Stanford

Sharada Kalanidhi

Director of Data Science, Biochemistry - Genome Center

Bio

BIO

Sharada Kalanidhi is Director of Data Science at Stanford Genome Technology Center, SGTC (Dept of Biochemistry), Stanford University School of Medicine. Prior to this role, she worked in industry for 20+ years in roles involving quantitative strategy, data science and statistics. Her experiences shape her multi-disciplinary outlook and approach.

A decade of her experience was in the bond markets, where she developed trading and portfolio strategies on interest rate derivatives and mortgage portfolios. When a family member developed symptoms of unexplained fatigue, she became drawn to biostatistical problems. She assisted researchers at SGTC with data science and statistical analysis on ME/CFS patients, and finally joined them full-time. Her recent research has involved multivariate and machine learning analysis of the genomics, proteomics and metabolomics underlying ME/CFS, and post-viral fatigue (such as long Covid.) Her research interests are biological and chemical intersections with (pure) mathematics. She is an inventor on several granted US patents.

CURRENT ROLE AT STANFORD

Paraphrasing the mathematician Alexander Grothendieck: the essential thing is to pose problems in the right framework.

Sharada is developing a new field, Mathematical Medicine, which applies pure mathematical frameworks to genomic and multi-omic data for quantitative, personalized diagnosis. This approach explores alternatives to prevailing cohort-based statistical paradigms, particularly in complex clinical cases that have resisted standard methods.

After more than a decade of research and close collaboration with biochemists at the Stanford Genome Technology Center (Dept. of Biochemistry), Sharada concluded that the mathematics currently used for multi-omic diagnosis is inadequate for the level of biological and clinical complexity being attempted. Her conclusion echoes the perspective of the mathematician Mikhail Gromov: “This area does not yet exist. It will have to be invented.” Mathematical Medicine represents one possible construction of such an area. This approach is aligned in spirit with the philosophy of the late mathematician Jim Simons: "We don't start with models. We start with data. We don't have any preconceived notions." Mathematical Medicine lets the data speak for itself.

This field is focused on the development of an intermediate translation layer between cohort-based statistical models and individualized multi-omic diagnosis and clinical decision-making. Without this mathematical layer, the clinical adoption of multi-omic data- particularly for complex cases- has been limited. As a result, many complex, multi-system conditions remain undiagnosed or misdiagnosed for long periods, delaying effective treatment and, in

some cases, allowing disease processes to worsen. Additionally, what is learned from rare and extreme cases proves highly informative for the rest of the population.

Further information on this field, including opportunities for early philanthropic partnerships, is available at: https://mathmed-2026.web.app/

PATENTS

- "United States Patent 8996510 Identifying digital content using bioresponse data", Mar 31, 2015
- "United States Patent 8719278 Method and system of scoring documents based on attributes obtained from a digital document by eye-tracking data analysis", May 6, 2014
- "United States Patent 8509826 Biosensor measurements included in the association of context data with a text message", Aug 13, 2013

LINKS

- Mathematical Medicine: https://mathmed-2026.web.app/

Publications

PUBLICATIONS

- **Immunoglobulin G complexes from post-infectious ME/CFS, including post-COVID ME/CFS disrupt cellular energetics and alter inflammatory marker secretion.** *Brain, behavior, & immunity - health*
  Liu, Z., Hollmann, C., Kalanidhi, S., Lamer, S., Schlosser, A., Basens, E. E., Nikolayshvili, G., Sokolovska, L., Riemekasten, G., Rust, R., Bellmann-Strobl, J., Paul, F., Naviaux, et al
  2026; 52: 101187

- **Increased circulating fibronectin, depletion of natural IgM and heightened EBV, HSV-1 reactivation in ME/CFS and long COVID.** *medRxiv : the preprint server for health sciences*
  Liu, Z., Hollmann, C., Kalanidhi, S., Grothey, A., Keating, S., Mena-Palomo, I., Lamer, S., Schlosser, A., Kaiping, A., Scheller, C., Sotzny, F., Horn, A., Nürnberger, et al
  2023

- **Off label use of Aripiprazole shows promise as a treatment for Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS): a retrospective study of 101 patients treated with a low dose of Aripiprazole.** *Journal of translational medicine*
  Crosby, L. D., Kalanidhi, S., Bonilla, A., Subramanian, A., Ballon, J. S., Bonilla, H.
  2021; 19 (1): 50