

Meghana Venkata Palukuri

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## 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 ( <i>Honors</i> ) & M.Tech in Chemical Engineering	Indian Institute of Technology Madras	8.94/10	2017	2

## RESEARCH INTERESTS

I am passionate about developing **machine learning algorithms** to solve the world's most challenging problems.

**Areas:** Machine Learning (**Deep Learning, Reinforcement Learning**), **Optimization, Graph theory**

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

## PROFESSIONAL EXPERIENCE

- **Applied Scientist, Amazon (Last Mile Science), Project: Route Planning** Aug 2022 - present
  - Built road network communities as a **new geospatial planning unit** for many applications using graph algorithms.
- **Graduate Research Assistant, University of Texas at Austin** Jun 2018 - Aug 2022  
(Supervisor: Prof. Edward Marcotte - Oden Institute for Computational Engineering and Sciences)
  - Worked on **Ph.D. Thesis** titled 'Machine Learning methods for community detection in networks using known information'.
  - Developed **Super.Complex**, a **distributed, supervised AutoML method** achieving **98% accuracy** in protein complex detection.
  - Developed a **fast reinforcement-learning algorithm** with **graph embeddings** for **community search**, an **NP hard problem**.
- **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 Intern, Amazon (Last Mile Science), Project: Route Planning** Jun - Aug 2021
  - Accurately **forecasted productivity** of delivery routes using **AutoML**, and **selected features** to influence for improvements.
- **Applied Scientist Intern, Amazon (Brands Experience), Project: Substitute Product Recommender** Jun - Aug 2020
  - Built **product embeddings** using catalog **text** and performed **fast neighbor search** for substitute products with **99% Recall**.
- **Cloud Software Engineering Intern, Schlumberger, Project: Time-Series Operations** Jun - Aug 2019
  - Developed a **Domain Specific Language** in **Scala** for **custom calculations** on real-world **time series data** on **Google Cloud**.
- **Graduate Assistant, Indian Institute of Technology, Madras** 2016-17
  - Worked on Master's thesis titled 'Human bio-chemical reaction network analysis for treating autism'.
  - Developed **two constrained pareto-optimization algorithms** and **two metrics** for optimal **network flow distribution**.
- **Intern, Hindustan Unilever, Project: Autonomous Maintenance** May-Jul 2015
  - **Improved process energy efficiency by 20%** by eliminating an identified stream through **modification of system logic**.

## RESEARCH PROJECTS (ML, HPC & OPTIMIZATION)

- **AutoML image clustering with similarity graph embeddings** [\[Code\]](#) Jan-May 2022
  - Combined image and similarity graph embeddings of 2D projections and clustered them into 3D objects (97% accuracy).
- **Protein complex classification with graph neural networks** [\[Code\]](#) Sep-Nov 2021
  - Tuned 6 graph neural networks for imbalanced binary graph classification as protein complexes or not with 86% accuracy.
- **Graph theoretical feature selection for protein complex classification** Jan-May 2019
  - Selected 18 graph-theoretical features achieving 0.97 APS in binary classification with PCA, glmstep and logistic regression.
- **Laplacian finite difference solver application** Aug-Dec 2018
  - Developed from scratch a C++ application leveraging solvers for the 2D heat equation, achieving high convergence rates.
  - Features: performance - 0.4s (100x100 mesh), 100% code coverage (lcov), 0 memory errors (Valgrind), HPC environment.
- **Hyperspectral image denoising and classification** [\[Code\]](#) Mar-May 2018
  - 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
  - Formulated and implemented a novel SVM classifier for re-ranking docking poses from F2-dock with 75% accuracy.
- **Implementation of ML algorithms for image and speech data classification** [\[Code\]](#) Aug-Dec 2016
  - Built neural networks, GMM, HMM, Bayes, k-means and k-nn classifiers for speaker identification and image recognition.
- **Kinetic modeling of anti-cancer drug action** Jul 2016-May 2017
  - Simulated experimental circadian rhythms with a robust data-tuned parametric model using a genetic algorithm.
- **Design of microfluidic networks performing floating point operations** Jul 2015-Jun 2016
  - Employed genetic algorithms and MINLP to design optimal micro-fluidic networks for combinatorial sequence sorting.

