

SAMARTH (SAM) RAWAL

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M.D. student with a research background in the application of Artificial Intelligence (AI) to healthcare. Aiming to pursue a career in medicine while shaping and contributing to the profound technological changes coming to the healthcare industry to improve lives and the state of public health.

EDUCATION

- **MD Candidate, Carle Illinois College of Medicine, University of Illinois at Urbana-Champaign**
 - Expected Graduation: May 2024
- **MS in Computer Science with concentration in Biomedical Informatics, Arizona State University**
 - Graduated: May 2020, GPA: 4.0/4.0
 - Thesis: *Multi-Perspective Semantic Information Retrieval in the Biomedical Domain* [<https://arxiv.org/abs/2008.01526>]
- **BS in Computer Science, Arizona State University**
 - Graduated: May 2018, GPA: 4.0/4.0
 - Honors Thesis: *Prescription Information Extraction from Electronic Health Records using BiLSTM-CRF and Word Embeddings* [<https://repository.asu.edu/items/48493>]

PROFESSIONAL EXPERIENCE

Varatharajah Lab at UIUC (Natural Language Processing in Medical Records Research) Dec 2020 – Present

- Overarching goal:
 - *Make **information deep within patient medical records more easily accessible and actionable** by applying Artificial Intelligence-based techniques to EMRs in order to **answer clinical questions, intelligently filter and sort data, and automatically generate reports.***
- In addition to research papers, have **published open-source Clinical AI software packages and models** which have been **downloaded over 50,000 times** in the past 2 years
- Notable works from lab include **IEEE Signal Processing in Medicine and Biology Best Paper award** and collaborations with several medical institutions such as Mayo Clinic and Barrow Neurological Institute towards **building applied AI software to improve clinical workflow**

“Artificial Intelligence in Medicine” Certificate Continuing Medical Education Course Dec 2020 – Sept 2021

- **Developed lectures** for course in the UIUC Department of Bioengineering – the course provides a technical overview of Machine Learning and Artificial Intelligence techniques and their application to clinical domain
- Led initiative for **incorporating Teaching Assistants into course** and served as first TA; helped first batch of students through completion of the course
- This class serves as a **Continuing Medical Education (CME) course** for physicians and healthcare workers

Cognition and Intelligence Lab at ASU (Natural Language Processing Research) Jan. 2015 – July 2020

- The overarching theme of my research under Dr. Chitta Baral was to **leverage Natural Language Processing across biomedical & clinical data** (like Electronic Medical Records) to make actionable decisions that **improve efficiency of healthcare delivery**
- **ASU team leader for several Clinical NLP Challenges**, including **Harvard National NLP Clinical Challenge (n2c2)**; team placed **#1 out of 47 teams** in n2c2 2018 Track 1 Challenge
- **Led Clinical NLP Graduate Engineering projects** – guided about 20 Computer Science MS and PhD students from ideation to completion of academic NLP research projects in the clinical domain
- Collaborated with institutions such as Mayo Clinic and King’s College Hospital in London to **design and integrate AI systems** into data and documentation pipelines

Center for Innovation AI Researcher at Mayo Clinic, Rochester, MN, USA July 2018 – June 2020

- Integration of **AI-powered system to assist Mayo Clinic Oncology department workflows** that brings creation time of Cancer Survivorship Care Plan documents by nurses down from ~1 hour to a couple of minutes.
- Worked with oncologists at the Mayo Clinic to develop a system that **automatically extracts data** from various locations in Electronic Medical Records to **auto-generate patient reports** using Natural Language Processing techniques, something that is currently done completely manually by nurses.

- Developed GeneData, a sophisticated Virtual Reality data visualization program to help doctors clearly and intuitively visualize large amounts of patient genomic information during cancer treatments.
- Tool used by ASU Biomedical Informatics Department as a demonstration of clinical technology in BMI courses

Software Architecture Intern at Dell CTO Office, Austin, TX**May 2017 – Aug 2017**

- Worked in the Office of the Chief Technology Officer (CTO) on developing consumer technology 2-5 years from commercial deployment
- Developed software for voice assistants like Amazon Alexa to help users communicate with their PCs intuitively
- Presented work to a board of Dell technical and executive management, including the **Chief Technology Officer (CTO)**

SELECTED PUBLICATIONS & PRESENTATIONS

Full publication list on [Google Scholar](#).

