Curriculum Vitae
Bhanu Teja Gullapalli
http://bhanutejagullapalli.github.io

CONTACT INFORMATION

Graduate Student
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RESEARCH INTERESTS

Machine Learning, Wearable Health Sensing, Ubiquitous computing

EDUCATION

Ph.D. in Computer Science, Sep'18 - Present
University of Massachusetts, Amherst, USA
CGPA-3.95/4.0

Masters in Computer Science, Jan'17 - Sep'18
University of Massachusetts, Amherst, USA CGPA-4.0/4.0

Bachelor of Technology in Computer Science, Jun'11 - May'15
Indian Institute of Technology(IIT), Guwahati, India CPI-7.81/10

RESEARCH PROJECTS

Self-supervised modeling for opioid administration Jun'21 - Present
Guide:Tauhidur Rahman Dept. of Computer Sciences UMass, Stephanie P. Carreiro UMass Medical school
Unlabeled sensor data is easier to collect as compared to the labeled sensor data. We design a self-supervised task specific to the opioid administrations dataset and train an upstream Channel-Temporal Attention TCN model. This upstream model is used for downstream tasks of detecting opioid administrations IV or orally.

Joint prediction of cocaine craving and euphoria using structured prediction energy networks Mar'21 - Apr'21
Guide:Tauhidur Rahman Dept. of Computer Sciences, UMass
Addiction-related states craving and euphoria are interdependent and correlated. However, the state of the art digital biomarker technologies model these states independent of each other and thus fail to use the inherent relationship while making predictions. We use structured prediction energy networks (SPENs) to jointly predict self-reported visual analog scale (VAS) ratings of cocaine craving and euphoria from cardiac signals captured from a wearable chest band.

Detecting Opioid administration using physiological signals Jul'19 - Feb'21
Guide:Tauhidur Rahman Dept. of Computer Sciences UMass, Stephanie P. Carreiro UMass Medical school
Using the physiological signal data captured from the E4 wristwatch, we predict intravenous(IV) opioid administrations in a clinical setting. We built a channel-temporal attention TCN architecture (CTA-TCN), motivated by our observations and previous medical findings to detect administration in a time window. Along with the detection of administrations in a time window, we also predict the moment of administration with CTA-TCN.

Understanding Addiction loop for Cocaine Feb'18 - Feb'19
Guide:Tauhidur Rahman, Deepak Ganesan Dept. of Computer Sciences, UMass

This work focuses on understanding multiple variables of the addiction loop to develop Just-in-time interventions. We model Cocaine craving, euphoria, and drug-seeking behavior using cardiac and respiratory signals obtained from a wearable chest band in subjects addicted to the drug. We analyze various aspects of ECG and Breathing signal, making it possible and observing how it differs for different addiction loop variables. We also show how knowing the target user's personal information can benefit our system performance. Finally, we modeled Drug-seeking behavior, which previously was not studied in humans.

Growing Tree-Structured Detector Cascade May'17 - Aug'17
Guide:Benjamin M. Marlin, Dept. of Computer Sciences, UMass
Developed a novel way to grow and find the optimal configuration of a tree-structured cascade model using the idea of the neutral predictor. Tested this model on the Mobile Health dataset for smoking. This method increased the accuracy and F1-Score from the past models that were based on linear-cascade. Brought down the computational complexity from exponential to linear.

Community Detection Algorithms May'13 - Jul'14
Guide:Saswata Shannigrahi , Dept. of CSE, IIT Guwahati
Comparative study of behavioral-based vs. structural-based community detection methods using goodness metrics- modularity and like-mindedness was performed. Then introduced two new algorithms- the modified louvain method and like-mindedness maximization. Unlike the louvain method, modified louvain increases both modularity and like-mindedness. Like-mindedness maximization is a bottom-up hierarchical clustering approach that maximizes like-mindedness metric by discouraging the merging of big communities.

KEY ACADEMIC PROJECTS

Drug Target prediction using Deep Representation Learning *Jan'18-Apr'18*
Guide:Achille Fokoue IBM Research

- Traditional methods involved naive representations of drugs and proteins, which resulted in low performance, and the results were hard to interpret.
- Using the idea of Graph convolution to represent the drugs, as they are more interpretable and stable. Protein sequence will be converted to a smaller vector representation using an LSTM, similar to word embeddings. The hypothesis is better representation guarantees better results.
- Finally, Using the Attention Mechanism to interpret the results better, i.e., which part of the protein interacts with which part of the drug structure.

Improving the practical effectiveness of a best arm algorithm and extending it to top K arm in stochastic multi-armed bandit *Oct'17-Dec'17*

- Exponential gap, the best prediction algorithm guarantees good theoretical bounds but fails miserably in practical situations.
- By improving the elimination criteria, making it practically effective against current state-of-art best arm algorithms.
- This algorithm is then extended to Top K arm selection by changing the sampling rate. The sample complexity of this modified algorithm is better than the current state-of-art Top K arm selection algorithms.