## PUBLICATIONS & INTERNATIONAL CONFERENCES

- 6 papers including 3 peer-reviewed journal papers, 8 conferences, with 22 citations and h-index 3. [\[Google Scholar\]](#)
- Palukuri MV (2022) Machine learning methods for community detection in networks using known information [\[Thesis\]](#)
  - Palukuri MV, Patil RS and Marcotte EM (2022) Molecular complex detection in protein interaction networks through reinforcement learning [bioRxiv: 496772](#). [\[Paper\]](#)
  - Mohammad FK, Palukuri MV, Shivakumar S, Rengaswamy R and Sahoo S (2022) A Computational Framework for Studying Gut-Brain Axis in Autism Spectrum Disorder. *Front. Physiol.* 13:760753. [\[Paper\]](#)
  - Palukuri MV, Marcotte EM (2021) Super.Complex: A supervised machine learning pipeline for molecular complex detection in protein-interaction networks. *PLoS ONE* 16(12): e0262056. [\[Paper\]](#), [bioRxiv: 449395](#) [\[Paper\]](#)
  - Palukuri M, Marcotte EM (2021) "Super.Complex v3.0: A Supervised Machine Learning Pipeline for Molecular Complex Detection in Protein-interaction Networks", *US HUPO (Human Proteome Organization Conference)* [\[Poster\]](#)
  - Palukuri M, Marcotte EM (2020) "Super.Complex: Intelligent subgraph search for communities with deep reinforcement learning", *SIAM MDS: Conference on Mathematics of Data Science*, Cincinnati [\[Invited Talk\]](#)
  - Palukuri M, Marcotte EM (2019) "Super.Complex: A Computational Pipeline for Supervised Community Detection in Graphs", *TACCSTER 2019: TACC Symposium for Texas Researchers*, Austin [\[Invited Talk\]](#), [\[Poster\]](#)
  - Palukuri M, Marcotte EM (2019) "Supervised community detection in protein-interaction networks", *The 2nd Annual Meeting of the SIAM Texas Louisiana Section*, Dallas [\[Best Poster Award\]](#)
  - Palukuri M, Marcotte EM (2019) "Supervised community detection", *Workshop on Recent Developments on Mathematical Statistical approaches in Data Science (MSDAS)*, Dallas [\[Poster\]](#)
  - Kizhuveetil U, Palukuri M, Karunakaran D, Rengaswamy R, Suraishkumar GK. (2019) "Entrainment of superoxide rhythm by menadione in HCT116 colon cancer cells", *Scientific Reports, Nature Publishing Group* 9.1: 3347 [\[Paper\]](#)

- Palukuri M, Shivakumar S, Sahoo S, Rengaswamy R. (2018) "Computational framework for exploring the interplay of diet and gut microbiota in autism." *bioRxiv*: 422931 [Paper]
- Palukuri M, et al. (2018) "An integrated COBRA-PBPK model to study interactions between gut and brain in autism", *5th Conference, Constraint-Based Reconstruction and Analysis*, Seattle [Poster]
- Kizhuveetil U, Palukuri M, Rengaswamy R, Suraishkumar GK. (2017) "Menadione induced reset of circadian superoxide rhythms in human colon cancer cells", *Free Radical Biology and Medicine*, 112, 91-92, Baltimore [Poster]
- Palukuri M, et al. (2017) "Predicting the role of gut microbiota and diet in autism", *11th Copenhagen Bioscience Conference: "Data-Driven Biotechnology: Bench, Bioreactor, Bedside"*, Hillerød [Poster]
- Palukuri M, Shivakumar S, Sahoo S, Rengaswamy R. (2016) "Predicting the role of gut microbiota and diet in autism", *Interdisciplinary Laboratory for Data Sciences Workshop*, Chennai [Poster]

## AWARDS & HONOURS

- Passed **Ph.D candidacy exam & Ph.D preliminary exam** (applicable math, scientific computing, math modeling).
- **O'Donnell Fellowship and General ISSS Financial Aid** award (\$34k) by UT Austin towards research. (2017-19)
- **Two-time \$500 Professional Development Award** and **25% discount** given to present at two 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 and 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**. (2006,2012)

## CO-CURRICULAR ACTIVITIES

<b>Coding</b>	<b>Windows App(C#): Wardrobe Assistant- outfit suggestions</b> 2016 <i>Microsoft-24hr Code.Fun.Do Hackathon</i>
<b>Robotics</b>	Coded locomotion for <b>autonomous transwheel</b> robot 2013 <b>Asia-Pacific Robot Contest - Robocon</b>
<b>VR</b>	Designed <b>spatial augmented reality</b> at Envisage, India's largest student tech show: <b>2000+ people</b> (2014)
<b>Table Tennis</b>	<b>UT Austin TT Team Member:</b> Participated in USA <b>nationals</b> by NCTTA, securing <b>7<sup>th</sup></b> place. (2018-19) <b>IITM TT Team Captain:</b> Won <b>Gold Medal-</b> Sportsfest, <b>Silver Medal-48<sup>th</sup> Inter-IIT Meet</b> . (2012-16)
<b>Chess</b>	Placed <b>1<sup>st</sup></b> in <b>Intra-hostel Chess</b> Competition, <b>4<sup>th</sup></b> in <b>Dean's Trophy</b> . (2013,2015)
<b>Classical Arts</b>	Learnt <b>Carnatic music</b> for <b>7 years</b> , classical <b>dance</b> forms Bharatnatyam and Kuchipudi for <b>3 years</b> Selected for the <b>Guinness World Record</b> event, ' <b>Laksha Gala Sankeertanarchana</b> '. (2009)

## VOLUNTEERING

- **Two-time Captain Judge** at the Dallas Regional **Science and Engineering Fair** for middle-class students. 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 and Alumni*) (Feb - Apr 2016)
  - Formed & lead a **team of 60** across 6 divisions to **organize a literary fest with 30 events** and 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.

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