- **SCORE-IT: A Machine Learning Framework for Automatic Standardization of EEG Reports.** [S. Rawal](#), Y. Varatharajah. 2021 IEEE Signal Processing in Medicine and Biology Symposium (SPMB) – **Best Paper Award**
- **Evaluating Latent Space Robustness and Uncertainty of EEG-ML Models under Realistic Distribution Shifts.** N. Wagh, J. Wei, [S. Rawal](#), B. Berry, Y. Varatharajah. NeurIPS 2022.
- **Domain-guided Self-supervision of EEG Data Improves Downstream Classification Performance and Generalizability** N. Wagh, J. Wei, [S. Rawal](#), et. al. Machine Learning for Health 2021.
- **Tensor Decomposition of Large-scale Clinical EEGs Reveals Interpretable Patterns of Brain Physiology.** T. Gupta, N. Wagh, [S. Rawal](#), B. Berry, G. Worrell, Y. Varatharajah. Accepted to 11th International IEEE EMBS Conference on Neural Engineering (NER'23)
- **Novel evidence synthesis system to support living systematic reviews and living guidelines for cancer immunotherapy.** IB. Riaz, [S. Rawal](#), R. Siddiqi, et. al. Journal of Clinical Oncology, 2020.
- **Semi-automated clinical lexicon induction and its use in cohort selection from clinical notes.** [S. Rawal](#), A. Prakash, S. Adhya, S. Kulkarni, S. Anwar, C. Baral, M. Devarakonda. 2020 IEEE International Conference on Healthcare Informatics (ICHI).
- **Identification of Adverse Drug Reaction Mentions in Tweets–SMM4H Shared Task 2019.** [S. Rawal](#), S. Rawal, S. Anwar, & C. Baral. Proceedings of the Fourth Social Media Mining for Health Applications Workshop. 2019.
- **Selected Posters and Presentations:**
 - **SCORE-IT: A Machine Learning Framework for Automatic Standardization of EEG Reports – Carle Illinois College of Medicine Research Day, 2021.** [S. Rawal](#), Y. Varatharajah.
 - **Semantic Search of Medical Records – Carle Illinois College of Medicine IDEA Course, 2022.** [Samarth Rawal](#); Abigail Adams, MD; April Yasunaga, MD; Ujjal Mukherjee, PhD.
 - **Semi-automated clinical lexicon induction and its use in cohort selection from clinical notes – Phoenix Symposium on Data Analytics in Healthcare at University of Arizona School of Medicine, 2019.** [S. Rawal](#) et al.
 - **Uncovering insights about effective palliative care via Machine Learning methodology applied to city-level data – PLuS Alliance Symposium at King’s College Hospital, London, UK, 2019.** [S. Rawal](#), A. Mitra, C. Baral.

HOBBIES & PROJECTS

- **Hindustani Classical Music (2003 – Present) – Vocal and Tabla**
 - **Visharad Degree (equivalent to Bachelor’s Degree) in Hindustani Classical Vocal Music** - Awarded by the Indian Institute of Classical Music, following 10 years of intensive training and performances in classical vocal music
 - **Accomplished player of Tabla (North Indian drum instrument)** – accompanied various artists in 20+ public performances over the past ten years. Studied Tabla for 13 years under a senior disciple of Ustad Alla Rakha, one of the most revered, eminent Tabla artists of all time.
 - Have given over 30 Indian classical and light vocal and instrumental public performances over the past 10 years
- **Software Engineering and Artificial Intelligence Projects**
 - Designed, architected, and developed Raag Database, an Android application for categorizing and accessing technical information about components of Indian classical music, with over 30,000 downloads.

- Currently develop open-source software for building clinical Natural Language Processing data pipelines as well as broader deep learning projects, with over **300 stars on GitHub** and **50,000 downloads on HuggingFace Model Hub**. Projects available at <https://github.com/samrawal>.

AWARDS AND ACHIEVEMENTS

- **Best Paper Award at 2021 IEEE Signal Processing in Medicine and Biology Symposium (SPMB)**
 - Best Paper out of 35 accepted and presented papers
 - *SCORE-IT: A Machine Learning Framework for Automatic Standardization of EEG Reports*. S Rawal, Y Varatharajah. 2021 IEEE Signal Processing in Medicine and Biology Symposium (SPMB).
- **#1 in Harvard National NLP Clinical Challenge (n2c2) out of 47 teams total**
 - ASU team leader for n2c2 2018 Track 1 competition
 - Built a system to flag potential patients for 13 different clinical trials based off their clinical records with over 90% accuracy
- **#1 at Clinton Global Initiative University (CGI-U) 2017 Codeathon**
 - Ideated and developed Patient Record Access Network (PRAN), a low-cost hardware and software package to address the issue of lack of reliable patient identification methods in rural India.
- **Arizona State University Dean's List:** Fall 2014 – Spring 2018 (8 semesters); graduated Summa Cum Laude (B.S.)

INSTRUCTOR AND TA EXPERIENCE

- **Course Development & Teaching Assistant; AI in Medicine Certificate CME Course, UIUC** (Summ 2021 – Spr 2021)
 - Helped create lectures and served as TA for course with UIUC Dept of Bioengineering that served as a Continuing Medical Education (CME) course for physicians and healthcare workers
- **Instructor for FSE 100 – Introduction to Engineering** undergraduate course at ASU (Fall 2018 – Fall 2020)
 - Responsible for creating and presenting weekly lectures and running weekly labs, as well as student grading
- **Teaching Assistant for CSE 576 – Natural Language Processing** graduate course at ASU (Fall 2018 – Spring 2020)
 - Responsible for developing class projects and working with student teams throughout the project, along with grading
- **Math Tutor** at ASU's University Academic Success Programs (UASP) (2015-2016)
 - Worked at the largest math tutoring center among ASU campuses and focused on helping students on a variety of math courses, ranging from Calculus to Discrete Math to Applied Linear Algebra

CLINICAL VOLUNTEERING & EXPERIENCE

- **CORE Institute** (2019-2020): Volunteered at the MORE Foundation Helping Hands program at the CORE Institute (an orthopedic institute), a nonprofit dedicated to working with young patients with hand developmental issues. Took patient limb measurements and designing prosthetics via 3D printing to get patients acclimated to use of prosthetics in adulthood