, and assessment preparation materials for placement training students.

RESEARCH PUBLICATIONS
*denotes equal contribution and joint lead authorship

BOOK
Python for Chemistry, Notion Press, India	2024
P. Subashini, P.Lalitha, R.Janani, M.B. Janifer, M.Mohana	

BOOK CHAPTERS

Springer **Technology Enhanced Mulsemedia Learning (TEML) Through Design for Learners with Dyslexia for Enhancing the Quality of Experience (QoE)** ✐   2024
M.Mohana*, Aleph Campos da Silveira*, P.Subashini, Gheorghita Ghinea,Celso Alberto Saibel Santos. *Envisioning the Futures of Education Through Design, Springer*

IGI Global **Review on Artificial Intelligence and Robots in STEAM Education for Early Childhood Development: The State-of-the-Art Tools and Applications** ✐   2022
Handbook of Research on Innovative Approaches to Early Childhood Development and School Readiness, edited by Anastasia Lynn Betts and Khanh-Phuong Thai, IGI Global, 2022.
Mohana M, Nandhini, K., Subashini, P.

JOURNALS

Springer **XAI: Explainable-based Deep Semi-Supervised Convolutional Sparse Autoencoder for**

Enhancing Facial Expression Recognition 2024

Signal, Image, and Video Processing *(Published)*

Mohana Murugan, Parthasarathy Subashini, Gheorghita Ghinea

IEEE **Towards Enhancing STEM Learner Experience by Leveraging Mulsemedia Technology**

Transactions on Emerging Topics in Computing, Springer *(Under Review)* 2024

Mohana Murugan, Aleph Campos da Silveira, Parthasarathy Subashini, Celso Alberto Saibel Santos, Gheorghita Ghinea

Inderscience **Empowering Young Learners: M-Learning Application with Adaptive Learning and CCI Standards** *(Accepted)* 2024

International Journal of Technology Enhanced Learning, Inderscience.

S.Divyasri, M.Mohana*, T.T.Dhivyaprabha; P, Subashini

Springer **Facial Expression Recognition Using Machine Learning and Deep Learning Techniques: A Systematic Review** 2024

SN Computer Science, Springer ✆

M.Mohana, P. Subashini

IOS Press **Revisiting Face Detection: Supercharging Viola-Jones with Particle Swarm Optimization for Enhanced Performance** ✆ 2024

Journal of Intelligent & Fuzzy Systems, IOS Press

M.Mohana, P. Subashini, Diksha Shukla

Inderscience **Analysing the Performance of Viola-Jones and Multi-Task Convolution Neural Network (MTCNN) Face Detection algorithms using video sequences.** ✆ 2024

International Journal of Computational Vision and Robotics. Inderscience Publishers

M.Mohana, P. Subashini

World Sci **Emotion Recognition from Facial Expression using Hybrid CNN-LSTM Network** ✆ 2023

International Journal of Pattern Recognition and Artificial Intelligence. World Scientific

M.Mohana, P. Subashini, M. Krishanveni

CONFERENCES

Springer **Technology Enhanced Mulsemedia Learning: Insights of an Evaluation** ✆ 2023

International Conference on Computer-Human Interaction Research and Applications

M.Mohana, Aleph Campos, P. Subashini, Celso Alberto Saibel Santos, Gheorghita Ghinea

IEEE **A Study on Technology-Enhanced Mulsemedia Learning for Enhancing Learner's Experience in E-Learning** ✆ 2023

International Conference on Network, Multimedia and Information Technology (NMITCON)

M.Mohana, N. Valliammal, V.Suvetha, M.Krishnaveni, P.Subashini, Gheorghita Ghinea

Springer **Convolutional Sparse Autoencoder for Emotion Recognition** ✆ 2023

International Conference on Artificial Intelligence and Computer Vision, (AICV2023)

M.Mohana, P. Subashini

IEEE **Emotion Recognition using Deep Stacked Autoencoder with Softmax Classifier** ✆ 2023

International Conference on Artificial Intelligence and Smart Systems and Smart Systems

M.Mohana, P. Subashini

IEEE **Emotion Recognition using Autoencoders: A Systematic Review** ✆ 2023

International Conference on Intelligent Systems for Communication, IoT, and Security.

M.Mohana, P. Subashini

WORKSHOP

ACM   **Technology Enhanced Mulsemedia Learning (TEML) for Learners with Dyslexia** 🔗   2023
International Conference on Interactive Media Experiences Workshops (IMXw '23),
M. Mohana*, Aleph Campos Da Silveira*, V. Suvetha, P. Subashini, Gheorghita Ghinea, and
Celso Alberto Saibel Santos.

CERTIFIED COURSES

- IBM Generative AI Engineering Professional Certificate   2025
- Affective Computing – NPTEL (IITM), India   2024
- Google Data Analytics Professional   2022
- Google Certified Educator – Level 1   2022

HONORS AND AWARDS

FELLOWSHIP

- University Grants Commission (UGC)-NET | India   (2021-2024)

ACHIEVEMENTS

- Qualified UGC NET with JRF and Assistant Professor in the June 2020 exam, India
- Secured First Rank in Master of Computer Science, Tamil Nadu, India   2018
- Secured First Rank in SSLC exam in Public School, Tamil Nadu, India   2010

AWARD

- Won first place in Innovative Ideas to Products at National Science Day Celebrations, Coimbatore.   2023