

# Tiny (Bharathkumar Ramachandra, Ph.D.)

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Authorized to work for any US employer | O-1 extraordinary ability visa

## SUMMARY

Scientist in deep learning and leader of high-performing machine learning teams. Expertise in the design, development, training and deployment of machine learning systems based on state of the art research, and in leading cross-cultural and cross-functional teams. Lifelong learner with a growth mindset; breathes positive energy into the workplace.

## WORK EXPERIENCE

### Geopipe AI | Hybrid; New York, NY, USA

Head of Machine Learning | Aug 2022 – present

- Supervised and developed a hybrid team of 2 machine learning engineers of different backgrounds in building ML models for inferring properties of cities from multi-modal data for 3D digital twins.
- Transformed the team into high performing by having meta conversations about ways of working and culture, principles of science, defaults of engineering and standards expected of each other.
- Collaborated with peer engineering, data and product teams to build the AI technology roadmap and execute in a robust, ethical and sustainable manner, balancing immediate business priorities with innovation pursuit.
- Designed, trained and deployed deep learning models for image inpainting, semantic segmentation (Pix2pix, DefGrid) and object detection (YOLO, PointNet, Spatial Transformer Network).
- Designed, developed and trained a novel multi-modal Mask2Former-based deep learning system for estimating 2.5D building shape parameters from aerial orthophotos and LiDAR data to circumvent autoregressive drift.
- Improved instance segmentation with known topology (1 connected component) using a persistent homology loss.

### Invision AI | Hybrid; Toronto, ON, Canada

Team Lead and Scientist, Machine Learning | Aug 2021 – Aug 2022 (1 yr)

- Supervised, grew and retained an excellent hybrid team of 4 machine learning engineers in building detection, counting and tracking technologies for infrastructure in cities, warehouses, railways, roads and airports.
- Identified strategic opportunities for the use of machine learning in our products and collaborated with peer engineering and product development teams to build out new technological capabilities for emergency assisted breaking of railways, vehicle occupancy detection for high occupancy vehicle lane monitoring, pavement crack detection, warehouse inventory and logistics management, face mask detection, people tracking and analytics and taxi queue optimization at airports.
- Designed, trained and evaluated models for 2.5D object detection (SSD-based), federated learning on the edge, knowledge distillation (General Instance Distillation) and multitask loss balancing (uncertainty weighting).

### Wrnch AI (acquired by: Hinge Health) | Remote; Montreal, QC, Canada

Computer Vision Scientist | Mar 2020 – Aug 2021 (1yr 6mos)

- Headed the design, development and training of a novel system for 3D human pose estimation from a single RGB image based on bone direction supervision from poor quality 3D pose annotations for our markerless motion capture system.
- Developed, trained, evaluated and patented a novel system to solve a 5-year-old problem that the team had been grappling with - a fully trainable joint-to-person association method for multi-person pose estimation with a DETR-based transformer.
- Contributed to the design of generative human shape modeling with GANs (PiFU), 3D hand pose estimation and bottom-up 2D pose estimation (PAF, HR-Net, Pose Residual Networks).
- Organized community service events to energize the company.

### Mitsubishi Electric Research Labs | Cambridge, MA, USA

Computer Vision Research Intern | Summers 2018, 2019 | with Michael Jones

- Created a dataset and evaluation protocol for video anomaly detection to nudge research in a more meaningful direction.
- Designed, trained and evaluated a novel video anomaly detection Siamese network based on metric learning.

## TECHNICAL AND LEADERSHIP PROFICIENCY

Python; TensorFlow; PyTorch; OpenCV; Scikit-learn.

Deep learning; Computer Vision; Machine Learning; Artificial Intelligence.

Transformational and servant leadership; Development and retention focused.

## AWARDS

- [The Peak's 2022 Emerging Leaders in Artificial Intelligence](#)
- WACV 2020 PhD consortium + travel award.
- Best paper award at ICCS 2016.

