Waqar Hussain Shah

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Work: Department of Exact Science and Technology, Centro Universitario de los Lagos., Lagos de Moreno (Mexico)

WORK EXPERIENCE

Lecturer

Superior college Esakhel [Jan 2023 – Current]

I teach Calculus, Linear Algebra-I, and college mathematics.

Research Assistant

Topological Data Analysis LAB at FAST-NUCES. [Jul 2022 – Jan 2023]

Mathematics lecturer

Army Public School and College Ordnance road [Aug 2021 – Jun 2022]

EDUCATION AND TRAINING

Doctorate in Mathematics

Centro Universitario de los Lagos, University of Guadalajara. [16 Jan 2024 – Current]

City: Jalisco | **Country:** Mexico

Master of Science in Mathematics

COMSATS University Islamabad [Sep 2019 – Aug 2021]

Final grade: CGPA: 3.68\4.00 | **Thesis:** Statistics on the Space of Persistent Diagrams with Applications

Automatic classification between normal and immature leukemic blast cancer cells is a challenging task due to their morphological similarity. We use techniques from Topological Data Analysis to extract topological and shape features. Using these features, we train a topological machine learning model. Our proposed approach captures exactly those features observed by a hematologist.

Bachelor of Science in Mathematics

University of Gujrat [Sep 2014 – Oct 2018]

Final grade: CGPA: 3.21\4.00

COURSE WORK

Course Work

Advanced Topology-I

Algebraic Geometry

Linear Algebra 1 & 2

Fluid Mechanics

Differential Geometry 1 & 2

Theory of Group, Rings & Modules

Analytical dynamics

PROGRAMMING SKILLS

Languages

Python

MATLAB

LANGUAGE SKILLS

Mother tongue(s): Urdu

Other language(s):

Spanish

LISTENING A1 **READING** A1 **WRITING** A1

SPOKEN PRODUCTION A1 **SPOKEN INTERACTION** A2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

PROGRAMMING AND LANGUAGE SKILLS

Skills

Programming:

I am proficient in MATLAB and Python.

Language:

1. My mother tongue language is Urdu
2. I have obtained a band score of 5.5 in IELTS, with a score of 5 in listening, 5 in reading, 6 in writing, and 6.5 in speaking.

PROJECTS

[Jul 2022 – Jan 2023]

Topological Data Analysis and its Application in the Detecting Lung Diseases

Our project, funded by the Higher Education Commission, develops a Topological Machine Learning model that automatically classifies and predicts COVID-19 severity using CT scan images, utilizing the Stoic Dataset and applying segmentation and classification/regression models.

HONOURS AND AWARDS

[16 Feb 2024] SECIHTI-Mexico

Doctoral Scholarship

I am pursuing my doctorate at the University of Guadalajara, with a fully funded scholarship from the Secretariat of Science, Humanities, Technology, and Innovation (SECIHTI) in Mexico.

[Aug 2023] Mathematics Media

2nd Position in Mathematics Poster Competition

[Jun 2022] Army Public School and College Ordnance road, Rawalpindi

Award of Excellence

This certificate of merit acknowledges me as a highly motivated and proactive member of the faculty.

ACHIEVEMENTS

[26 Jun 2024]
Talk in Lyapunov Seminar

Classification of Acute Lymphoblastic Leukemia using Persistent Homology.

[Oct 2021]
Talk

A lighting talk on, “Statistics on the Space of Persistent Diagrams with Applications” in 2nd workshop on Topological methods in Data Analysis. This virtual workshop was organized by the mathematical community of Heidelberg University, Germany.

[Apr 2021]
AATRN Poster

Presented a poster about my master's thesis in AATRN. AATRN is a network of researchers and data scientists interested in Algebraic Topology.

[22 Apr 2021]
Tutorial-a-thon Video

It was an honor to record a video titled *"An Introduction to Persim for Analyzing Persistence Diagrams"* for the AATRN community in 2021.

COURSES

[27 Feb 2024 – 12 Jul 2024]
Spanish Language Course

I learned the Spanish language from the language center of the University of Guadalajara-CU Lagos, Jalisco, Mexico.

[May 2022]
Recent developments in Applied and Computational Mathematics

This international conference was jointly organized by COMSATS University Islamabad and society for Industrial and Applied Mathematics (SIAM-CUI) student chapter.

[Sep 2020 – Oct 2020]
MATLAB for Maths and Data Science

In this course I have learned the two very generic libraries of Python are Numpy and Pandas.

Python for Machine Learning

CONFERENCES AND SEMINARS

Universidad Panamericana, Aguascalientes
EDIESCA 2024
I give a talk at Dissemination and Research in the Study of Complex Systems and their Applications (EDIESCA 2024, for its meaning in Spanish). EDIESCA is mainly organized by the Mexican Association of Dynamic Systems and Complexity.

PUBLICATIONS

[2025]

Persistent homology approach for uncovering transitions to chaos.

[2024]

Acute lymphoblastic leukemia classification using persistent homology

Acute Lymphoblastic Leukemia (ALL) is a prevalent form of childhood blood cancer characterized by the proliferation of immature white blood cells that rapidly replace normal cells in the bone marrow. The exponential growth of these leukemic cells can be fatal if not treated promptly. Classifying lymphoblasts and healthy cells poses a significant challenge, even for domain experts, due to their morphological similarities. Automated computer analysis of ALL can provide substantial support in this domain and potentially save numerous lives. In this paper, we propose a novel classification approach that involves analyzing shapes and extracting topological features of ALL cells. We employ persistent homology to capture these topological features. Our technique accurately and efficiently detects and classifies leukemia blast cells, achieving a recall of 98.2% and an *F1*-score of 94.6%. This approach has the potential to significantly enhance leukemia diagnosis and therapy.

REFEREES

Research Professor

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