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The University of Texas at Austin
Oden Institute for Computational Engineering and Sciences

Education

Program	Institution	GPA	Year	Rank
MS & Ph.D. in Computational Science, Engineering & Mathematics	The University of Texas at Austin	3.76/4	2022	-
B.Tech (*Hons*) & M.Tech - Chemical Eng.	Indian Institute of Technology Madras	8.94/10	2017	2
XII	Vidyadham Junior College, Hyderabad	97.5%	2012	1
X	Johnson Grammar School (ICSE), Hyderabad	95%	2010	1

Research Interests

I am passionate about developing **machine learning algorithms** to solve the world's most challenging problems.
Research interests: Machine Learning **(DL, RL), Optimization, Graph theory, Computational biology**

Coding Skills

Python (scikit-learn, tensorflow, networkx, pandas), **C++** (GRVY, MASA, HDF5, PETSc), **R** (tidyverse), **Matlab** (Statistics & ML, Optimization, ODE Solvers), **Scala**, **Latex**, **Linux** & **HPC** (at TACC), Github
Exposure: Travis-CI, autotools, Valgrind, Docker, C, Java, Arduino-coding, HTML, CSS, Javascript, C#

Select Graduate Course Work

- **Statistical Models for Big Data**
- Tools & Techniques in Computational Science
- Geometric Foundations of Data Science
- **Reinforcement Learning**
- Deep probabilistic modeling
- Pattern Recognition
- **Bayesian Deep Learning**
- Functional Analysis
- Graph Theory & Optimization

Projects (machine learning & HPC)

- **Machine Learning methods for detection of protein complexes from PPI networks** *(Ph.D. Thesis)* Jun 2018 +

(Guide: Prof. Edward Marcotte - Oden Institute, UT Austin)

  - Developed **Super.Complex**, a **supervised ML pipeline** achieving **98% accuracy** in classification as complex in **human** PPINs.
  - Formulating a **deep reinforcement-learning algorithm** with **graph embeddings** for **complex search** (**NP hard problem**).

- **Laplacian finite difference solver application** Aug-Dec 2018

(Guide: Prof. Karl Schulz - Dept. of Women's Health, Oden Institute, UT Austin)

  - Developed from scratch a **C++ application** leveraging **solvers** for the **2D** heat equation, achieving **high convergence rates**.
  - **Features**: **performance - 0.4s** (100x100 mesh), tests (**bats**, **Travis CI** & **Docker**), **100%** code coverage (**lcov**), **0** memory errors (**Valgrind**), visualization (**Paraview**), build (**autotools**), **HPC** env (**Stampede2**), storage (**HDF5**), parser & logger (**GRVY**).

- **Hyperspectral image denoising & classification** Mar-May 2018

(Guide: Prof. Chandrajit Bajaj - Computational Visualization Center (CVC), Oden Institute, UT Austin)

  - Applied a framework with **one-against-one and one-against-all SVMs** for **multi-class** classification with **90% accuracy**.

- **Re-ranking molecule docking poses with RankSVM** Oct-Dec 2017

(Guide: Prof. Chandrajit Bajaj - CVC, Oden Institute, UT Austin)

  - Formulated & implemented a **novel SVM classifier for re-ranking docking poses** from F2-dock with **75% accuracy**.

- **Implementation of ML algorithms for image & speech data classification** Aug-Dec 2016

(Guide: Prof. Chandra Sekhar C. - Speech & Vision Lab, Dept. of Computer Science, IITM)

  - Developed from scratch and compared- **neural networks (MLP), GMM, HMM, Bayes, k-means and k-nn classifiers**.

PROJECTS (OPTIMIZATION)

- **Human bio-chemical reaction network analysis for treating autism** *(Master's Thesis)* Jun 2016-May 2017

(Guide: Prof. Raghunathan Rengaswamy & Dr. Swagatika Sahoo - Initiative for Biological Systems Engineering (IBSE), IITM)

  - Developed **2 constrained pareto-optimization algorithms** and **2 metrics** for optimal reaction **network flow distribution**.

- **Kinetic modeling of anti-cancer drug action** *(Mathematical Biology)* Jul 2016-May 2017

(Guide: Prof. Raghunathan Rengaswamy, Prof. G.K Suraishkumar & Prof. Karunagaran D. - Dept. of Biotechnology, IITM)

  - **Simulated experimental circadian rhythms** with a **robust data-tuned parametric model**, using a **genetic algorithm**.