## EDUCATION

### Ph.D. in Computer Science | *North Carolina State University* | *Raleigh, NC, USA*

2014 – 2019 | GPA 4.0 | with Ranga Raju Vatsavai

- Dissertation on 'Anomaly Detection in Videos'; wrote the authoritative survey on Video Anomaly Detection.
- Reproduced convolutional auto-encoders to perform video anomaly detection. [60+ ★s, 15+ forks on GitHub](#).
- Collaborated on research on video action recognition, semi-supervised image classification, remote sensing change detection, multi-modal image classification and manifold estimation.
- Directed thesis research for and supervised several masters and junior PhD students.

### B.E. (Hons.) in Computer Science | *Birla Institute of Technology and Science - Pilani* | *Dubai, UAE*

2010 – 2014 | GPA: 3.51

## SERVICE

- Program Chair: SSTDM '21 (at ICDM).
- Program Committee: WAIN '22 (at ICDM), BigSpatial '22 (at ACM SigSpatial), SSTDM '22, '19 (at ICDM).
- Reviewer: TPAMI ['20], WACV ['24, '23, '22, '21, '20], ICDM ['22, '19], KDD['18], PKDD ['19], AAAI ['20, '19], SDM ['23, '20, '19, '18], PAKDD ['18], SSTD ['17], SSTDM ['16, '17], SIGSPATIAL ['22], CIKM ['21, '20].

## TALKS

- "Innovation to Implementation: Building Deep Tech Powered Systems" at McGill AI Society's Learnathon Feb 2021.
- "Understanding Human Pose" at McGill AI Society's Hackathon Sep 2020.

## PATENTS

- "Pose Parsing using a Transformer Network": [publication WO/2022/243739](#), July 2021
  - Independent research that followed presenting the idea: "End-to-End Multi-Person Pose Estimation With Transformers." Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. 2022.

## SELECT PUBLICATIONS ([GOOGLE SCHOLAR](#))

- **Ramachandra, B.**, Jones, M., & Vatsavai, R. R. (2020). A Survey of Single-Scene Video Anomaly Detection. *IEEE Transactions on Pattern Analysis and Machine Intelligence*.
- **Ramachandra, B.**, & Jones, M. (2020). Street Scene: A new dataset and evaluation protocol for video anomaly detection. In *The IEEE Winter Conference on Applications of Computer Vision* (pp. 2569-2578).
- **Ramachandra, B.**, Jones, M., & Vatsavai, R. (2020). Learning a distance function with a Siamese network to localize anomalies in videos. In *The IEEE Winter Conference on Applications of Computer Vision* (pp. 2598-2607).
- **Ramachandra, B.**, Jones, M., & Vatsavai, R. R. (2021). Perceptual metric learning for video anomaly detection. *Machine Vision and Applications*, 32(3), 1-17.
- Barbalau, A., Ionescu, R. T., Georgescu, M. I., Dueholm, J., **Ramachandra, B.**, Nasrollahi, K., ... & Shah, M. (2022). SSMTL++: Revisiting Self-Supervised Multi-Task Learning for Video Anomaly Detection. *Computer Vision and Image Understanding*, 103656.
- Gadiraju, K. K., **Ramachandra, B.**, Chen, Z., & Vatsavai, R. R. (2020, August). Multimodal Deep Learning Based Crop Classification Using Multispectral and Multitemporal Satellite Imagery. In *Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining* (pp. 3234-3242).
- Chen, Z., Dutton, B., **Ramachandra, B.**, Wu, T., & Vatsavai, R. R. (2020). Local Clustering with Mean Teacher for Semi-supervised Learning. *IEEE International Conference on Pattern Recognition 2020*.
- **Ramachandra, B.**, Gadiraju, K. K., Vatsavai, R. R., Kaiser, D. P., & Karnowski, T. P. (2016). Detecting extreme events in gridded climate data. *Procedia Computer Science*, 80, 2397-2401. (**Best Paper Award**)
- Chen, Z., **Ramachandra, B.**, Wu, T., & Vatsavai, R. R. (2018). Relational Long Short-Term Memory for Video Action Recognition. *arXiv preprint arXiv:1811.07059*.
- Chen, Z., **Ramachandra, B.**, & Vatsavai, R. R. (2020). Consistency Regularization with Generative Adversarial Networks for Semi-Supervised Image Classification. *arXiv preprint arXiv:2007.03844*.