“Causarum Cognitio: From Khoarsan to Califronia (via Cordova)”

Bud Mishra
Prof of CS and Math, Courant Inst.

The dream of a powerful inductive inferential framework, only hinted at in Ibn Sina's Canon, can now be fulfilled at a global scale as a result of many recent advances: foundational advances in statistical inference; hypothesis-driven experiment design and analysis; distributed large-scale databases of scientific and auxiliary experimental data; algorithmic approaches to model building and model checking; machine learning approaches to generate large number of hypotheses, and multiple hypotheses testing to tame computational complexity and false-discovery rates, etc. More specifically, in the area of biomedical sciences, there has been an explosion of new technological advances: genomics, transcriptomics and proteomics; web interfaces allowing patients to keep personal logs; genome-wide association studies; detailed analyses of hereditary, genetic and ancestral history of patients' genomes; construction of phenomenological models of disease initiation and progression; type-level and token-level analysis of the causal bases of human diseases; translational systems biology for biochemical explanations of diseases; and the accessible integration of these capabilities into a multi-faceted system with specific attention to the ethical use of medical data, patient privacy, powerful hardware and software infrastructure and cognitive consonance with biomedical scientists, physicians and care-givers. We will focus on an application centered on cancer - "the emperor of all maladies."

Professor Bud Mishra is a professor of computer science and mathematics at NYU's Courant Institute of Mathematical Sciences, professor of engineering at NYU’s Tandon School of engineering, professor of human genetics at Mt. Sinai School of Medicine, visiting scholar at Cold Spring Harbor Laboratory and a professor of cell biology at NYU School of Medicine. He founded the NYU/Courant Bioinformatics Group, a multi-disciplinary group working on research at the interface of computer science, applied mathematics, biology, biomedicine and bio/nanotechnologies. Prof. Mishra has a degree in Science from Utkal University, in Electronics and Communication Engineering from IIT, Kharagpur, and MS and PhD degrees in Computer Science from Carnegie-Mellon University. He has industrial experience in Computer and Data Science (ATTAP, brainiad, Genesis Media,

Pypestream, and Tartan Laboratories), Finance (Instadat, PRF, LLC, and Tudor Investment), Robotics and Bio- and Nanotechnologies (Abraxis, Bioarrays, InSilico, MRTech, OpGen and Seqster). He is the author of a textbook on algorithmic algebra and more than two hundred archived publications. He has advised and mentored more than 35 graduate students and post-docs in the areas of computer science, robotics and control engineering, applied mathematics, finance, biology and medicine. He holds 21 issued and 23 pending patents in areas ranging over robotics, model checking, intrusion detection, cyber security, emergency response, disaster management, data analysis, biotechnology, nanotechnology, genome mapping and sequencing, mutation calling, cancer biology, fintech, adtech, internet architecture and linguistics. His pioneering work includes: first application of model checking to hardware verification; first robotics technologies for grasping, reactive grippers and work holding; first single molecule genotype/haplotype mapping technology (Optical Mapping); first analysis of copy number variants with a segmentation algorithm, first whole-genome haplotype assembly technology (SUTTA), first clinical-genomic variant/base calling technology (TotalRecaller), and current work in progress continuing in the areas of liquid biopsies, cancer data, cyber security, cryptography, financial engineering and internet of the future. He is a fellow of IEEE, ACM and AAAS, a Distinguished Alumnus of IIT-Kgp, and a NYSTAR Distinguished Professor.