Vikram Ramavarapu

Github: [Github Link](#)   vikramr2@illinois.edu
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Interests: Graph/network analysis, High-performance computing, Bioinformatics, Social networks, Machine learning

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Education

University of Illinois at Urbana-Champaign   Aug. 2024 – Present
PhD. Computer Science   *Champaign, IL*

University of Illinois at Urbana-Champaign   Aug. 2022 – Aug 2024
MS. Bioinformatics   *Champaign, IL*
- **Relevant Course Work**: Bioinformatics, Algorithmic Genomic Biology, Applied Parallel Computing, Machine Learning
- **Focus:** Bioinformatics

University of Illinois at Urbana-Champaign   Aug. 2019 – May 2022
BS. Mathematics and Computer Science   *Champaign, IL*
- **Graduated with High Distinction**
- **Relevant Course Work**: Algorithms, Deep Learning, Web Programming, Database Systems, Numerical Analysis, Partial Differential Equations, Graph Theory, Real Analysis

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Professional Experience

National Institute of Informatics   Mar. 2024 – Jul. 2024
Research Intern   *Tokyo, Japan*
- Graph data mining of citation networks in open science.
- Graph clustering algorithms to examine patterns and community structure in cross-lingual citations. Moreover, to understand how cross-lingual citation can divide a citation network into communities.
- **Network Analysis, Graph Clustering, Python: Multiprocessing, Networkit/NetworkX**

Uhnder Inc.   Apr. 2022 – Jan. 2023
Research and Development Intern   *Champaign, IL*
- Graphical simulation and frame generation of vehicle camera/radar footage. **CARLA (Unreal Engine)/Python/C++**
- Parallel Radar Image processing. Noise removal and image compression sped up from non-parallel implementation by a factor of >100x. **CUDA**
- Object detection for self driving cars: Trained **2D U-Net** on 2D rectangular projections of spherical radar data (r, theta, phi) to perform **Semantic Segmentation**. Improved mean IoU by 30% since initial segmentation model's implementation. **Gitlab, Python: Pytorch/MMSegmentation, AWS S3**
- Built methods to validate effectiveness of various self driving car simulator versions: Created methods that used **Wasserstein Distance (EMD)** to compare simulated and real radar images, as well as older and newer simulator generated images. **C++: Catch2**

HBO Max (Warner Bros. Discovery)   Jan. 2022 – Apr. 2022
SWE Intern – Data   *Culver City, CA*
- Designed, implemented and productionalized method to identify potential international pricing abusers of the streaming service. **SQL/Python**
- Built a scheme to auto-generate the list using an orchestrator **Airflow, Snowflake**

Exelon   Aug. 2021 – Dec. 2021
SWE Co-Op   *Chicago, IL*
- Built an application to run statistical analysis of simulations based on the reactor design. **Python: Tkinter/Matplotlib/Pandas**
- Reduced analysis time from a week's worth of manual effort to about an hour for over 99% improvement in work efficiency.

Inprentus   Jun. 2018 – May 2019
Research and Development Intern   *Champaign, IL*
- Built an application to automatically generate precise statistical product reports from Atomic Force Microscopy (AFM) images of diffraction gratings. Recipients of these reports included NASA and SLAC (Stanford). **Python: Matplotlib/PyGTK**
- Created macros to identify components of Scanning Electron Microscope (SEM) images of indentation tools. **ImageJ, Java**
- Developed material indentation simulations of the mechanical ruling process in manufacturing of diffraction gratings. **Mathematica**

Publications

CM++ - A Meta-method for Well-Connected Community Detection
Vikram Ramavarapu, Fábio Jose Ayres, Minhyuk Park, Vidya Kamath Pailodi, João Alfredo Cardoso Lamy, Tandy Warnow, and George Chacko (2024)
Journal of Open Source Software (JOSS) (Link)

Well-Connected Communities in Real-World and Synthetic Networks
Minhyuk Park, Yasamin Tabatabaee*, **Vikram Ramavarapu***, Baqiao Liu, Vidya Kamath Pailodi, Rajiv Ramachandran, Dmitriy Korobskiy, Fabio Ayres, George Chacko, Tandy Warnow (2023)*
Proceedings in COMPLEX Networks 2023. Accepted, PLoS Complex Systems. (*) These authors contributed equally as first authors (Link)

A Smart Power Outlet for Electric Devices that can Benefit from Real-Time Pricing
V.P. Ramavarapu, R. Sreenivas, R. Sowers (2017)
Conference article in The Proceedings of the 2017 International Conference on Control, Electronics, Renewable Energy and Communications (ICCEREC). Published at IEEE (Link)

Conference Presentations

Exploration of Multi-Lingual Community Structure in Scholarly Articles
Vikram Ramavarapu, Chifumi Nishioka (2024)
To be presented at the IEEE/ACM Joint Conference on Digital Libraries (JCDL) 2024 Conference in Hong Kong.

Work Featured in Workshops

Inferring Migration Histories of Metastatic Cancers
*Mrinmoy Roddur, **Vikram Ramavarapu**, Mohammed El-Kebir (2023)*
Talk given by Prof. Mohammed El-Kebir at the BIRS Workshop: Mathematical Methods in Cancer Biology, Evolution and Therapy (Link)

Software

MACH2/MACH2-Viz (MACH2 Repository), (Visualizer Application)
- MACH2 is a follow up on MACHINA to infer migration history of metastatic cancers. The visualizer is backwards compatible with MACHINA. **React, CSS, Cytoscape, Python: Flask**
- Researchers using this software can upload data and navigate and filter through the solution space of inferred migration histories.

CM++/CM Pipeline (Repository)
- Parallel meta-method for generating well-connected (high minimum cut) network clusters. **C++, Shell, Python: Multiprocessing, Networkit**
- Pipeline software for community detection, having stages for clustering, computing communnity statistics, CM++, and filtration by size

Recent Research Experience

Metastatic Cancer Migration Inference and Visualization, Department of Computer Science Jan. 2023 – Present
Independent Study, University of Illinois at Urbana-Champaign Urbana, IL
- PI: Prof. Mohammed El-Kebir
- Visualization of cancer migration history given input clonal histories. **Javascript: React/Express, HTML/CSS, Python: Flask**
- Extensible application to explore the solution space of the parsimonious migration history inference problem. **Graph Theory, Tree Inference**

Scientometrics and Network Science, Department of Computer Science Jan. 2023 – Present
Graduate Research Assistant, University of Illinois at Urbana-Champaign Urbana, IL
- PIs: Prof. George Chacko, Prof. Tandy Warnow
- Graph-theoretic clustering of research citation networks to understand the structure and development of scientific communities. **Python, C/C++**
- High performance computing to run clustering algorithms in parallel. **HPC, Python: Multiprocessing, Networkit/NetworkX**
- Developed a multi-purpose community detection pipeline package to run graph analytics and clustering, as well as a meta-method for well-connected communtiy detection.
- Analysis of a multi-dimensional framework to assess breadth and depth of publication impact. **Python: Pandas, Networkit/NetworkX, Jupyter Notebook**

Cyclicity Analysis on COVID19 in North America, Department of Mathematics Jul. 2021 – May 2022
Independent Study, University of Illinois at Urbana-Champaign Urbana, IL
- PI: Prof. Yuliy Baryshnikov
- Cyclicity analysis is the technique of aggregating regional linear time series to map spread of a signal over a medium. (Traditionally in neuroscience to map the spread of trauma during a brain injury).
- Using American and Canadian provincial COVID case time series, spread is mapped across North America. **Python: Pandas/Matplotlib/Jupyter Notebook**