

Shivakeshavan Ratnadurai-Giridharan

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ML and AI Engineer

AI/ML engineer with **10+ years of experience** building and deploying computer vision, deep learning, and signal processing systems across healthcare and research domains. Proven expertise in **end-to-end ML pipelines**, from custom dataset collection and model training to production deployment and monitoring. Strong track record of **scaling research into production**, optimizing algorithms for real-time performance, and leading technical teams. Skilled in **modern ML infrastructure**: LLMs, generative AI, MLOps, Docker, and cloud deployment. Permanent US resident with advanced degrees in biomedical engineering, electrical engineering, and clinical sciences.

WORK EXPERIENCE

Freelance / Self-employed AI/ML Consultant

09/2025 – Present
Remote

- **Assessed and benchmarked multi-modal AI agents**: CLINE, Gemini CLI for ML/programming challenges using containerized environments.
- **Debugged and optimized AI-generated code for production** ML tasks for cloud and on-edge deployment.
- **Technical Stack**: Docker, Python, CLINE, Gemini CLI, ML evaluation frameworks

Weill Cornell Medicine / Burke Neurological Institute Assistant Professor of research and Interim Lab Director

04/2016 – 08/2025
White Plains, NY

- **Co-supervised a multi-site diverse collaborative research** on NIHCHD R01 grant project; Managed data pipelines and analytics across 2 clinical sites processing 60+ patient records.
- **Designed and deployed Python-based EMG** quantification pipeline using HGBost, eliminating manual processing and reducing processing time from ~ 10 hours to 5 minutes per dataset (120x speedup).
- **Built real-time signal processing interface** to Brainsight via NeuroConn electrophysiology systems using Python for rapid identification of TMS-based motor hot spots (< 100 ms latency).
- **Managed clinical data resources** including IRB protocols and REDCap.
- **Performed DTI analysis on MRI data** to identify cortico-spinal tracts in children with unilateral spastic cerebral palsy.

Instructor (faculty) • Full-time

White Plains, NY

- **Designed and created PEACK** (Platform for the Evaluation and Acquisition of Clinical Kinematics), an end-to-end computer vision system using 3D cameras, pose estimation (deep learning), time-series signal processing, and statistical methods for human movement assessment.
 - . Created/Extracted custom datasets: 100 subjects (controls and participants with cerebral palsy).
 - . Added real-time functionality @ 30-60 FPS skeletal tracking with <60 ms latency.
- **Developed ML-optimized pose estimation pipeline**, improving deep learning model accuracy by 5% through deep-learning based supersampling techniques.
- **Conceptualized and secured \$250K NIH R01 supplement grant** for developing tools to collect more rigorous, unbiased, quantitative data on reaching and upper limb use in children with cerebral palsy.
- **Trained 10+ researchers and students** on TMS-based clinical neurophysiology protocols; Updated lab manual and documentation, reducing onboarding time by 50%.
- **Developed a custom automated hand function assessment device**: Implemented hardware-software integration (C++ and Python) and synchronization between 3D camera and mechanical drawer task for kinematic analysis of hand function.
- **Developed Self-Localization and Mapping (SLAM) algorithm from scratch** in Python for robotic exploration using particle filters (academic project).

- **Technical stack:** Python (TensorFlow, OpenCV, scipy, scikit-learn), C++ (Caffe, Boost, OpenCV, TensorFlow, 2D/3D Camera APIs), MATLAB

Research Associate

White Plains, NY

- **Designed and constructed AutoScala (using computer vision + deep learning)**, a custom rodent ladder device for automated analysis of movement using 3 high-speed color cameras and mirrors for capturing side and bottom profile videos; prototyped in Python and deployed using C++.
- **Developed real-time multi-camera video acquisition algorithm** for Autoscala using C++ multi-threading; achieved <2% frame drop rate on CPU-only systems (no GPU), enabling real-time capture from 3 synchronized cameras at 1080p 60 FPS
- **Developed analysis software for AutoScala from scratch** by retraining VGG16 neural network in TensorFlow for rodent task recognition.
- **Technical Stack:** C++, Python, OpenCV, TensorFlow, Signal processing

