# Md. Sanaul Haque Shanto

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**GoodReads** : Md. Sanaul Haque Shanto
**Portfolio**: https://md-sanaul-haque-shanto.github.io/
**Python Package**: https://pypi.org/user/mdshs.shanto/

Enthusiastic about STEM education, Bio Engineering; emphasizing on the computer vision and bio-conductors with a strong passion for solving real-world problems of the combination of Computer, Electrical, and Neuro Science.

## Education:

2021 **Birshreshtha Munshi Abdur Rouf Public College**
Higher Secondary School Certificate / A Level.
GPA: 5 out of 5. [Unweighted]

2018 **Rajshahi Government Laboratory High School.**
Secondary School Certificate / O Level.
GPA: 5 out of 5. [Unweighted]

2015 **Rajshahi Government Laboratory High School.**
Junior School Certificate.
GPA: 5 out of 5. [Unweighted]

## Assessment Test:

2021 **SAT.** [Reading & Writing: 740, Math: 780]
1520 out of 1600.

**Duolingo English Test.**
Overall 135 out of 160.

**TOEFL**
Overall 105 out of 120.

## Accepted University List:

2024 **University of Wisconsin Madison Biomedical Engineering.**
**Drexel University EEE,**
**Rochester Institute of Technology Neuroscience**
**Clark University CS**

2023 **St. John's University CS**
**Ohio Dominican University CS**
**NSU Florida CS**
I got interviewed by **Dartmouth, Duke**, **Princeton**, and **New York University.**
Waitlisted by **Brown University, Amherst College**, and **Duke.**

### Russia:

**Moscow Institute of Physics and Technology**

### India ICCR Scholar:

**National Institute of Technology, Rourkela**
**National Institute of Technology, Silchar**

**Indian Institute of Science and Education, Kolkata**
**Indian Institute of Science and Education, Bangalore**

## AP Courses:

2020-21 AP Geography - Alizé Carrère; AP Chemistry - Deboki Chakravarti; AP World Mythology - Mike Rugnetta; AP World History - John Green; AP Psychology – Hank Green; AP Sociology - Nicole Sweeney; AP Physics - Dr. Shini Somara; AP Astronomy - Phil Plait; AP Biology – Hank Green & Dr. Rae Wynn-Grant; AP Anatomy & Physiology – Hank Green; AP Ecology – Hank Green; AP Statistics – Adriene Hill; AP Literature – John Green; AP US History - John Green; Big History - John Green, Hank Green, and Emily Graslie; US Government & Politics - Craig Benzine; Business Entrepreneurship - Anna Akana; Intellectual Property - Stan Muller.[Covid-Extra Courses] [2]

## Honors & Awards:

2023 **Silver Medalist** at **International Medicine and Disease Olympiad**. Score **85** out of **100**. (Result Link)
**Gold Medalist** at **US Medicine and Diseases Olympiad**. Score **141** out of **160**. (Result Link)
**Runner Up** at the **Advocate Abdus Salam Tennis Tournament 2023**.

2022 Nominated for Princeton **Tiger Entrepreneur Award 2022** for "**TigerShell**" Project. [3]

2021 Best **judge/Problem Setter** in Programming Contest at **Boson Biggan Songho**. [4]

2019 **2nd** on IUBAT CSE FEST Programming Contest.

2018 **Bronze Medalist**, DUGC_N00bs, NDITC Onsite ICPC Style Programming Contest.[Event Link]

**16th** on Ada Lovelace Programming Contest.

**3rd** on National ICT Day Programming Contest.

**3rd** on Rajshahi College Science Fair Programming Contest.

**YESIST SS12** – Make Fair 2018 Myanmar **ranked 12th Global** .

2017 **15th** on National ICT Day Programming Contest.

**8th** on National High School Programming Contest Regional.

2016 **5th** on National High School Programming Contest Regional.

**3rd** on Rajshahi College Science Fair Programming Contest.

**2nd** on Rajshahi Science Fair 36 (Project Fair: Zero-Cost 3D Hologram for Laboratory Use). [5]

RGLHS Intramural **Debate Champion**. [6]

2015 **Awadee** Bangladesh Scout.

## Grants:

2019 **ICT Division of Bangladesh Innovation** Awards ($5,000) for "**Contest for all**" project.

2016 RGLHS Intramural **Debate Champion** Awards ($100).

**2nd** On Rajshahi Science Fair 36 Awards ($100) for "3D Hologram".

## Work Experience:

2023

Material Science Researcher at Informatics Skunkworks University of Wisconsin-Madison (Under Professor Benjamin Afflerbach)

Machine Learning Researcher intern at Younger's Research Lab, at RUET.( Under Md. Azmain Yakin Srizon)

Research Intern at MBPSL, Rajshahi University. (Under Professor Md Abu Reza)
Neuroscience Researcher working on a research project at Neurogram.

Research Summer Internship (Machine Learning & Computational Biology) at International Youth Research Institute.

Business Research Summer Internship at Youth Journal.

**Spring 2023 internship at, Neuroscience Foundation (Develop local Traumatic Brain Injury Book, Split gadgets and advice Mobile Clinics for proper advice). [Remote through Bangladesh].**
**Link:** https://www.neurosciencefoundation.org/meet-the-team

**(Intern) at Weill Cornell Medicine, Cornell University. [Remote].**
**References:** Susana Morales, MD, srm2001@med.cornell.edu
Lynne Holden, MD, Holden@medicalmentor.org

2022 Junior Scientist, Wit Laboratory (Develop PCB, Case, and Python based Package). [7]

Clinical Pathology (Intern), Life Sine Lab. Rajshahi, Bangladesh. [8]
Member & Researcher, International Neuroethics Society.

Member & Researcher, The New York Academy Of Science.

President at Bangladesh Chapter, International Youth Neuroscience Association.

2020-21 Android Application Developer, Xstreams.live. Delhi, India. [Remote].

2019-present Host, Bangladesh Economics Olympiad (1 week of work per year) [9]
The Bangladesh Economics Olympiad is being hosted by ArenaBoard. ArenaBoard's elite Olympiad performance is a significant accomplishment for Bangladesh.

