Khushi Doshi

Biological sciences (Masters) · Chemical Engineering (Bachelors)

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Education

Birla Institute of Technology and Science, Pilani, Rajasthan — *GPA: **9.01 (Dept.)** / **8.34 (Overall)***

M.Sc. in *Biological Sciences* — *Aug. '18 – July '23*

Birla Institute of Technology and Science, Pilani, Rajasthan — *GPA: **8.68 (Dept.)** / **8.34 (Overall)***

B.E. in *Chemical Engineering* — *Aug. '18 – July '23*

Internships

Ultrasensitive Antigen-Based Point-of-Care Diagnostics

Thesis

Prof. Hadi Shafiee | Harvard Medical School | Brigham and Women's Hospital — *July '22 – June '23*

- Developed and optimized LUCAS (LUminescence CAscade-based Sensor), an enzyme cascade system capable of rapidly detecting analytes with ultrahigh sensitivity and prolonged bioluminescence
- Actively engaged in troubleshooting the challenges faced during assay development. Helped implement it on a fully automated, portable and user-friendly platform featuring a microfluidic cartridge with pre-loaded reagents and a cost-effective reader
- Achieved over 95% accuracy in the qualitative classification of 177 viral-infected patient samples and 50 viral-spiked serum samples, for various respiratory viruses and blood-borne pathogens including SARS-CoV-2, HIV, HBV, and HCV
- Implemented the protocol for testing HBV. Selected antibody pairs and target antigen and carried out bioconjugation reactions of nanoparticles and immunogens. Achieved a limit of detection of 0.4 fM for HBV surface antigen and a clinical sensitivity of 100% and specificity of 92% for HBV patient samples

Microfluidic Platforms for Droplet Synthesis

Remote Internship

Prof. Uday Kompella | University of Colorado Denver — *June '21 – Aug '21*

- Designed a solvent extraction channel, with 4 inlets, a fusion chamber and a collection reservoir. Simulated the mixing of silicone oil, water and DCM in the chip to generate droplets in Ansys Fluent
- Performed the mixing of silicone oil and water in a T-chip. Modified the design and added a laminated water stream in order to extract droplets from the oil phase and collect them in aqueous phase
- Created a parametric model of a 3-inlet microfluidic channel in AutoCAD. Simulated the mixing of aqueous PVA and PLGA dissolved in acetone by varying flow parameters in Autodesk CFD

Fruit Fly – Biology and Behavior

Remote Internship

Prof. Adelaine Leung | University of Saskatchewan — *June '21 – Aug. '21*

- Conducted manual analysis of fly behavioral videos, documenting copulation periods, alignment during copulation, and unique postures. Also performed the above analysis utilizing Caltech FlyTracker software
- Developed a MATLAB code that processed the output files from the FlyTracker software, analyzing the start and end times of copulation based on a threshold value of distance between two flies
- Worked with JAABA, a machine learning-based behavioral annotator, to understand how to train classifiers for automated analysis of fly behaviors

Prototyping of Portable Centrifuge and Reagent Strip Quantification

Internship

Prof. Rohit Srivastava | Indian Institute of Technology Bombay — *May '19 – July '19*

- Designed a 3-D model of a lateral flow assay reader and portable centrifuge of 10,000 RPM using AutoCAD and 3-D printed the designs using the Ultimaker-3 printer as a part of a bigger project for remote healthcare
- Resolved the challenges of unwanted vibrational stresses using absorber rubber pads and measured the centrifuge speed by integrating a photosensor and frequency-to-analog converter
- Prepared reagent strips and solutions of albumin, creatinine and glucose and quantified them using light sensors

Publications & Pre-prints

Ultrasensitive and Long-Lasting Bioluminescence System for Antigen-Based Point-of-Care Diagnostics

S. Kim, G. Cho, J. Lee, **Khushi Doshi**, S. Gharpure, H. Chen, J.M. Hardie, H. Shafiee — *2023*

In Submission at Nature Biomedical Engineering

COVID-19 Pandemic: Mechanism, Diagnosis and Treatment

V. Kumar, **Khushi Doshi**, W. H. Khan, Anurag Singh Rathore — *2020*

Journal of Chemical Technology & Biotechnology

Academic Projects

Genetic Engineering Techniques
Lab Course

Prof. Prabhat N. Jha | BITS Pilani — *Jan. '20 – May '20*

- Isolation of plasmid from pQE60 clone of E. coli by boiling lysis, alkaline lysis and kit based methods, restriction-digestion of isolated plasmid and analysis using agarose gel electrophoresis followed by DNA extraction, purification and quantification using Nanodrop
- Performed competent cells preparation of E. coli, transformation using PuC19 vector followed by DNA ligation, creation of recombinant clones and their selection by blue-white screening

