

# Nishchal Sapkota

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

## EDUCATION

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**The University of Notre Dame (UND)** Notre Dame, IN  
**Ph.D.** in Computer Science and Engineering 05/2026  
**Master of Science** in Computer Science and Engineering 08/2024  
Research Areas: Deep Learning, Computer Vision, AI for Healthcare, Medical Image Analysis

**The University of Southern Mississippi (USM)** Hattiesburg, MS  
**Bachelor of Science** with Honors (GPA: 3.91), *summa cum laude* 05/2020  
Dual Major: **Computer Science** and **Mathematics**  
Thesis: *Probabilistic Analysis of Revenues in Online Games*

## RESEARCH EXPERIENCES

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**The University of Notre Dame** Notre Dame, IN  
*Graduate Researcher* | Python, PyTorch, TensorFlow, Bash, Matlab 08/2020 - Present

- Currently developing a diffusion-based super-resolution framework for unpaired infrared photothermal heterodyne images, aimed at overcoming the Abbe diffraction limit and mitigating scanning-resultant background artifacts.
- Developed data efficient encoder-agnostic universal segmentation models for 3D images to learn from dissimilar datasets outperforming the state-of-the-art by up to 11% on zero-shot transfer. [1] [3] [8]
- Proposed a multimodal classification framework for automated sperm analysis and a shape-aware segmentation method using implicit neural representations improving data efficiency by 30%. [7]
- 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%. [4]
- Developed 3 self-supervised learning approaches achieving state-of-the-art segmentation performances. [9][10][11]
- Proposed different novel methods leveraging foundation models (based on SAM and GPT) for medical image classification [6] and cancer survival outcome prediction. [2][5]

**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. [12]
- 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. [13]

## SOFTWARE/MACHINE LEARNING ENGINEERING PROJECTS

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

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

**Our Safe Neighborhood** | Google Cloud NLP, NLTK, React, JavaScript, Flask CalHacks 6.0 @ UC Berkeley 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 crime's location, type, and severity.

## TECHNICAL SKILLS AND RELEVANT CONCEPTS

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**Programming:** Python, R, C++, Matlab, SQL  
**ML Packages:** PyTorch, Tensorflow, Scikit-Learn, SciPy, OpenCV, Pandas, NumPy, Matplotlib, WandB  
**ML Concepts:** Deep Learning, Computer Vision, Neural Networks, CNN, GAN, Transformers, NLP, LLM, Auto Encoders, Foundation Models, Self-supervised Learning, Generative AI, Multimodal Learning, INR, Diffusion Models  
**Tools:** Jupyter, LaTeX, Fiji, 3D Slicer, Adobe Illustrator, Git, Microsoft Office Packages  
**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. UniCoN: Universal conditional networks for multi-age embryonic cartilage segmentation with sparsely annotated data. *Submitted to Nature Scientific Reports*, 2024
- [2] Yejia Zhang, Hanqing Chao, Zhongwei Qiu, **Nishchal Sapkota**, Pengfei Gu, Danny Z Chen, Ke Yan, Dakai Jin, and Le Lu. IHCSurv: effective immunohistochemistry priors for multi-stain cancer survival analysis in gigapixel whole slide images. *MICCAI*, 2024
- [3] **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 ISBI*, 2024 [Oral]
- [4] **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 ISBI*, 2024
- [5] 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 ISBI*, 2024 [Oral]
- [6] 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 ISBI*, 2024 [Oral]
- [7] 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. *MICCAI*, 2023
- [8] 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
- [9] 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. *IEEE ISBI*, 2022
- [10] Yejia Zhang, **Nishchal Sapkota**, Pengfei Gu, Y. Peng, Hao Zheng, and Danny Z Chen. Keep your friends close & enemies farther: Debiasing contrastive learning with spatial priors in 3d radiology images. In *IEEE BIBM*, 2022
- [11] Yejia Zhang, Xinrong Hu, **Nishchal Sapkota**, Yiyu Shi, and Danny Z Chen. Unsupervised feature clustering improves contrastive representation learning for medical image segmentation. In *IEEE BIBM*, 2022
- [12] **Nishchal Sapkota**, R Bhatta, P Dabney, and Z 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
- [13] **Nishchal Sapkota** and Bernd SW Schröder. Probabilistic analysis of revenues in online games. *University of Southern Mississippi*, 2020

## TEACHING EXPERIENCES

### The University of Notre Dame

Notre Dame, IN

#### Graduate Teaching Assistant

↗ Complexity and Algorithms (CSE 60111)	Spring 2023 & Spring 2024
↗ Mobile Application Design (CSE 40333)	Spring 2021
↗ Discrete Mathematics (CSE 20110)	Fall 2020

#### STEM Project Leader | Warrior-Scholar Project

↗ Medical Image Analysis	Summer 2024
↗ Introduction to Data Science	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)	UND 2024
GSG Conference Presentation Grant (\$450)	UND 2024
CSE Select Fellowship Award ( <i>1/40 incoming Ph.D students; yearly stipend worth \$40,000</i> )	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
<b>First Place</b> , Mathematics Comprehensive Exam (MFT)	USM 2019
<b>Second Runner Up</b> : Best Undergraduate Paper	MAA Meeting 2019
Eagle SPUR grant, Drapeau Center for Undergraduate Research (\$2,000)	USM 2019
Honors Keystone Scholarship (\$2,000)	USM 2019
<b>Finalist</b> , Integration Bee	MAA Meeting 2018
Nominated for College of Science and Technology's <b>Outstanding Sophomore Award</b>	USM 2017
Burner Science & Tech. Scholarship (\$800), Wallace C. & Lynn L. Pye Endowed Scholarship (\$800)	USM 2017