2019-21 Software Engineer, Protijog.com , ICT Division of Bangladesh Project. [Remote] [10]

2019 **Website Developer at Orlabs.org** (Collaboration on my junior high alumni website). Rajshahi, Bangladesh.

## Researches:

2023 **International Youth Research Institute:**
**Computational Biology:** (**Paper Submitted**)
**Research Title:** Identification of Gene Expression Changes of Colon Epithelial Biopsies from Ulcerative Colitis patients and Healthy control donors.
**Independent Research.**

**Machine Learning:** (**Paper Submitted**)
**Research Title:** Deep Convolutional Neural Network Classification of Brain Tumors Using VGG16.
**Independent Research.**

**Neurogram: (Paper Submitted)**
**Research question:** How do the subjective perceptions of quality of life among individuals with ADHD align with objective measurements of grade achievement and subjective measurements of academic satisfaction?

**Co-Authors**: Florence Diana, and Angeliki Giorgalli.
**Research Mentor:** Sreeja Roy.

**Youth Journal: (Paper Submitted)**
**Research Title:** Assessing Customer Choices for Herbal and Synthetic Skin Care Products based on Advantages.

**Co-Authors**: Aruzhan Tulepbergen.
**Research Mentor:** Salma Shakir Elgendy.

2022 **The New York Academy Of Science.**
Global STEM Alliance. New York, USA.
Profile: https://joinlaunchpad.com/#/profile/16816

Recent Research: HAWA- Game of Gases (Using Futuristic Mechanism to Absorb Flue Gasses)
I design the **Brain of Hawa** - Driving components the mechanics to functional electrical circuit integration using HDL Verilog with microcontroller, wiring, fan, capacitor, sensors, and relay.

Post Research : Flexible use of electricity .
I did the technical solution part of the WEB integration with the mathematical model. We named it **PVsOenix**. Recently, selected **for DoE Emerging Tech Studio-FedTech Call to Entrepreneurs 2022 at U.S. Department of Energy, Washington D.C. and Queens Common Wealth Awards.**

**MIT Solve.**
Research Topic: Improvement of primary health care performance in low- and middle-income countries.

**Project Paper.**

[1]Md Sanaul Haque Shanto, “Internship in Clinical Pathology”. Zenodo, Oct. 02, 2023. doi: 10.5281/zenodo.8398279.

[2]Md Sanaul Haque Shanto, “Compiler Design Using Flex & Bison”. Zenodo, Sep. 19, 2023. doi: 10.5281/zenodo.8360362.

**Journal Paper.**

[1]S. Md Sanaul Haque, “Brain Tumor Detection using VGG-16 Convolutional Neural Network (CNN) with Transfer Learning”. Md Sanaul Haque Shanto, Aug. 22, 2023. doi: 10.5281/zenodo.10820737.

[2]M. S. H. Shanto, T. Aruzhanand S. S. Elgendy, “Assessing Customer Choices for Herbal and Synthetic Skin Care Products Based on Advantages”. Youth Science Journal, Jun. 24, 2023. doi: 10.5281/zenodo.10429343.

[3]Md Sanaul Haque Shanto, “Transcriptomics Study of Patients with Pulmonary Fibrosis Identifies Disrupted Cilium Assemblies Associated with the Spread of Pulmonary Fibrosis”. Md Sanaul Haque Shanto, Oct. 23, 2023. doi: 10.5281/zenodo.10032615.

## Projects:

2023 Research/Developed **Youth Research Journal** (yrjournal.org)
**Platform:** PWA.
**Plan:** Conduct Research Workshop and tech student with affordable price, student can submit their research paper to YRJ Journal Platform.

2023 Research/Developed **WitLab** (https://github.com/WitLaboratory/witlab)
**Platform: Developed A Python simulation framework for easy whole-brain neural mass modeling.**
**Python Package:** https://pypi.org/project/witlab/

2022 Research/Developed TigerCite (Extension for citing websites in various formats)
**Platform**: Extension for Chrome and Firefox.
**Plan**: University uses third-party services for citing and conducting research materials. It’s user-friendly for our browser and saves links as MLA8, IEEE, BibTeX, APA(7th Edition), APA(6th Edition), Chicago, AMA, ASA, ACS, and GSA.

TheOriginator (Combination of Computer Science and Neuroscience)
Platform: Web Application.
Architecture: Embedded System.

**Completed:**

2022 Developer TigerShell (University event Frame Generator).
Platform: Web Application.
Architecture: **Monolithic**.
Technology: **HTML, Javascript, CSS, and PHP**.
**Plan**: Develop cloud based application where anyone can generate Social Network Site posts in one click. Eco and Cloud-based Platform for student Vibe.

2022 Founder & Creator eptOnline AI (English Proficiency Test Practice Application).
Platform: PWA Web Application.
Architecture: **Server-less Software Architecture**.
Technology: **Javascript**, **ml5.js**, **brain.js**, **Tensorflow.js**, **NLP**.
Monthly unique user: 5,000.

2020-21Founder & Creator Partride Lab (Quizzing and Live Streaming Application).

Platform: Web Application, Android, and IOS.
Architecture: **Server-less Software Architecture**.
Technology: **Java**, **Flutter**, **Dart**, **Swift**, **Soup Framework** for **Database**.
**Hypothesis**: Everyone should have access to free education.
User: 50,000+.

2018-20 Founder & Creator [ArenaBoard Online Judge] (Programming, MCQ, Written, Blog, Eco-System).
**2018:**
Platform: Web Application.
Architecture: **Monolithic Software Architecture**.
Technology: **PHP**, **Bash**, **Rational MYSQL Database**.
Compiler Support: C, C++11, PHP, and JAVA.
Users: 5,000.
**2019:**
Platform: Web Application.
Architecture: **Service Oriented Architecture**.
Technology: **GO**, **Bash**, **NO-SQL Database**, **BigQuery**.
Compiler Support: (Sandbox) C, C++11,C++17, PHP, JAVA, Python2.7, Python3.6, and GO.
Users: 26,000.
**Hypothesis**: Learning software architecture, dealing with a large audience, and creating an eco-system.

2016-17 [Rajshahi Government Laboratory High School Application] (School directory, Faculty Details, Course details, Fees, and Call functionality.).

