

Nishchal Sapkota

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🏠 [Personal Website](#) [🔍 Google Scholar](#) [🐙 GitHub](#)

EDUCATION

The University of Notre Dame (UND)

Notre Dame, IN

Ph.D. in Computer Science and Engineering

08/2020 - 12/2025 (Expected)

Research Areas: Deep Learning, Computer Vision, Mathematical Modeling, Medical Image Analysis

The University of Southern Mississippi (USM)

Hattiesburg, MS

Bachelor of Science with Honors (GPA: 3.91), *summa cum laude*

08/2016 - 05/2020

Dual Major: **Computer Science** and **Mathematics**

PROFESSIONAL EXPERIENCES

The University of Notre Dame

Notre Dame, IN

Graduate Researcher | Python, PyTorch, TensorFlow, Bash, Matlab

08/2020 - Present

- Proposed a novel transformer-based segmentation model for 3D images utilizing a conditional training scheme to learn from dissimilar datasets outperforming CNNs and Transformer models by up to 19% on zero-shot transfer. [1][6]
- Designed a state-of-the-art classification framework with a novel feature fusion scheme for sperm head morphology analysis by handling ambiguity in noisy labels and beating the known methods by up to 8%. [2]
- Introduced shape-aware segmentation using implicit neural representations improving data efficiency by 30%. [5]
- Developed 3 self-supervised learning approaches achieving state-of-the-art segmentation performances. [7][8][9]
- Proposed different novel methods leveraging foundation models (based on SAM and GPT) for medical image classification and cancer survival outcome prediction. [3][4]

The University of Southern Mississippi

Hattiesburg, MS

Undergraduate Researcher | Python, R, Matlab

08/2017 - 05/2020

- Modeled a 3 species' predator-prey dynamic food chain model by introducing hunting cooperation in the middle predator and studying its long-term behavior. [10]
- Analysed revenues in online games using Markov Chain's transition matrix and its stationary form to estimate the per-game and the maximum revenues for players and the provider. [11]

SOFTWARE/MACHINE LEARNING ENGINEERING PROJECTS

The University of Notre Dame

Notre Dame, IN

Distributed Peer-to-peer Messaging App | Python, Socket Programming, Catalog Server

Fall 2021

- A secure, inexpensive, and central-server free peer-to-peer messaging interface with functionalities such as connecting to online users, creating group chats, real-time notifications, and persistent access to chat histories.

The University of Southern Mississippi

Hattiesburg, MS

Nenglish: A Language Translator App | React Native, Google Cloud Vision, AutoML Translation.

Spring 2020

- A mobile application that detects the contents from public signboards written in over 105 languages and translates to the user's choice of language.

CalHacks 6.0, The University of California, Berkeley

Berkeley, CA

Our Safe Neighborhood | Google Cloud NLP, NLTK, React, JavaScript, Flask

Fall 2019

- A web application that scraps through the local news article and classifies the cities in the neighborhood as safe or unsafe by identifying the location of the crime, its type, and its severity using NLP tools.

TECHNICAL SKILLS AND RELEVANT CONCEPTS

Programming: Python, R, C++, Matlab, SQL

ML Packages: Pytorch, Numpy, Scikit-Learn, SciPy, OpenCV, Pandas, Tensorflow, Matplotlib, WandB

Tools: Jupyter, LaTeX, Fiji, 3D Slicer, Adobe Illustrator

ML Concepts: Artificial Intelligence, Machine Learning, Computer Vision, Neural Networks, CNNs, GANs, Transformers, Natural Language Processing (NLP), Self-supervised Learning, Generative AI, Auto Encoders, Distributed Systems

Math Concepts: Data Analysis, Numerical Methods, Real Analysis, Modern Algebra, Number Theory, Statistics