Extending Learning-to-Optimize *Oct'17-Dec'17*

- In this project, we look at the work done to eliminate the hyperparameter tuning of optimization algorithms. We model this as a learning problem and train an RNN, which takes gradient information as input to predict the update step of parameters. We investigate which parts of the model architecture play an important role in generalizing different problems. We perform experiments using the MNIST dataset using different model architecture variants and present the performance results.
- Removing the hyperparameters in optimization algorithms of neural networks by trying to learn these hyperparameters at each step of the iteration.
- Using RNN whose input is the optimization algorithm's input, by inputting this RNN with all current standard optimization algorithm's input together with a goal to learn over these depending on the current position in function space.

Tags prediction for Stack Overflow questions using linear CRF *Mar'17-May'17*

- Using the idea of cascading, initial predicted tags are used as features for later predictions.
- Information present in body of post and code information if provided are treated differently. These two changes gave the best accuracy so far present on this dataset.
- Features considered here include user details, question information, time posted etc.

Heart Disease Prediction Using Graphical Models *Mar'17-Apr'17*

- Modeled and implemented Bayesian Networks using various factors that could affect heart disease.
- Implemented maximum likelihood learning from scratch and achieved 81% accuracy

Disease candidate gene identification and prioritization Feb'15 - Apr'15

- Disease Gene prioritization using HITS and Page Rank.
- Comparing and analyzing this with results of standard techniques like Toppgene and ENDEAVOUR.

Mini Projects

- Created a model based on General Full Factorial, and analyzed average download speeds of files in DC++.
- Implemented mini search engine which search for a phrase in large number of text file in order of length of phrase.
- Developed a compiler for a subset of C-like programming Language (LL1 grammar) using tools like flex and bison
- Built database application for hospital management.
- Implemented Z buffer algorithm to remove hidden surfaces for set of cubes, Sutherland-Hodgeman Polygon Clipping algorithm, scan filling algorithm.

PUBLICATIONS

- OpiTrack: A Wearable-based Clinical Opioid Use Tracker with Temporal Convolutional Attention Networks
  ***Gullapalli, B.T.**, Stephanie, C., Brittany, P.C., Ganesan, D., Jan, S. and Rahman, T.* **UBICOMP 2021**
- Joint prediction of cocaine craving and euphoria using structured prediction energy networks
  ***Gullapalli, B.T.**, A., Angarita, R.T., Ganesan, D. and Rahman, T.* **MOBISYS 2021 WORKSHOP**
- On-body Sensing of Cocaine Craving, Euphoria and Drug-Seeking Behavior Using Cardiac and Respiratory Signals
  ***Gullapalli, B.T.**, Natarajan, A., Angarita, G.A., Malison, R.T., Ganesan, D. and Rahman, T.* **UBICOMP 2019**
- A new hierarchical clustering algorithm to identify non-overlapping like-minded communities
  Deepak, T.S., Adhya, H., Kejriwal, S., ***Gullapalli, B.*** *and Shannigrahi, S.* **HT 16**

WORK EXPERIENCE

Software Engineer Jul'15 - Nov'16
Samsung R&D Institute, Bangalore, India
Worked in Video Editor Team of Samsung camera. Primary work was in the applications-Video Editor(Pro/Lite), Highlight player, Slow Motion. Developed and implemented theme mode in Video Editor Pro, which helps the user create stories (Available from S8 device onwards). Developed a camera-based application that uses different composition tools to aid the user in taking good pictures.

Intern May'14 - Jul'14
Samsung R&D Institute, Bangalore, India
Developed a simulation of OLSR (Optimized Link State Routing) Protocol for Tizen OS. Added APIs which extended the functionalities of the network

TECHNOLOGY SKILLS

Languages: C, C++, Python, Java, Assembly, SQL, Prolog, LaTeX.
Packages used: Numpy, PyTorch, Scipy, Theano

ACHIEVEMENTS

- Accepted to Yale's Innovation to Impact program
- My work on opioids has contributed to National science foundation (NSF) smart and connected health grant ($1.1 Million) in 2021 titled *"Collaborative Research: SCH: Psychophysiological sensing to enhance mindfulness-based interventions for self-regulation of opioid cravings"*
- Received Spot Award in Samsung R&D Institute Bangalore for providing good solutions and for coding skills
- Won first prize in an tech-fair at Samsung R&D Institute Bangalore
- Listed among top 0.3% students of 0.5 million appearing in Joint Entrance Exam, IIT-JEE 2011
- Secured 961 rank in All India Engineering Entrance Exam (AIEEE) 2011 taken by 1.2 million people.

COURSES

Theory: Machine Learning Theory, Optimization, Structural Complexity, Theory of computation, Discrete Maths, Data Structures, Algorithms, Probability and Random Processes, .

Systems: Digital Design, Computer Organization and Architecture, Operating Systems,Compilers , Databases , Computer Graphics, Multimedia Systems.

Artificial Intelligence: Artificial Intelligence, Machine Learning, Advanced Natural Language Processing, Probabilistic Graphical Models, Computational Biology, Data Mining .

Labs: Databases, Compilers, Networks, Peripherals, System Software, Software Engineering, Systems Programming, Hardware.