## Hackathons:

2021 Hacktober Fest.
2020 Hacktober Fest.
2019 Hacktober Fest. [11]

## Technology Expertise:

**Software:** Adobe Photoshop, Android Studio, XCode, MS Word, MS Access, Blender, Unity, 3D-Max, MatLab-SimuLink, Autodesk Eagle & Fusion 360, Discovery Studio, PyMol, Avogadro, Cytoscape, SPDBV. [12]

**Knowledge engineering:** Ontologies, Linked Data, Visualization.

**Artificial Intelligence:** Tensorflow, OpenCV, Expertise In Machine Learning and Deep Learning Algorithms (Linear, Logistic Regression,CNNs, and KNN. [13]

**Data Integration:** EHR, Lab and Research Data, Clinical Notes.

**Data Science:** Apache Spark, STATA, Matlab. [14]

**Programming Languages:** Assembly, Bash, C/C++, C#, Dart & Flutter, GO, Java, Javascripts, Linux/Unix/Shell Environment, Python, PHP, R, and Swift. [15]

**Library:** ggplot2, Jupyter Notebook, Matplotlib, NLTK, Scikit-learn, Bio-Python.

**Databases**: GEO, EnsemblGenomes, IMPAAT, NoSQL and SQL e.g., Cassandra, Relational (Mysql, Postgresql, Sqlite), Graph (Neo4j).

**Hardware:** Arduino (iot), Raspberry Pi (iot), PCB, CNC Milling, Soldering. [16]

**Graphical User Interface:** Tkinter, Electron, GTK.

**Hardware Description Language:** System Verilog.

**Version Control:** Gitlab, Github (Workflow).

**Word Processing:** Latex, Mathjax.

**Prototype Design:** Canva, and Figma.

**Research Computing Cluster:** SLURM, Server Clustering using Raspberry Pi.

## Community Service:

Well, I decided to volunteer for the work at that time, mainly because I got bored with my studies and some challenging work, and taking part in that volunteer work provided me with a perfect escape from that. Besides, I love to help needy people, and that volunteer work gave me an ideal opportunity.

2019-21 Technology Head, Baati.org.
2018-21 Regional Head, **Cholo Swpno Chui**.

## My Competitive Skills Profile:

**Bio-Informatics**
2022- Present **ROSALIND**: mdshs.shanto . (Level: $2^6$ Solved: 109)

**Mathematics**
2022- Present **Project-Euler**: mdshs.shanto . (Top 1%).

**Competitive Programming** (Live Contest Profile):

2016-Present **Codeforces**: Md. Sanaul Haque Shanto , Contest rating: **1509** (max. **specialist, 1523**).
2016-Present Toph: Md. Sanaul Haque Shanto.
2016-Present ACM-Timus : Md. Sanaul Haque Shanto.
2016-Present PEG Judge: Md. Sanaul Haque Shanto.
2016-Present URI or Beecrowd Judge: Md. Sanaul Haque Shanto.
2016-Present SPOJ: Md. Sanaul Haque Shanto .

## Publishing:

2022 Life Science Writer at Life Science Blog.
Algorithm Article Writer at My Blog . [17]
2021 Micro-service Prototyping Design, (January 29, 2021), [Link]
2018 Compiler Design in Bangla and How to clustering our own data center at home. This is the architecture design of my ArenaBoard project.
Admin and Writer at Science Olympiad News and Preparation Facebook Page [Now 15,144 Followers]
2015 Tech Article Writer at Mujtamae.org

## Workshop and Teaching:

2023 Teach **60 student Research 101** and 30+ students pull out research paper **at** Youth Research Journal.
Mentoring 7 students at **Advocate Abdus Salam Tennis Complex.**
2022 Latex for Resume and Poster at my School. [18]
2022 Human Rights Organization Resources at my school (Amnesty, Watch Dog).
2019 Compiler Design & **Natural Language** Processing for BUET student esikkhon.com project.
2018 Computer Programming (Time & Memory Limit, Big O Notations, Algorithms, I/O) at Smartians Of Science. [19]

## Organized Competitive Programming Contest and Problem Setting:

2021 JN Islam Mega Fest Programming Contest 2021 (Junior and Senior)
**Problems**: Wrote 1 challenge ( C. Chana's Playlist ).
**Time:** June 23 2021, 10:00 am BDT to June 23 2021, 02:30 pm BDT

**Senior:** https://toph.co/c/jn-islam-mega-fest-2021-senior
**Junior:** https://toph.co/c/jn-islam-mega-fest-2021-junior

2017 Mujtamae Programming Blog Intro Contest 2017
**Problems**: Wrote 5 challenges.
**Time:** Nov 17 2017, 03:00 pm BDT to Nov 17 2017, 05:00 pm BDT
**URL:** https://www.hackerrank.com/mujtamae-programming-blog-intro-contest-2017

NHSPC17 Jossor and Dinajpur Regional Problems set
**Problems**: Wrote 3 challenges.
**Time:** Mar 24 2017, 11:15 pm BDT
**URL:** https://www.hackerrank.com/nhspc17-jossor-and-dinajpur-regional-problems-set

NHSPC17 Rajshahi Regional
**Problems**: Wrote 3 challenges.
**Time:** Mar 24 2017, 04:00 pm BDT
**URL:** https://www.hackerrank.com/nhspc17-rajshahi-regional

NHSPC17-Preparation-Contest-Unofficial
**Problems**: Wrote 6 challenges.
**Time:** Mar 5 2017, 06:00 pm BDT to Mar 6 2017, 12:00 am BDT
**URL:** https://www.hackerrank.com/nhspc17-preparation-contest-unofficial

Mocking Test (Organized for Smartians of Science Workshop)
**Problems**: Wrote 4 challenges.
**Time:** Mar 1 2017, 01:15 pm BDT to Mar 5 2017, 08:00 pm BDT
**URL:** https://www.hackerrank.com/mocking-test

2016 Chit~Chat of Coders Fire Contest
**Problems**: Wrote 3 challenges.
**Time:** Nov 9 2016, 10:00 pm BDT to Nov 9 2016, 11:30 pm BDT
**URL:** https://www.hackerrank.com/chitchat-of-coders-fire-contest-09112016

## University Courses:

2023 **MS&E401: Special Topics in Materials Science and Engineering (002) FA23**
Course By: **University of Wisconsin-Madison.**
**Professor:**, Dr. Benjamin Afflerbach
Time-line: November to December 18, 2023.