Postdoctoral Fellow

White Plains, NY

- Developed an open-source tool: Motometrics in MATLAB for processing evoked EMG signals to construct and analyze muscle recruitment curves, speeding up analysis of experimental data by 200%. Cited 16 times.
- Built automated image registration and quantification tool in Python to analyze spinal cord neuron and axonal density across multiple histological slices

Indiana University-Purdue University

10/2014 - 04/2016

Postdoctoral Fellow

Indianapolis, IN

- **Analyzed and modeled Basal Ganglia phase synchronization** in Parkinson's disease using advanced signal processing
- **Implemented real-time feedback algorithm** for closed-loop deep brain stimulation, using phase synchrony biomarkers from brain signals to trigger stimulation pulses in real-time
- **Built computational models** comparing optogenetic vs. conventional DBS efficacy; models informed clinical research protocols

IIT Madras

07/2007 - 08/2008

Research Assistant

Chennai, India

- Developed computational models of Basal Ganglia to simulate handwriting dynamics in Parkinson's disease
- Implemented computer vision based heart rate estimation from microscope videos using image processing techniques

EDUCATION

Master of Science in Clinical Translation Sciences

Weill Cornell Medicine

New York, NY • 08/2021 - Present

Ph.D. in Biomedical Engineering

University of Florida

Gainesville, FL • 05/2010 - 08/2014

Master of Science in Electrical and Computer Engineering

University of Florida

Gainesville, FL • 08/2008 - 04/2010

Bachelor of Engineering in Electrical and Electronics Engineering

Anna University

Chennai, India • 08/2003 - 04/2007

CERTIFICATIONS

Reinforcement Learning

University of Alberta

05/2021

Quantum Computing Fundamentals

MIT xPro

12/2020

Natural Language Processing in TensorFlow

08/2020

DeepLearning.AI

TensorFlow Developer

08/2020

DeepLearning.AI

RECOGNITION AND ACHIEVEMENTS

Full scholarship for Masters in Clinical and Translational Sciences

Weill Cornell Medicine

NIH R01 Supplement Grant (2021): Co-led successful \$250K grant proposal for clinical assessment tools

NICHHD

Published Researcher: 15+ peer-reviewed publications in computer vision, neuroscience, and biomedical engineering

Primary work cited 400+ times in clinical and neuroscience literature

Green Card Holder: US Permanent Resident

SKILLS

ML/AI Frameworks and Libraries: CLINE, Gemini CLI, Hugging face, LLMs, LSTMs, NLP, ResNet, Transformers, VGG, YOLO

Programming Languages & Tools: Bash, Boost, C/C++, Docker, git, Git, IRB/Compliance tools, Linux, MATLAB, Python, Qt, REDCap, SSH

Computer Vision: Basler API, Intel Depthsense API, OpenCV, Stereolabs Zed API

Specialized Domains: Biomedical Engineering, Clinical Translation, Computer Vision, Data Science, Deep Learning, Neuroscience, Signal Processing, Time Series Analysis

Soft Skills: Cross-functional collaboration (clinical, engineering, Grant writing, Leadership and Mentoring, research teams), Writing/ Peer-reviewing Scientific Publications

PUBLICATIONS

Measuring Multi-Joint Upper Limb Proprioceptive Position Sense in Children with Unilateral Spastic Cerebral Palsy using 3D Kinematics.

09/2024

medArxiv, 2024

Motometrics: A toolbox for annotation and efficient analysis of motor evoked potentials.

03/2019

Frontiers in Neuroinformatics, 2018

Shivakeshavan Ratnadurai Giridharan, Disha Gupta, Ajay Pal, Asht Mishra, Jeremy Hill, and Jason Carmel.

Effects of electrical and optogenetic deep brain stimulation on synchronized oscillatory activity in parkinsonian basal ganglia.

11/2017

IEEE transactions on neural systems and rehabilitation engineering, 2017.

Shivakeshavan Ratnadurai-Giridharan, Chung C Cheung, and Leonid L Rubchinsky.

Temporal patterning of neural synchrony in the basal ganglia in Parkinson's disease.

02/2016

Clinical neurophysiology, 2016

Shivakeshavan Ratnadurai-Giridharan, S Elizabeth Zaubler, Robert M Worth, Thomas Witt, Sungwoo Ahn, and Leonid L Rubchinsky.