- **Design of microfluidic networks performing floating point operations** *(Systems & Control)* Jul 2015-Jun 2016

(Guide: Prof. Raghunathan Rengaswamy - Systems & Control Group, Dept. of Chemical Engineering, IITM)

  - Employed **genetic algorithms & MINLP** to **design optimal micro-fluidic networks** for **combinatorial sequence sorting**.

- **Model Predictive Control** *(Modern Control Theory)* Oct-Nov 2015

(Guide: Prof. Raghunathan Rengaswamy - Systems & Control Group, Dept. of Chemical Engineering, IITM)

  - **Optimized operating conditions** of a catalytic cracker via an MPC framework and **studied its performance**.

- **Modeling of polymer solar cell nano-morphologies** *(Stochastic Simulations)* Oct-Dec 2013

(Guide: Prof. Ethayaraja Mani - Polymer Engineering & Colloid Sciences Group, Dept. of Chemical Engineering, IITM)

  - **Generated event sequences** in morphology via FRM **queuing model** developed with **Dynamic Monte Carlo** simulations.

PUBLICATIONS & INTERNATIONAL CONFERENCES

- Palukuri M, Marcotte EM "Super.Complex v3.0: A Supervised Machine Learning Pipeline for Molecular Complex Detection in Protein-interaction Networks", ***US HUPO*** *(**Human Proteome Organization** Conference)* **[Poster]** (2021)
- Palukuri M, Marcotte EM "Super.Complex: **Intelligent subgraph search** for communities with **deep reinforcement learning**", ***SIAM MDS****: Conference on **Mathematics of Data Science***, Cincinnati **[Invited Talk]** (2020)
- Palukuri M, Marcotte EM "**Super.Complex**: A Computational Pipeline for Supervised Community Detection in Graphs", ***TACCSTER 2019****: TACC Symposium for Texas Researchers*, Austin **[Invited Talk, Poster]** (2019)
- Palukuri M, Marcotte EM "Supervised community detection in protein-interaction networks", *The 2nd Annual Meeting of the SIAM Texas Louisiana Section)*, Dallas **[Best Poster Award]** (2019)
- Palukuri M, Marcotte EM "Supervised community detection", *Workshop on Recent Developments on **Mathematical/ Statistical approaches** in **Data Science** (MSDAS)*, Dallas **[Poster]** (2019)
- Kizhuveetil U, Palukuri M, Karunagaran D, Rengaswamy R, Suraishkumar GK. "Entrainment of superoxide rhythm by menadione in HCT116 colon cancer cells", ***Scientific Reports, Nature Publishing Group*** 9.1: 3347 **[Paper]** (2019)
- Palukuri M, Shivakumar S, Sahoo S, Rengaswamy R. "Computational framework for exploring the interplay of diet and gut microbiota in autism." ***bioRxiv***: 422931 **[Paper]** (2018)
- Palukuri M, *et al*."An integrated COBRA-PBPK model to study interactions between gut & brain in autism", ***5th Conference, Constraint-Based Reconstruction & Analysis***, Seattle **[Poster]** (2018)
- Kizhuveetil U, Palukuri M, Rengaswamy R, Suraishkumar GK. "Menadione induced reset of circadian superoxide rhythms in human colon cancer cells", ***Free Radical Biology and Medicine, 112***, 91-92, Baltimore **[Poster]** (2017)
- Palukuri M, *et al*. "Predicting the role of gut microbiota & diet in autism", ***11th Copenhagen Bioscience Conference: "Data-Driven Biotechnology***: Bench, Bioreactor, Bedside" , Hillerϕd **[Poster]** (2017)
- Palukuri M, Shivakumar S, Sahoo S, Rengaswamy R. *"Predicting the role of gut microbiota and diet in autism"*, **Interdisciplinary Laboratory for Data Sciences Workshop**, Chennai **[Poster]** (2016)

Select Professional Experience

- **Graduate Research Assistant, University of Texas at Austin** Jun 2018 - present
- **Concentration in Teaching and Mentoring**, Texas Institute for Discovery Education in Science Jun 2018 - present
- **Professional Memberships: Society for Industrial and Applied Mathematics**, SBE, AICHE 2017 - present
- **Applied Scientist II Intern, Amazon** *Project: Substitute Product Recommender* Jun - Aug 2020
  - Built product embedding space based on catalog text info & performed nearest neighbor search for substitutes (**0.99 Recall**).
- **Cloud Software Engineering Intern, Schlumberger** *Project: Time-Series Operations* Jun - Aug 2019
  - Deployed on **Google Cloud** - a **Domain Specific Language** in **Scala**, for **custom calculations** with real **time-series data** .
- **Graduate Teaching Assistant, Indian Institute of Technology, Madras** 2016-17
- **Internship at Hindustan Unilever** *Project: Autonomous Maintenance* May-Jul 2015
  - **Improved process energy efficiency by 20%** by eliminating an identified stream through **modification of system logic**.
- **Internship at Hindustan Coca-Cola Beverages** *Project: Water Balance* May-Jul 2014
  - Analyzed **water data trends & network distribution**, devising methods to **improve factory's water usage ratio by 40%**.