2022 **Curanderismo: Traditional Healing Using Plants** (The art of Hispanic/Latino traditional medicine)
Course By: **The University of New Mexico.**
**Professor:** Eliseo (Cheo) Torres, and Mario Del Angel-Guevara,
Time-line: December 05 to present, 2022.

**Health Concepts in Chinese Medicine**
Course By: **The Hong Kong University of Science and Technology.**
**Professor:** Robert Co.
Time-line: December 05 to present, 2022.

Calculus Applied! (Single-variable Calculus, derivatives, integrals and basics of differential equations).
Course By: **HarvardX.**
**Professor:** John Wesley Cain (Senior Lecturer on Mathematics at Harvard University)
Time-line: October 25 to December 01, 2022.

Introduction to Bioelectricity
Course By: **PurdueX nano525x.**
**Professor:** Dr. Irazoqui.
Time-line: July 10 to August 07, 2022.
Fundamentals of bioelectricity of the mammalian nervous system and other excitable tissues. Passive and active forms of electric signals in both the single cell and cell-cell communication. Tissue and systemic bioelectricity. Mathematical analysis including Nernst equation, Goldman equation, linear cable theory, and Hodgkin-Huxley Model of action potential

generation and propagation. To design and build a wireless bioelectric recording device to control a prosthetic limb.

Effective Altruism (Meta- Ethics, Utilitarianism, Deontology, Giving Game, and Prima Facie Duties).
Course By: **Princeton University.**
**Professor:** Peter Singer.
Time-line: May 01 to July 01, 2022.

Imaging The Earth (Planetary Atmospheres, Solar-system, Kepler & Einstein, Relativity, Microlensing & Stability, Physical Properties, Stellar Structure & Nuclear Fusion, Evolution, Quantum Mechanics and Fingerprinting Planets, Optics and Imaging Planets, Angular Momentum and Protoplanetary Disks, Diversity or Planetary Systems, Biochemistry of life : Amino Acids to Proteins & Proteins to Cells, Synthesizing Life, Evolution of Life: Inevitability, Sex Alternatives & the Tree of Life, Evolution of Astrobiology, 5 Mass Extinction, Habitable Planet, Faint Sun & Goldilocks Problem, Fermi Paradox & SETI).
Course By: **Princeton University.**
**Professor:** David Spergel.
Time-line: May 01 to July 11, 2022.

Computer Architecture ( Micro-architecture, Microcode, Super Scalar, VLIW, Branch Implementation, Advanced Caches, Memory Protection, Vector Processor and GPUs, Multithreading, Parallel Programming, Multiprocessor Interconnect, Large Multiprocessor).
Course By: **Princeton University.**
**Professor:** David Wheeler.
Time-line: April 25 to May 26, 2022.

Computer Architecture (Design single-cycle, multi-cycle, and pipelined microprocessors with RISC-V)
Course Name: **HarveyMuddX ENGR85B.**
**Professor:** David Harris
Time-line: April 09 to April 15, 2022.

Write Your First Novel (Novel writing format, ACT formats, writing Prologue and Synopsis).
Course By: **Michigan State University.**
**Professor:** David Wheeler.
Time-line: April 15 to April 22, 2022.

Qualitative Research Methods Analyzing Data (Grounded Theory, Organize Data, Transcript, Coding)
Course Name: **MITxT 21A.819.2x**.
**Professor:** Susan Silbey.
Time-line: April 09 to April 15, 2022.

Qualitative Research Methods Conversational Interviewing (Qualitative, Quantitative Research Methods)
Course Name: **MITxT 21A.819.1x.**
**Professor:** Susan Silbey.
Time-line: April 01 to April 04, 2022.

Reuters Training Course: **Digital Journalism** (Procedure, ethics, People Safety, people rights, news authenticity) [Certificate]
Time-line: April 05, 2022.

**Language Courses**: I used actual menu-scripts to investigate the ancient books of **Greek Bibel, Bhagavad Gita,** and **Quran**.
**Hebrew** : Reading.[Skim]
**Sanskrit**: Listening, and Reading. [Skim]
**Arabic**: Writing, Listening, and Reading.

## Workshop I Attend:

2023 **The Brain Bee Bootcamp by IYNA**
November 18, 2023) to December, 17, 8:00 AM - 12:00 PM - Eastern Time (US & Canada) (UTC - 05:00
The Neuron, Neuroanatomy, Neuronal Communication, Sensory and Motor Systems, Learning and Memory, Emotion and Motivation, Sleep and Circadian Rhythms, Developmental Neuroscience, Neurological Disorders, Psychiatric Disorders,

2022 # Optica Virtual Engagement:

## Industry Tutorial: Low loss PICs: from fast prototyping to high volumes

December 08, 2022 9:00 AM - 10:00 AM - Eastern Time (US & Canada) (UTC - 05:00)
Propagation losses in PICs are very important to have energy efficient on chip routing and are especially crucial if already very few photons are there to start with. In this webinar I learn an overview of LIGENTEC's low loss PICs based on silicon nitride and application areas in LiDAR, Quantum and sensing. They explain their Process Design Kit and different fabrication modules. Reliability and uniformity are of critical importance and are addressed with statistical process control in their 100mm and 200mm wafer fabrication.

## The Limits of Natural and Artificial Compensation in Abnormal Color Vision

December 07, 2022, 11:00 - 12:00 - Eastern Time (US & Canada) (UTC - 05:00)
In this webinar hosted by the Color Technical Group, Kenneth Knoblauch presented evidence for such compensation using a psychophysical approach to estimate luminance and chromatic contrast response functions. Anomalous observers require higher chromatic contrasts at threshold but contrast response then rises more steeply than in normal observers, indicative of contrast gain enhancement. Noise in contrast encoding limits the full benefits of such compensation and induces a dependence between contrast gain and maximal response. Interestingly, long-term usage of notch filters designed to enhance chromatic contrast for anomalous observers results in enhancement of contrast appearance without the filters. This is likely explained by the same gain-noise interaction described above but working in the opposite sense. The results support that optimal vision depends on an exquisite balance between gain and noise.