PUBLICATIONS

- [1] **Nishchal Sapkota**, Yejia Zhang, Susan M M Perrine, Yuhua Hsi, Sirui Li, Meng Wu, Greg Holmes, Abdul Abdulai, Ethylin Jabs, Joan T. Richtsmeier, and Danny Z Chen. ConUNETR: A conditional transformer network for 3D Micro-CT embryonic cartilage segmentation. *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2024 [Oral]
- [2] **Nishchal Sapkota**, Yejia Zhang, Sirui Li, Peixian Liang, Zhuo Zhao, and Danny Z Chen. SHMC-Net: A mask-guided feature fusion network for sperm head morphology classification. *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2024
- [3] Hongxiao Wang, Yang Yang, Zhuo Zhao, Pengfei Gu, **Nishchal Sapkota**, and Danny Z Chen. Path-GPTomic: A balanced multi-modal learning framework for survival outcome prediction. *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2024 [Oral]
- [4] Pengfei Gu, Zihan Zhao, Hongxiao Wang, Yaopeng Peng, Yizhe Zhang, **Nishchal Sapkota**, and Danny Z Chen. Boosting medical image classification with segmentation foundation model. *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2024 [Oral]
- [5] Yejia Zhang, Pengfei Gu, **Nishchal Sapkota**, Yaopeng Peng, Hao Zheng, and Danny Z Chen. Swipe: Efficient and robust medical image segmentation with implicit patch embeddings. *Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2023
- [6] Susan M Motch Perrine, **Nishchal Sapkota**, Kazuhiko Kawasaki, Yejia Zhang, Danny Z Chen, Mizuho Kawasaki, Emily Durham, Yann Heuze, Laurence Legeai-Mallet, and Joan T Richtsmeier. Embryonic cranial cartilage defects in the fgfr3y367c/+ mouse model of achondroplasia. *Anatomical Record*, 2023
- [7] Yejia Zhang, Pengfei Gu, **Nishchal Sapkota**, Hao Zheng, Peixian Liang, and Danny Z Chen. A point in the right direction: Vector prediction for spatially-aware self-supervised volumetric representation learning. *The IEEE International Symposium on Biomedical Imaging (ISBI)*, 2022
- [8] Yejia Zhang, **Nishchal Sapkota**, Pengfei Gu, Yaopeng Peng, Hao Zheng, and Danny Z Chen. Keep your friends close & enemies farther: Debiasing contrastive learning with spatial priors in 3d radiology images. In *2022 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, 2022
- [9] Yejia Zhang, Xinrong Hu, **Nishchal Sapkota**, Yiyu Shi, and Danny Z Chen. Unsupervised feature clustering improves contrastive representation learning for medical image segmentation. In *2022 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, 2022
- [10] **Nishchal Sapkota**, Rimsha Bhatta, Phillip Dabney, and Zhifu Xie. Hunting co-operation in the middle predator in three species food chain model. *Proceedings of the LA-MS Section of the Mathematical Association of America (MAA)*, 2020
- [11] **Nishchal Sapkota** and Bernd SW Schröder. Probabilistic analysis of revenues in online games. *University of Southern Mississippi*, 2020 [Undergraduate Thesis]

TEACHING EXPERIENCES

The University of Notre Dame	Notre Dame, IN
Graduate Teaching Assistant	
✦ Complexity and Algorithms (CSE 60111)	Spring 2023 & Spring 2024
✦ Mobile App Design (CSE 40333)	Spring 2021
✦ Discrete Mathematics (CSE 20110)	Fall 2020
STEM Project Leader Warrior-Scholar Project	
✦ Data Science and Exploratory Data Analysis	Summer 2023

SCHOLARSHIPS, GRANTS, HONORS AND ACHIEVEMENTS

2024 IEEE International Symposium on Biomedical Imaging (ISBI2024) Travel grant (\$800)	ISBI 2024
Graduate School Professional Development Fund (\$1, 250) & Conference Presentation Grant (\$450)	UND 2024
CSE Select Fellowship Award (1/40 incoming Ph.D students; yearly stipend worth \$40, 000)	UND 2020-2025
Wright W. and Annie Rea Cross Endowed Chair in Mathematics (\$10, 500)	USM 2017-2020
Danny R. Carter Endowed Scholarship (\$4, 000)	USM 2017, 2019
First Place , Mathematics Comprehensive Exam (MFT)	USM 2019
Second Runner Up : Best Undergraduate Paper	MAA Meeting 2019
Eagle SPUR/Wings grant, Drapeau Center for Undergraduate Research (\$2, 000)	USM 2019
Honors Keystone Scholarship (\$2, 000)	USM 2019
Finalist , Integration Bee	MAA Meeting 2018
Nominated for College of Science and Technology's Outstanding Sophomore Award	USM 2017
Burner Science and Technology Annual Scholarship (\$800)	USM 2017
Wallace C. and Lynn L. Pye Endowed Scholarship (\$800)	USM 2017