

LI Yihai

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EDUCATION

- **Trinity College Dublin (TCD); Dublin, Ireland** Sept. 2023 - Nov. 2024
 - Master of Science (M.Sc): High Performance Computing;
 - Supervisor: Michael Pearson; GPA: 3.98/4.00 (Award and Distinction);
 - Key Modules: C/C++; HPC Hardware/Software; Numerical/Stochastic Methods; Machine Learning; Artificial Intelligence
- **ShanXi University (SXU); TaiYuan, China** Sept. 2016 - Jun. 2020
 - Bachelor of Science (B.S.): Theoretical and Applied Mathematics; GPA 86.07/100;
 - Key Modules: Analysis; Algebra/Topology; Real/Complex/Functional Analysis; ODE/PDE; Probability/Statistics Theory; Analytic/Differential Geometry; C; R; Matlab; Classical Physics; $\LaTeX$;

PUBLICATION

† denotes equal contribution

1. LI Yihai[†]; GU Shaotang[†]. International Conference on Big Data & Artificial Intelligence & Software Engineering (ICBASE), 2021. Detecting Post Hurricane House Damage Using Geographic Information Related Multi-Resource Classification Model
2. ZHANG Wenli; LIN Shangwei; LI Yihai; GUO Huiling. Computer Engineering and Application, 2019, 55(4): 62-65. Diagnosability of Unidirectional K-ary N-cubes under PMC Model

RESEARCH EXPERIENCE

- **Data Science and Artificial Intelligence: Deep Learning - Upper Intermediate** Remote Project
Supervised by Prof. Pavlos Protopapas from Harvard University; Team Leader Jan. 2021 - Mar. 2021
 - Acquired algorithms of machine learning specifically in Convolutional Neural Networks (CNNs) accelerated by CUDA.
 - Built Proxy model for CNNs' evaluation based on Bootstrap algorithm in Python using Tensorflow 2.
 - Utilized of Grad-CAM Map, Saliency Map to check the internal learning process in Python and Matlab.
 - Drafted and typeset a comprehensive final report in $\LaTeX$, including detailed performance graphs.
- **Diagnosability of K-ary of N-cubes under unidirectional PMC model** ShanXi University
Undergraduate Researcher & Team Leader; RIMAM Nov. 2017 - Nov. 2018
 - Authored 1-Good-Neighbor Diagnosability of Unidirectional K-ary N-Cubes under the PMC Model in *Computer Engineering and Applications*.
 - Employed combinatorial proof techniques using mathematical induction and constructive labeling to derive the diagnosability bound for K-ary N-Cubes.
 - Coordinated a 5-member team over a year, producing one journal submission on schedule.
 - Cultivated advanced skills in formal proof techniques, MATLAB coding, and team project management.
 - Formally derived 1-good-neighbor diagnosability bound $k(n-1)$, and n and $kn-1$.

SELECTED PROJECTS

- **Meta-Programming and Hybrid Parallel Strategies for Solving PDEs: An FDM and PINN Comparison** Trinity College Dublin
Jun. 2023 - Aug. 2024
 - Designed a template-object of distributed multi-dimensional matrix in C++ with contiguous memory layout, MPI async-communication enabled.
 - Implemented a meta-programming framework to auto-generate solver with shared memory parallelization enabled, for Poisson and Laplace PDEs with Dirichlet, Neumann conditions.
 - Developed a Physics Informed Neural Network (PINN) and accelerated by CUDA devices using Libtorch in C++ to predict PDE solutions.
 - Produced a MPI/OpenMP hybrid parallel PDE solver optimized for multi-thread and multi-node environment.
 - Conveyed comparisons on HPC cluster systems between PINN and FDTD method in terms of accuracy, efficiency and computational stability.