### What I Learn:

- A rigorous method for estimating a scale describing appearance along a physical dimension
- Factors that constrain the perception of contrast in normal and anomalous vision

## Adaptive Optics for Microscopy and Photonic Engineering

December 05, 2022, 9:00 - 10:00 - Eastern Time (US & Canada) (UTC - 05:00)
In this webinar hosted by the Holography and Diffractive Optics Technical Group, Martin Booth from the University of Oxford will review recent work on using adaptive optical elements, such as deformable mirrors and spatial light modulators, to increase the capabilities of laser micro fabrication and optical microscopy.
In particular, Prof. Booth will show how adaptive aberration correction and dynamic parallelization can improve precision and reliability and increase the accessible volume and speed of these systems. The applications of this laser writing technology range from quantum optics, through radiation sensing to security marking of diamond gemstones. In addition, the imaging methods include applications in cell biology, neuroscience and super-resolution microscopy.

### What I Learn:

- Why we need adaptive optics and how it can improve the performance of optical microscopy and laser processing systems
- Recent work on adaptive microscopy, including methods and applications
- Recent work on adaptive laser processing, including methods and applications

## Ill-Defined Topologies and Energy Sinks in Photonic Systems

December 01, 2022, 14:00 - 15:00 - Eastern Time (US & Canada) (UTC - 05:00)
In recent years there has been a great interest in topological materials and in their fascinating properties. Topological band theory was initially developed for condensed matter systems, but it can be readily applied to arbitrary wave platforms with little modifications. Thus, the topological classification of optical systems is usually regarded as being mathematically equivalent to that of condensed matter systems.
In this webinar hosted by the NonImaging Optical Design Technical Group, Mário Silveirinha will demonstrate that both the particle-hole symmetry and the dispersive nature of nonreciprocal photonic materials may lead to situations where the usual topological methods break-down and the Chern topology becomes ill-defined. Furthermore, Prof. Silveirinha show how by exploiting ill-defined topologies it is possible to halt abruptly the wave propagation at a topological singularity that determines the transition between well-defined and ill-defined topologies. Prof. Silveirinha's vision is that systems with ill-defined topologies may open new inroads in nanoplasmonics and have exciting applications in energy harvesting and in the enhancement of nonlinearities.

### What I Learn:

- Topology
- Nonreciprocal Materials
- Nanophotonics

## Nonvolatile Electro-Optically Programmable Gate Array for Optical Interconnects

November 29, 2022, 11:00 - 0:00 - Eastern Time (US & Canada) (UTC - 05:00)
Large-scale, electronically reconfigurable photonic integrated circuits (PICs) can enable programmable gate array (PGA) to realize extremely fast, arbitrary linear operations, with potential applications in classical and quantum optical information technology. The basic building blocks of existing PGAs are thermally tunable broadband Mach-Zehnder-Interferometers, which pose several limitations in terms of size, power, and scalability. Phase change materials (PCMs), exhibiting large nonvolatile change in the refractive index, can potentially transform these devices, providing at least one order of magnitude reduction in the device size, zero static energy consumption, and minimal cross-talk.

In this webinar hosted by the Optics in Digital Systems Technical Group, Arka Majumdar discuss different PCMs that can be used in conjunction with silicon and silicon nitride photonics, to create reconfigurable optical switches for visible and infrared wavelengths. Dr. Majumdar will also talk about different heaters that are needed to actuate the phase transitions on-chip.

**What I Learn:**
• Gas-phase fluorescence spectroscopy using ultrashort laser pulses
• Applications of femtosecond imaging methods for chemically reacting flows
• Opportunities and challenges in laser imaging diagnostics in harsh environments such as gas turbine engines and hypersonic flight systems development.

## National Pre-Health Conference Events 2022:

**August 4th, 2022 Day one: HEALTHCARE SPECIALTIES**

The Path to a Nursing Profession
Melanie Martin and Jessica Barnett | University of Pennsylvania School of Nursing
Timeline: 10:00 AM - 11:00 AM

**Psychiatry as a Career**
John Krystal, MD | Yale-New Haven Hospital
Timeline: 11:00 AM - 12:00 PM.
Exploring Competitive Specialties as an Underrepresented Student
Shavonia Wynn, PhD | Johns Hopkins University
Timeline: 12:00 PM - 01:00 PM.

**Tabling Session**
Timeline: 01:00 PM - 02:00 PM

**A Career in Public Health**
Leslie Petroff, MPH | Eastcentral and Northeast PA Area Health Education Centers
Timeline: 02:00 PM -03:00 PM.

**Making a Career in Medicine Work for You**
Jennifer Lincoln, MD, IBCLC | Providence Health and Services
Timeline: 03:00 PM - 04:00 PM.

**Integrative Rehab: Innovative & Collaborative**
Approaches in OT & PT // Shandalov, OTR/L | PhysioYoga; Yoga OT
Timeline: 04:00 PM - 05:00 PM.

**A Career in Dentistry**
Olivia Sheridan, DMD | Penn Dental Medicine
Timeline: 05:00 PM - 06:00 PM.

**A Future in Dermatology**
Kristina Collins, MD, FAAD | Austin Skin Dermatology
Timeline: 06:00 PM - 07:00 PM.

**August 5th, 2022 Day two: A P P L I C A T I O N S A N D R E S U M E B U I L D I N G**

**Making the Most of Your Interview**
Robin Michaels, PhD | University of Minnesota
Medical School Duluth Campus
Timeline: 10:00 AM - 11:00 AM.

**Crafting Your Personal Statement**
Accomplishment Story
Carlos Medina, PhD | Johns Hopkins University
Timeline: 11:00 AM - 12:00 PM.

**Understanding the Medical School Application Process**
Neha Vapiwala, MD | Perelman School of Medicine
Timeline: 12:00 PM - 01:00 PM.