Biomarkers of Ovarian Cancer
Design Project

Prof. Rajdeep Chowdhury | BITS Pilani — *Aug. '20 – Dec. '20*

- Undertook an in-depth study on ovarian cancer, analyzing treatment approaches, drug repurposing strategies, mechanisms of drug tolerance and resistance, collateral sensitivity and FDA-approved biomarkers used for detection
- Worked on identifying molecular signatures and created database for the machine learning team, enabling them to develop a cognitive model that can predict ovarian cancer and the patient's response to therapy

Fruit Fly Genetics
Lab Project

Prof. Meghana Tare | BITS Pilani — *Jan. '20 – Mar. '20*

- Performed literature review on the study of Alzheimer's disease using fruit fly as a model organism
- Learned to identify male, female and virgin flies, their handling, transferring and maintenance, food preparation, anaesthetizing flies and fruit fly genetics
- Studied the anatomy and developmental stages of different model organisms (zebrafish, fruit fly, chick, worm and mouse)

Biosensors and Biorecognition Elements
Study Project

Prof. Ashis Kumar Das | BITS Pilani — *Aug. '19 – Dec. '19*

- Conducted literature review to explore the classification, functionality, and applications of different types of biosensors, including strip-based biosensors, implantable biosensors, and wearable sensors that have the capability to measure and monitor heart rate, blood pressure, and respiration rate
- Covered various biorecognition elements employed in biosensors, such as enzymes, antibodies, microbes, DNA, and aptamers

Comparative Genomics of the ATR Gene
Lab Course

Prof. Shibasish Chowdhury | BITS Pilani — *Jan. '21 – May '21*

- Analyzed the ATR gene from various organisms. Wrote python scripts to examine gene content, restriction enzymes sites and start/stop codons. Used GOR4, Predator and Predict Protein to predict and visualize the secondary and 3D protein structures
- Predicted structural and functional regions using GENSCAN and used ORF Finder to obtain the ORFs and protein sequences
- Performed pairwise amd multisequence alignments (EMBOSS, BLAST, Clustal Omega) and phylogenetic tree constructions (MEGA-X) to gain insights into evolutionary and functional relationships and sequence conservation among organisms

Skills

Laboratory Skills	ELISA, Agarose gel Electrophoresis, SDS-PAGE, Luminometer, UV-Vis Spectroscopy, Fluorescence Spectroscopy, TLC, FT-IR, Gas Chromatography, Molecular Cloning Techniques, Safe Handling of Patient Samples within BSL2+ Setting, Isolation, Cultivation, Physiological and Biochemical Characterization of Microbial Cultures
Software Skills	MS Office, ImageJ, AutoCAD, Ansys Fluent, Basic Programming (MATLAB, Python, C), Serial Cloner Software, IMG-JGI, Caltech FlyTracker

Scholastic Achievements

Aug. '22	**IPCD Travel Grant Award,** One of the 10 students in the '23 batch to receive Grant for Off-Campus Thesis	*BITS Pilani*
Jan. '20	**MCN Scholarship,** Awarded the Merit-cum-Need Scholarship to cover 25% of tuition for the Semester	*BITS Pilani*
2018	**Dual Degree Program Selection,** Selected for B.E. Chemical with MSc. Biological Sciences at BITS Pilani, Pilani Campus (Acceptance Rate 1.47%)	*BITS Pilani*
2015	**Dr. Homi Bhabha Balvaidnyanik Competition,** Earned a Silver Medal at the State Level	*High School*

Certified Courses

Aug. '20	**Biology Meets Programming : Bioinformatics for Beginners,** UC San Diego	*Coursera*
Jun. '20	**MATLAB Onramp,** MathWorks	*MathWorks*
May. '20	**Introduction to the Biology of Cancer,** Johns Hopkins University	*Coursera*