

# SAKTHI KUMAR ARUL PRAKASH

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## EDUCATION

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### Carnegie Mellon University

Postdoctoral Research Associate, Department of Machine Learning

**Area of Research:** Geometric Deep Learning and Causal Structures in Physics

Pittsburgh, PA

August 2023 - December 2023

### Carnegie Mellon University

Ph.D. in Mechanical Engineering

**Area of Research:** Geometric Deep Learning and Graphical Models for studying Social Networks and Physics Simulations

**Awards:** Knight Fellowship

Pittsburgh, PA

August 2019 - August 2023

(2022)

### The Pennsylvania State University

M.S. in Industrial Engineering

**Area of Research:** Optimization Theory and Computer Vision for Healthcare

**Awards:** C.H.O.T. Scholar

State College, PA

August 2016 - July 2019

(2018)

### Anna University

B.E. in Mechatronics Engineering

**Awards:** Mahatma Gandhi Merit Scholarship

Chennai, India

July 2012 - May 2016

(2012-2016)

## SKILLS

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**Programming:** *Experienced-* Python, Matlab | *Familiar-* C++, JavaScript, Java for Android Programming

**Frameworks:** Pytorch, Pytorch Geometric, TensorFlow, Jax, Keras, Flask, Django

**Languages:** Tamil and English

## SELECT RESEARCH EXPERIENCE

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### Raytheon Company

- Working on discovering causal and symbolic structures from particle and mesh-based physics simulations.
- Working on a Humanoid Face Robot project wherein I'm solving the problem of optimal actuator placement and motor control to enable a Face Robot to enact natural facial movements.

### Air Force Office of Scientific Research; Rolls-Royce Company

Part Ph.D. Funding

- Worked on utilizing Graph based ML techniques such as Graph Neural Networks and Probabilistic Graphical Models to learn generalizable physics simulators as well as accelerate the speed of computing simulations. The proposed techniques achieved an average RMSE reduction of 40% across all previously developed one-step/multi-step learnable physics models.
- Worked on graph representation learning techniques for improving accuracy in downstream tasks such as node classification and link prediction. This research entailed comprehensive testing across a wide range of graph sizes, spanning from 2,000 nodes to 2.5 million nodes. Notably, the findings revealed a significant 2-4% enhancement in node classification performance when compared to baseline methods, even in scenarios where node features were absent.

### Bill and Melinda Gates Foundation

M.S. Funding

- Worked on the development of a non-contact vision based algorithm capable of estimating physiological signals such as heart rate and respiratory from a diverse adult population. The proposed algorithm incorporates a robust Kalman Filter-based motion tracking mechanism and achieves illumination invariance by leveraging the HSV color space. This method was applied in a real-world setting, where subjects walked towards the camera from distances of up to 4 feet, yielding an impressive mean error of approximately  $\pm 3$  beats per minute (B.P.M.).
- Worked on and lead a team to develop Android and web application (<https://www.videovitals.org/>) variants of the algorithm.

## SELECT PUBLICATIONS (SEE [GOOGLE SCHOLAR](#) FOR ALL PUBLICATIONS)

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Prakash, S. K. A., & Tucker, C. S. (2021). Node classification using kernel propagation in graph neural networks. *Expert Systems with Applications*, 174, 114655.

Prakash, S. K. A., & Tucker, C. (2022). Graph network for simultaneous learning of forward and inverse physics. *arXiv preprint arXiv:2112.07054*.(Preprint).