**Research Exposition**
Timeline: 02:00 PM - 03:00 PM.

**Preparing for the MCAT**
Petros Minasi | Kaplan
Timeline: 03:00 PM - 04:00 PM.

**PANEL DISCUSSION: Application Advice from**
Current Healthcare Professional Students
Timeline: 04:00 PM - 05:00 PM.

**Interactive Case Study Session**

InstaMed | University of Arizona College of Medicine
- Phoenix Medical Students
Timeline: 05:00 PM - 06:00 PM.

### An Inside Look on Medical Scribing

Briana Astorga and Katie Dunaway | ScribeAmerica
Timeline: 06:00 PM - 07:00 PM.

**August 6th, 2022 Day Three: S P E C I A L T O P I C S TOPICS**

### Racism in Healthcare and Health Equity

Lauren Powell, MPA, PhD | The Equitist
Timeline: 10:00 AM - 11:00 AM.

### Making an Impact with Ovarian Cancer Survivor Stories

Minnesota Ovarian Cancer Alliance (MOCA)
Timeline: 11:00 AM - 12:00 PM.

### Scientific Communication in Research and Medicine

Vincent Racaniello, PhD | College of Physicians and Surgeons of Columbia University
Timeline: 12:00 PM - 01:00 PM.

### Emergency Medicine in Rural Hospitals

Fernando Cortes, MD | Banner Health
Timeline: 01:00 PM - 02:00 PM.

### Interactive Game Session

Timeline: 02:00 PM - 03:00 PM.

### Building Your Social Media Platform (IG) and Cosmetic Dentistry/Working with Celebrities

Bill Dorfman, DDS | Century City Aesthetic Dentistry
Timeline: 03:00 PM - 04:00 PM.

### Channeling Passions and Health Advocacy Through Social Media (TikTok)

Garrett Hawley, DS3 | Lake
Erie College of Osteopathic Medicine
Timeline: 04:00 PM - 05:00 PM.

### Mindful Wellness: Using Mindfulness Practices for Stress Management

Alexis Arczynski, PhD | University of Utah
Timeline: 05:00 PM - 06:00 PM.

### Volunteering Abroad the Africa Mercy

Ruth Walne | Mercy Ships
Timeline: 06:00 PM - 07:00 PM.

## Scientific publishing and peer-review

**Professor:** Elisa Floriddia (Nature Neuroscience in 2022 after working as Senior Editor at Nature Communications)
Time-line: July 10th 09 AM, 2022.

## Getting started in science policy and advocacy

**Professor:** Adriana Bankston (Principal Legislative Analyst at the University of California Office of Federal Governmental Relations in Washington, DC. CEO & Managing Publisher of the Journal of Science Policy & Governance, a Fellow with Advancing Research Impact in Society (ARIS), and a Biomedical Workforce & Policy Research Investigator at the STEM Advocacy Institute.)
Time-line: July 10th 10 AM, 2022.
In this session, Dr. Bankston will describe her career path from research into science policy, highlighting her experiences along the way. She will also discuss ways to get involved and existing opportunities in the field.

## Brave Neuro World?

**Professor:** Martha J. Farah (Walter H. Annenberg Professor of Natural Sciences at the University of Pennsylvania, Director of the Center for Neuroscience & Society and leads the Graduate Certificate in Social, Cognitive & Affective Neuroscience (SCAN) program.)
Time-line: July 10th 11 AM, 2022.
How will the field of neuroscience develop in the coming decades, and how will it shape life beyond the lab? None of us can know the answers to these questions now, but as young neuroscientists you will witness these developments and help guide them. In this talk I will encourage you to think about neuroscience in historical context and look ahead to ways the field may present new opportunities and new challenges for individuals and society.

## Neuroscience Theater: Examining Neuroscience in Movies and Pop Culture

**Professor:** Vanessa Grass (Vanessa Grass is a science communicator who founded Neuroscience Theater, a multimedia project making prominent and emerging neuroscience research fun, entertaining, and accessible to a lay-person audience by examining the neuroscience behind mainstream movies and pop culture. Earning a Bachelor's degree

in Biology from the University of Rochester, a Master's of Science in Data Science from the University of New Haven, and most recently, a Master's of Science in Cognitive Neuroscience from the City University of New York, where she researched the effects of traumatic brain injury.)

Time-line: July 10th 12 AM, 2022.

Humanity's fascination with the mind transcends the domains of neuroscience and influences the realms of art, movies, and pop culture. This fascination has manifested itself in classical works of art such as Michelangelo's Creation of Adam to modern-day movies, such as The Matrix movie franchise, arguably one of the greatest modern pop-cultural phenomena. While the arts and entertainment industry often take great artistic license when depicting neuroscience related themes, this isn't necessarily a bad thing. In fact, the generally scientifically preposterous storylines allow us to broaden the horizons of our collective imagination, pushing the boundaries of what's possible in the sciences. Technologies such as virtual reality, brain-computer interfaces, and advanced methods to measure brain activity, once only considered as fodder for outlandish sci-fi movies, are now a very real reality in the world of legitimate neuroscience. These often nonsensical and sometimes downright silly movie plots also bring to light hotly debated issues occurring within neuroscience, challenging ideas about the nature of memory, identity, and consciousness, introducing and educating a wider audience to fundamental questions about the brain and even what it means to be human. But philosophical waxing aside, ridiculous sci-fi movies are also just plain fun! This presentation will examine these ideas in more depth and discuss specific movies and TV shows that feature neuroscience themes, connecting them to real-life cutting-edge neuroscience research.

## The Ethics of Neurotechnology: Exploring Emerging Issues and Career Paths

**Professor:** Ishan Dasgupta (Program Officer at the Dana Foundation responsible for overseeing the Next-Gen program. postdoctoral scholar in the Department of Philosophy and the Center of Neurotechnology at the University of Washington (UW).)

Time-line: July 10th 1 PM, 2022.

This session will explore some of the latest ethical questions emerging in the development and commercialization of neurotechnology. Touching on both experimental and consumer neurotechnologies, the speaker will highlight some ways neuroscientists can help to better engage with end-users of neurotechnology. The session will also explore the speaker's own career trajectory as a way elucidating potential career paths for students interested in a career looking at questions at the intersection of neuroscience and society.