- Dublin Bike-usage Assessment of Pandemic by Means of Deep Learning**
Trinity College Dublin
Nov. 2023 - Jan. 2024
 - Developed and trained LSTM models to capture spatio-temporal patterns on Dublin city bike usage data in the last decade.
 - Applied data preprocessing and augmentation techniques to mitigate noise and address limited samples, to improve the model's robustness and accuracy.
 - Enhanced model performance by adapting pre-trained networks through transfer learning.
 - Visualized predictions and temporal trends using Matplotlib and Matlab, providing interpretable insights.
- Discrete Fourier Transform Based Convolutional Neural Networks for Visual Recognition**
ShanXi University
Sept. 2019 - Jun. 2020
 - Implemented convolutional neural networks (CNNs) in PyTorch and accelerated training using CUDA-enabled GPUs.
 - Designed custom edge-oriented filters combining handcrafted (HOG) and learned features to enhance CNNs.
 - Integrated HOG descriptors with CNN pipelines to explore edge-detection strategies.
 - Developed a Fast Discrete Fourier Transform (FDFT)-based filters with Ideal, Gauss, Butter-worth for spatial-frequency feature enhancement.
- Undergraduate Mathematical Modeling Group Competition**
Temperate University
Sept. 2018 - Nov. 2018

Group Leader

 - Led a 3-member team to win 1st place out of 40 teams in a university-wide mathematical modeling competition.
 - Utilized the LISp-Miner association rule algorithm to extract key feature relationships from a high-dimensional dataset.
 - Performed systematic dimensional analysis using Dimensional-analyysik-one tool to optimize models.

LEADERSHIP & TEACHING EXPERIENCE

- Student Representative**
Dublin, Ireland
Sept. 2023 - Nov. 2024

Trinity College Dublin, M.Sc Program, High-Performance Computing

 - Acted as a liaison between students and faculty, providing feedback on student concerns and feedback.
 - Represented student interests in academic and administrative committees.
 - Assisted faculty in enhancing academic experience through regular communication and problem resolution.
- Teaching Assistant**
Dublin, Ireland
Sept. 2023 - Jan. 2024

Trinity College Dublin, School of Mathematics

 - Graded assignments and exams for 4 undergraduate courses, ensuring fair and timely feedback.
 - Supported course delivery by collaborating with instructors to improve teaching strategies and student engagement.
 - Course: MAU22C00: Discrete Mathematics; MAU11S01: Mathematics for Scientists; MAU11E01: Engineering Mathematics; MAU11204: Analysis on the Real Line;

INTERNSHIP EXPERIENCE

- Oracle: Big-Data Research**
Peking, China
Nov. 2018

Internship; Teaching Assistant

 - Supported instructors in course delivery and provided guidance to students during big data training sessions.
 - Assembled X-shell client to control Ubuntu server remotely.
 - Configured and managed encrypted Hadoop clusters on Ubuntu servers via X-shell for data processing.
 - Setup Hadoop files system on Apache to optimize cluster performance and security.

AWARDS

- Award and Distinction** ; Trinity College Dublin, Award M.Sc. 2023 - 2024
- Outstanding Final Project Award (1.5%)** ; Shanxi University 2019 - 2020
- Annual Third-class Outstanding Student Scholarship (8%)** ; Shanxi University 2018 - 2019
- Successful Participant**; Interdisciplinary Contest In Modeling (ICM) Jan. 2019
- Best Overall Performance Winner, Temperate University** ; Mathematical Modeling Competition Nov. 2018
- The Third-class Award**; The 10th Chinese Mathematics Competitions (Mathematics Groups) Nov. 2018
- Honorable Mention** ; Interdisciplinary Contest in Modeling Jan. 2018
- The First-class Award** ; The 9th Chinese Mathematics Competitions (Mathematics Groups) Nov. 2017
- Annual First-class Outstanding Scholarship (2.5%)** ; Shanxi University 2016 - 2017
- The Annual Merit Student (2.5%)** ; Shanxi University 2016 - 2017
- Second-class Award** ; Mathematical Contest in Modeling (MCM), Shanxi Province Nov. 2016