Awards & Honours

- Passed **Ph.D candidacy exam** & **Ph.D preliminary exam** (applicable math, scientific computing, math modeling).
- Awarded **$24k O'Donnell Fellowship** & **$9.5k GIFA** award by UT Austin to encourage research. (2017-19)
- **2-time** $500 **Professional Development Award** recipient & **25% discount** to present at conferences. (2018-20)
- Selected for admission to graduate studies at **UT Austin, CMU** and the **University of Delaware**. (2017)
- Received the **C.A. Sastri Endowment Award** for best graduating chemical engineering student. (2017)
- Selected for the **KVPY Fellowship** awarded by the Department of Science & Technology, Govt. of India. (2012)
- **1 out of 6** students from 90 chemical engineering students to be awarded a **B.Tech Honours** degree (2017)
- Qualified for nationals **(top 5%)** of **International Chemistry Olympiad** hosted by HBCSE (TIFR). (2012)
- Secured undergrad admission at IITM, the **best engineering college** in India (**top 0.5%** of 500k applicants) (2012)
- Secured All India Rank of **34** in **National Science Olympiad**, **64** in **International Math Olympiad**. (2006,12)

Co-curricular Activities

Coding	**Windows App(C#): Wardrobe Assistant- dress suggestions** *2016 **Microsoft**-24hr Code.Fun.Do Hackathon*
Robotics	Coded locomotion for **autonomous transwheel** robot 2013 **Asia-Pacific Robot Contest - Robocon** Secured **3rd** in Gold Rush **Maze Solving** Robot contest & **Mechanica Autonomous Robotics** (2013)
VR	Designed **spatial augmented reality** at Envisage, India's largest student tech show:**2000+ people** (2014)
Table Tennis	**UT Austin TT Team Member**: Participated in USA **nationals** by **NCTTA**, securing **9^{th}** place. (2018) **IITM TT Team Captain:** Won **Gold Medal**- Sportsfest, **Silver Medal**-**48^{th} Inter-IIT Meet**. (2012-16)
Chess	Placed **1^{st} in Intra-hostel Chess** Competition, **4^{th}** in Dean's Trophy. (2013,15)
Classical Arts	Learnt **Carnatic music** for **7 years**, classical **dance** forms Bharatnatyam & Kuchipudi for **3 years** Selected for the **Guinness World Record** event, **'Laksha Gala Sankeertanarchana'**. (2009)

VOLUNTEERING

- **2-time Captain Judge**, Dallas Regional **Science & Engineering Fair** for Chemistry & Environmental Engg. 2019-20
- Information desk volunteer at **Explore UT** - campus wide event to promote learning attended by 1000+ people. 2019
- **Organized IITM** campus engineering facilities **tours and workshops** for middle **school kids**. 2015-16
- **Organized Run for a Cause**, event for **Chennai flood relief**, with proceeds going to **school repairs**. 2015-16

LEADERSHIP POSITIONS

- **Vice President, SIAM Chapter of UT Austin** (2020-2021)
- **Founder, Literary Fest 'Saahitya'** *(a self-driven initiative, commended by the Director, Dean & Alumni)* (Feb - Apr 2016)
  - Formed & lead a **team of 60** across 6 divisions to **organize the fest with 30 events**, with a **footfall of over 1000** in IITM.
- **Secretary, Chemical Engineering Society** *(Nominated by Dept. Faculty)* (2015 - 2016)
  - **Lead a team of 120 people** across 9 divisions to organize **'ChemClave'** (dept fest), with a footfall of around **1000** students.
  - **Pioneered an AICHE Student Chapter** in IITM, **introduced** the event - **Research Confluence with industry**.
- **Convener, Word Games Club** *(Head of 1 out of 9 institute cultural clubs)* (2015 - 2016)
  - **Raised club participation by 100%** through 25+ new events & 2 flagship events, with a budget of **INR 2 lakh**.
- **Placement Support Team Member** *(1 out of 6 selected from 40 applicants to the post)* (2014 - 2015)
  - Contacted & convinced **30+** companies to attend the campus recruitment program.