## Social Neuroscience: Understanding Social Behavior From Multiple Levels of Analysis

**Professor:** Eric J. Vanman (Associate Professor in the School of Psychology at the University of Queensland Australia. After receiving his Ph.D. in social psychology from the University of Southern California in 1994, he was a post-doctoral fellow in cognitive and behavioral neuroscience at USC and then spent a year as a research scientist at Texas A&M University. He was then a lecturer at Emory University until his appointment as an Assistant Professor at Georgia State University in 2000.)

Time-line: July 11th 10 AM, 2022.

In this presentation I will talk about how social neuroscience occurs at the intersection of social psychology and neuroscience, revealing fascinating insights into our social behavior. I'll give several examples of new insights that come from this relatively new field.

## What can human and computer vision reveal to us about brain health?

**Professor:** Mohamed Abdelhack (Postdoctoral Fellow at the Krembil Centre for Neuroinformatics working on computational neuroscience and deep learning to model psychiatric disorders and brain health.)

Time-line: July 11th 11 AM, 2022.

Computer vision has been recently successful in mimicking multiple computation techniques in the human visual cortex. This synergy allows scientists to use both systems to study different brain functions that affect mental and brain health. This talk will touch upon the different ways natural and artificial vision can be used to understand how mental and neuronal disorders manifest in the brain.

## Introduction to Neuroimaging Research (Functional magnetic resonance imaging (fMRI) and Electroencephalography (EEG)–specifically)

**Professor:** Patrick F. Bloniasz (Mathematical neuroscientist and educational reformer. Presently, he is a PhD student at Boston University where he creates mathematical models of neural time series at different spatial scales (e.g., spike trains, ECoG, and EEG/MEG). Patrick served as the Director of Education at the non-profit Aeon for Ocean, as a researcher for the Maine Department of Education, as a national researcher for America's Service Commissions, and as a Senior Interviewer at Bowdoin College.)

Time-line: July 12th 10 AM, 2022.

During this session, we will cover the basics of neuro-imaging research found in cognitive neuroscience and clinical research. Attendees will learn about Functional magnetic resonance imaging (fMRI) and Electroencephalography (EEG)–specifically what each is used for, what each can tell us about the brain, and how each has their own drawbacks.

### Science Policy 101

**Professor:** Meredith Schmehl (Neuroscientist, science communicator, and science policy advocate. She is the Digital Media & Communications Coordinator and the Public Engagement & Communications Chair of the National Science Policy Network, where she creates accessible written and visual content, leads a team in communicating science policy topics, and engages members in professional development opportunities. she organized the ComSciCon-Triangle 2021 workshop and was an associate editor for the Duke Science Review. Meredith is a PhD Candidate in the Department of Neurobiology at Duke University, where she studies how the brain uses vision to process sound.)

Time-line: July 13th 10 AM, 2022.

During this session, we will cover the basics of science policy. Attendees will learn what science policy is, what career paths are available in the science policy space, and how they can prepare for a science policy career during their training.

### Exploring Leadership in the Neuroscience Community

**Professor:** Chinmayi Balusu (She is a medical humanities and neuroepidemiology student at Columbia University in NYC. She is an award-winning researcher at Stanford Medicine and Columbia University Irving Medical Center with interests in traumatic brain injury, stroke, cognitive neuroscience, and cross-cultural neuroethics. In addition to her role as the Founder and Chief Executive Officer of Simply Neuroscience, Chinmayi serves in leadership and advisory roles through organizations such as 500 Women Scientists, HFC, and the ALBA Network. Outside of non-profit work, she is an avid international youth science communicator and three-time TEDx speaker.)

Time-line: July 13th 10 AM, 2022.

What does it mean to be a neuroscience leader? We'll break down this question by exploring different leadership roles across academic, entrepreneurship, and outreach spaces (e.g. Principal Investigator, Chief Scientific Office, Director of Public Engagement, Founder, Director of Undergraduate Studies). Additionally, attendees will learn more about effective communication skills, individual vs. group leadership dynamics, and growing self-confidence.

### Navigating Research Opportunities in Academia 101

**Professor:** Nikita Ghodke (Research assistant at Harvard University and the University of California, Los Angeles. She holds a Bachelor's in Psychology, English Literature, and Journalism. Her main research interests lie in the branches of Educational and Developmental Psychology.)

Time-line**:** July 14th 10 AM, 2022.

This session is for anyone that wants to work and gain exposure to different research settings. The workshop will focus on how one can navigate research opportunities, effective cold-emailing techniques when approaching these positions, building an academic profile, and using networking sites like Twitter to find opportunities. At the end of the session, students will also be given access to different resources including CV templates, cold-emailing templates, and the necessary materials to secure positions.

2017 **Suffix & Prefix** Algorithm by **Googler** Shakibul **Mowla** at RAPL Lab.

**Youtube Ads** Algorithm by **Googler Mahbubul** Hasan Shanto at RU CSE Lab.

**BACS ACM ICPC Camp** (3 Days Residential Camp), Bangladesh University of Professionals, Mirpur, Dhaka, Advanced Camp Topics list.

2016 **PWA Google** Bangladesh Chapter.

## Other Project:

2022 Melanoma Detection App using Tensorflow lite and OpenCV (Dataset: Kaggle).[20]

American Sign Language Using OpenCV. [Link]

2019 Micro-Service with Springboot develop Banking API, web-platform, and IOS app.[Bankend GO][Frontend Angular JS][IOS app Dart & Flutter]

Face Recognition OpenCV, Python and also own haarcascade Datasets Project Source Code.

Card Selection Tensorflow , Python and also own Datasets Project Source Code.

2016 Phulkuri Kisholoy Database Android Application (Java). Project Source Code.

2016 Free Facebook Supported on Internet[dot]org country Android Application(Java). Project Source Code.

2016 Developed an Android Game Math Teaser (Made with Unity C#). Project APK file.

2017 Developed an API Based Programming Online Judge Mujtamae OJ (PHP). Mujtamae OJ.

2017 Developed an API Based Programming Online Judge Mujtamae OJ Android Application(Java). Mujtamae OJ.

## Athletics:

- **Circket:** Grade 3 to 10 took part in the junior high school cricket tournament. (Right-handed bat and right-arm orthodox bowling)
- **Tennis**( Forehand, Volleys, Backhand): My father encouraged me to attend the Advocate Abdus Salam Tennis Complex in Sreerampur and Club Road in Rajshahi to enhance my physical activity.

