# UTSAB ACHARYA

BIOMEDICAL ENGINEER | PHYSICIST | DATA ANALYST | GRADUATE RESEARCH ASSISTANT
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## PROFESSIONAL SUMMARY

PhD graduate in Biomedical Science with strong experience in ocular biomechanics, myopia progression, and deformation of the sclera and optic nerve head (ONH). Skilled in computational modeling and inverse finite element analysis using SolidWorks, ABAQUS, Gmsh, and FEBio Studio/Solver. Research background includes studying GAG degradation and understanding how tissue mechanics influence eye growth. Brings solid physics training, strong data analysis abilities (Python, MATLAB, SQL), and the ability to bridge biomechanics, ophthalmology, and computational modeling. Highly collaborative, detail-oriented, and ready to contribute to vision science research at the postdoctoral level.

## RESEARCH EXPERIENCE

**University of Mississippi - Department of Biomedical Engineering**

GRADUATE RESEARCH ASSISTANT *August 2025 – Present*

- Investigating ocular biomechanics related to myopia progression, focusing on deformation of the peripapillary sclera and optic nerve head (ONH).
- Studying biochemical and structural changes in scleral tissue, including glycosaminoglycan (GAG) degradation and its role in altering tissue stiffness and eye growth.
- Developing advanced finite element (FE) models of the eye using SolidWorks, ABAQUS, Gmsh, and FEBio Studio/Solver.
- Performing inverse finite element analysis to estimate mechanical properties of scleral and ONH tissues.
- Combining computational modeling with biological principles to understand load-response behavior in ocular soft tissues.
- Contributing to scientific writing, manuscript preparation, data analysis, and interdisciplinary collaboration with engineering and biomedical teams.

**University of Mississippi - Department of Physics & Astronomy**

GRADUATE RESEARCH ASSISTANT *Summer 2022 & 2023*

- Conducted ultrasound research on human brain phantom preparation, measuring speed of sound and reflection coefficient.
- Developed MATLAB-based signal processing tools to analyze acoustic wave properties.
- Investigated computational methods to simulate ultrasound wave interactions in biological tissues.
- Computational Modeling of Acoustic Waves
- Applied MATLAB and COMSOL to simulate wave propagation in various materials.
- Validated computational results with experimental data for increased accuracy in modeling.
- Explored data-driven approaches for classifying acoustic signals using Python-based machine learning models.

## RESEARCH INTERESTS

- Ocular Biomechanics: Scleral & ONH deformation, soft-tissue mechanics, myopia progression
- Computational Modeling: Finite element analysis (FEA), inverse FE, soft-tissue simulations

- Biomedical Acoustics: Ultrasound wave propagation, brain phantom preparation, imaging physics
- Computational Physics: Wave propagation modeling using MATLAB and COMSOL
- Data Analysis: Python & MATLAB for signal processing, statistics, visualization

## RESEARCH PROJECTS

**University of Mississippi - Department of Physics & Astronomy**

- Acoustic Wave Simulation for Biomedical Devices – Using COMSOL and MATLAB to analyze wave interactions in biomaterials for potential medical imaging advancements.
- Computational Modeling of Acoustic Propagation – Developing numerical models to optimize ultrasound signal clarity in research applications.
- Machine Learning in Acoustic Signal Classification – Applying data-driven approaches to classify and enhance acoustic signal processing in industrial and medical applications.

## EDUCATION

**University of Mississippi - Department of Biomedical Engineering**

Ph.D. Biomedical Engineering *August 2025- Present*

- Research Focus: Ocular Biomechanics, Myopia Progression, Finite Element Modeling
- Thesis Title: "Determine the Anisotropic Hyperelastic Properties of the Peripapillary Sclera (PPS) and the Optic Nerve Head (ONH) through Inverse Finite Element Analysis (FEA)"
- Advisor: Dr. Yi (Jason) Hua

**University of Mississippi - Department of Physics and Astronomy**

MS PHYSICS *August 2025*

- Research focus: Physical Acoustics
- Thesis Title: "Preparation of a Human Brain Phantom and of Study its Ultrasonic Properties"
- Advisor: Dr. Cecille Labuda

Relevant Coursework:

- PHYS 503- Science Communication: Scientific writing, public speaking, inclusive teaching
- PHYS 634- Electronics In Research: Circuit design, instrumentation, troubleshooting

**Tribhuvan University, Kirtipur, Nepal**

MSc PHYSICS (Equivalent to MA Degree) *Sept 2017*

- Major in Physics

**Tribhuvan University, Kirtipur, Nepal**

BSC PHYSICS *Sept 2013*

- Major in Physics and minors in Statistics and Mathematics

## SKILLS

**Finite Element Modeling & Simulation**

Inverse FEA • ABAQUS • FEBio Studio/Solver • Gmsh • SolidWorks • COMSOL Multiphysics • Soft-tissue biomechanics modeling

**Biomedical & Computational Tools**

Ultrasound analysis • Signal processing • Tissue mechanics • Soft-tissue deformation modeling

**Programming & Data AnalysisData Analysis and Visualization**

Python (NumPy, Pandas, Matplotlib, Seaborn) • MATLAB • SQL • Git • LaTeX

**General Technical Skills**

Linux • Scientific writing • Presentations • Project management • Documentation

**Project Management & Collaboration**

- Experience managing goals, timelines, and deliverables in research settings
- Worked with interdisciplinary teams of engineers, researchers, and students
- Managed user forums and supported grid-based computing environments

**Communication skills**

- Skilled at presenting complex data to technical and non-technical audiences
- Experienced in writing technical reports and giving research talks

## TEACHING EXPERIENCES

**The University of Mississippi, Oxford, MS, USA**

GRADUATE TEACHING ASSISTANT *Aug 2022 – August 2025*

- Taught Physics Lab I & II (mechanics, electricity & magnetism).
- Designed interactive lab activities and delivered instructional presentations.
- Provided grading, tutoring, and individualized student mentoring.

**Canvas International College, Kathmandu, Nepal**

PHYSICS LECTURER *Sept 2017 – July 2022*

- Taught calculus-based physics (University Physics I & II).
- Supervised and developed physics lab experiments.

**Kaushal Boarding Secondary School, Kathmandu, Nepal**

SCIENCE TEACHER *April 2012 – April 2017*

- Taught physics, chemistry, biology, and environmental science.

## TEACHING CERTIFICATIONS & TRAINING

**The University of Mississippi- Department of Physics and Astronomy**

TA TRAINING PROGRAM

- Training in student-centered teaching and classroom engagement
- Active learning strategies, assessment, and lab instruction
- Experience designing lessons, reinforcing error analysis, and managing lab workflows

## AWARDS & GRANTS

- Summer Research Grant (2024 & 2023) – University of Mississippi
- Awarded for research on biomedical acoustics and ultrasound material properties.
- Awarded for computational modeling and applied physics research.
- Campus Scholarship Award – TU Amrit Campus (2009 – 2013)
- Recognized for academic excellence during the master's program- TU Amrit Campus (2014-2017)

## OUTREACH & LEADERSHIP DEVELOPMENT

1. Nepali Student Association at Ole Miss (NEPSA-Ole Miss) – President *Aug 2025 – Aug 2026*

- Leading the Nepalese Student Association, overseeing planning, coordination, and execution of cultural, academic, and community-building events.
- Managed funding processes, including proposal writing, budget oversight, and collaboration with university offices to secure resources.
- Coordinated with students, faculty, and external partners to organize large-scale cultural programs and represent the Nepalese community on campus.
- Handled administrative tasks such as data management, communication, event documentation, and organizing meetings to ensure smooth operation of the association.

2. Physics Graduate Students Association (PGSA) – Member & Volunteer *Aug 2022 – Present*

- Assisted in industry-academia collaboration events and engineering symposiums.

3. Spooky Physics Night, The University of Mississippi – Participant & Volunteer *2022, 2023*

- Contributed to an annual science exhibition organized by the University of Mississippi Physics Department to promote STEM education.
- Designed and demonstrated interactive physics experiments to engage students and the local community.
- Explained fundamental physics concepts (electromagnetism, optics, acoustics) to a diverse audience, fostering interest in science.

## REFERENCES

**Dr. Yi (Jason) Hua**
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