## Hobbies:

Cooking, Tennis, Reading, Running, Coding, Entrepreneurship, Watching Documentaries, Biography movies, and courses.

## Citation links:


[1] Bangladesh Education Board & Rajshahi Board. "PSC, JSC, SSC, and HSC" result published at "educationboardresults.gov.bd".

[2] All-Covid AP Courses from "Crash Course" at "www.youtube.com/user/crashcourse" .

[3] Develop graphics generator for Princeton University and Nominated "**Tiger Entrepreneur Award 2022**" for "TigerShell" Project. At this moment it parked at "https://tigershell.art" but it'll be parked at "tigershell.princeton.edu" and Co-lab with "**TigerApps**". September 12th, 2022, New Jersey, USA.

[4] We organized Covid-19 Pandemic Events "**JN Islam Mega Science Fest 2021**". Competitive Problem Setter
Junior: https://toph.co/c/jn-islam-mega-fest-2021-senior
Senior: https://toph.co/c/jn-islam-mega-fest-2021-junior

[5] I build PCB using Copper plate, **Etching** Solution(Ferric chloride, **FeCl3**) at home, **Soldering** all the components, **Verilog** coding and build Python Package for uses. just buy this product, plug-in, open the terminal and type "**pip install witlab**" ."**pypi.org/project/witlab**" .

[6] Learn the **Clinical** terms and practical hands-on (Clinical, CLIA, Biochemistry, Hematology, Serology, Microbiology, and Histopathology) experiences at **Life Sine Lab**. Under Khandker Md. Faisal Alam [MBBS, PhD, RMC] supervision. August 09th to October 09th, 2022, Rajshahi, Bangladesh.

[7] **ArenaBoard** is the host of **Bangladesh Economics Olympiad**. In this year, we host this at country level that means this is the 1st time we organize offline and every year we got medals from international Olympiad.

[8] I develop the software where recent **BDEO** Olympiad host for initial selection for national Olympiad. It is an eco-system where student can play quiz, participate on events and my work is to load-balance and sometimes add new features.
**ArenaBoard**: "arenaboard.net", "facebook.com/ArenaBoard".
**Protijog (Developed for ICT Division to take contest)** : "protijog.com"
**BDEO**: "facebook.com/BDEO.Official"
**Newspaper**: "https://www.thedailystar.net/star-youth/news/team-bangladesh-international-economics-olympiad-2019-1791406"
**ArenaBoard BDEO Team**: "https://www.youtube.com/watch?v=nOD7gfUmMm0"

[10] Every year I participated on **Github Hacktoberfest** event. It's really a good initiative for community bug resolvers and also the benefits of "How the coding community build-up through an international fest". And yes, I got SWAGS from Github.

[11] Blender, Unity, 3D-Max: "theoriginator.org" brain simulation using 3D Object.
Autodesk Eagle: "github.com/WitLaboratory/witlab-kits/blob/main/kits/pcb/".
Autodesk Fusion 360: "github.com/WitLaboratory/witlab-kits/tree/main/kits/case".

[12] Tensorflow: “github.com/Md-Sanaul-Haque-Shanto/Melanoma-Detection-App”
OpenCV: “github.com/Md-Sanaul-Haque-Shanto/OpenCV”.

[13] Apache Spark & STATA: “github.com/Md-Sanaul-Haque-Shanto/Data-Analysis-Tool”

[14] Assembly, Bash, C/C++, C#, Dart & Flutter, GO, Java, Javascripts, Linux/Unix/Shell Environment, Python, PHP, and R: My all project at “github.com/Md-Sanaul-Haque-Shanto”.

[15] I solve **bio-informatics** problems that included by-python module, make mathematical syntax using **Matlab**, **SimuLink**, **Mathjax**: “github.com/Md-Sanaul-Haque-Shanto/Rosalind-Solution”.

[16] Eagle, and Fusion 360 files for WitLab : https://github.com/WitLaboratory/witlab-kits/tree/main/kits
Connecting FPGA and Arduino using SPI : https://github.com/Md-Sanaul-Haque-Shanto/FPGA

[17] My Competitive Programming Articles: all articles at “ md-sanaul-haque-shanto.github.io/cpp/”

Combinatorics: Permutation and Combination, Multinomial Theorem, Stars and Bars Theorem, Catalan Numbers, Bell Numbers, Mobius Function

Data Structure: Range Minimum Query, Convex Hull Trick, Set Manipulation, Binary Indexed Tree

Game Theory: Hackenbush

Geometry: Great Circle Distance, Rotating Calipers

Graph Theory: 2SAT, Articulation Point, Block Cut Tree, Bridge, Euler Path, Prufer Code, Shortest Path Graph, Interval Scheduling

Mathematics: Harmonic Number, Exclusive OR

Network Flow: Minimum Cut, Vertex Cover

Number Theory: Fibonacci Numbers, GCD-Sum Function

Diophantine Equation: Linear Diophantine Equation, Polite Numbers, Prime Gap, Square Numbers, Wilson’s Theorem

Probability Theory: Bayes’ Theorem

String: Minimum Expression

[18] **Latex** template and github workflow repository: “github.com/Md-Sanaul-Haque-Shanto/gen”.

[19] **Smartians Of Science**, Rajshahi, For beginners, I organized a lot of workshops. Facebook posts:

06 [05-10-2019], Post URL:
“https://facebook.com/groups/1545632125748362/permalink/2319958658315701/”

05 [25-09-2019], Post URL: “https://facebook.com/notes/smartians-of-science/smartians-of-science-programming-workshop-05-topics/2311185742526326/”

Workshop files URL: “https://github.com/Md-Sanaul-Haque-Shanto/smartiansofscience”

[20] **Melanoma Detection App**, Github: “github.com/Md-Sanaul-Haque-Shanto/Melanoma-Detection-App”
**Demo Video** : “https://www.youtube.com/watch?v=__3IK_9Y18”