

# Chi-Hsien (Salima) Chang

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## RESEARCH INTERESTS

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My research focuses on **developing theoretical support for model-based genetic algorithms**, aiming to bridge the gap between theoretical understanding and practical applications of algorithms in solving complex optimization problems. Additionally, my research focuses on **developing improved fully interpretable simulators for pre-mRNA splicing**, aiming to enhance our understanding of splicing processes, thereby improving the interpretation of genetic variants and facilitating therapeutic interventions in gene expression.

## EDUCATION

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**National Taiwan University (NTU)** September 2018 – June 2025 (Expected)  
Doctor of Science in Electrical Engineering, Computer Science Division; GPA: **4.00/4.30**  
Topic: Theoretical Analysis for Module-building Genetic Algorithms  
Advisor: Tian-Li Yu

**National Taiwan University (NTU)** September 2016 – June 2018  
Master of Science in Statistics; GPA: **3.71/4.30**  
Topic: Statistical Analysis of the Application of Augmented Reality in the Salah Learning System  
Advisors: Cheng-Ying Chou, Yi-Ping Hung

**National Chengchi University (NCCU)** September 2013 – June 2016  
Bachelor of Science in Mathematics; GPA: **3.22/4.30**

## PUBLICATION

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- **Chi-Hsien Chang**, Szu-Ping Chen, Christopher Childers, and Monica Poelchau. From Genetic Variation to Visual Representation: Image Predictions in Insect Databases Using SNP. In *the Joint Conference of the International Association for the Study of Traditional Asian Medicine (IASTAM) and the Asian Society for the History of Medicine (ASHM)*, 2024.
- **Chi-Hsien Chang** and Ting-Shuo Chuang. Phased Integration of the BOPPPS Model and Large Language Model for Enhanced English Learning. In *the International Conference on Applied Linguistics and Language Teaching (ALLT)*, 2024.
- Jung-Chun Liu, **Chi-Hsien Chang**, Shao-Hua Sun, and Tian-Li Yu. Integrating Planning and Deep Reinforcement Learning via Automatic Induction of Task Substructures. In *the International Conference on Learning Representation (ICLR)*, 2024.
- Tzu-Hao Hsu, **Chi-Hsien Chang**, and Tian-Li Yu. Program Synthesis on Single-Layer Loop Behavior in Pure Functional Programming. In *the IEEE World Congress on Computational Intelligence (WCCI)*, 2024.
- Tu-Chin Chiang, **Chi-Hsien Chang**, and Tian-Li Yu. A Novel Symbolic Regressor Enhancer Using Genetic Programming. In *the IEEE World Congress on Computational Intelligence (WCCI)*, 2024.
- **Chi-Hsien Chang**, Szu-Ping Chen, Monica Poelchau, and Christopher Childers. Exploring Genetic Information with Ease: The Linkout Plugin for JBrowse 2. In *the microPublication Biology Journal*, 2023.
- **Chi-Hsien Chang**, Tu-Chin Chiang, Tzu-Hao Hsu, Ting-Shuo Chuang, Wen-Zhong Fang, and Tian-Li Yu. Taylor Polynomial Enhancer using Genetic Programming for Symbolic Regression. In *the proceedings of the Companion Conference on Genetic and Evolutionary Computation (GECCO)*, 2023.
- Wen-Zhong Fang, **Chi-Hsien Chang**, Jung-Chun Liu, and Tian-Li Yu. GP with Ranging-Binding Technique for Symbolic Regression. In *the proceedings of the Companion Conference on Genetic and Evolutionary Computation (GECCO)*, 2023.

- Po Ying Law, Chia-Cheng Tsai, Tsz Wun Fok, Ching-Ting Wang, **Chi-Hsien Chang**, Tsung-Yu Chin, Yi-Chen Liao, Jen-Kuang Lee, and Chung-Wei Lin. Secure Medical Data Management Based on Homomorphic Encryption and Secret Sharing. In *the IEEE International Conference on Smart Cloud (SmartCloud)*, 2023.

## RESEARCH EXPERIENCE

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**Massachusetts Institute of Technology (MIT)** Visiting Student June 2024 (Expected) – May 2025

- Developing **fully-interpretable simulators for pre-mRNA splicing** to better understand splicing processes for improving the interpretation of genetic variants and facilitating therapeutic interventions in gene expression. Focusing on applying algorithms to identify suboptimal parses and establishing a quantitative metric for the robustness of predictions for exon and intron.

**National Institute of Informatics (NII)** Research Intern February. 2024 – April 2024

- Developing **molecular generation algorithms** with model-based genetic algorithms, linkage learning, and clustering techniques. This approach aims to enhance the representation and analysis of molecular structures, facilitating advancements in computational chemistry and drug discovery.

**United States Department of Agriculture (USDA)** Research Intern February 2023 – August 2023

- Developed **Linkout plugin for JBrowse 2**, enhancing the accessibility and utility of genomic data. Additionally, developed a **machine learning model capable of predicting images in insect databases based on single nucleotide polymorphisms (SNPs)**, which holds potential for improving pest identification and management strategies.

**National Taiwan University** Research Assistant September 2016 – March 2024

During the doctoral program

- **Research on Model-based Genetic Programming Applied to Symbolic Regression:** Guided master's students through in-depth research discussions on genetic programming, specifically applied to symbolic regression, and conducted comprehensive code reviews to enhance project outcomes.
- **Development of Model-based Real Number Optimization Techniques - Subspace Exploration Combining Characteristics of Discrete and Real Number Domains:** Led the experimental design discussions and co-authored the research report for a pioneering study on model-based real number optimization techniques.
- **Learning with Limited Data :** Successfully improved the accuracy of a semi-supervised learning model from 77.4% to 81.2% on the MIT-BIH Arrhythmia Database. This enhancement was achieved by integrating data augmentation techniques, including both feature space and instance space augmentation, demonstrating advancements in learning with limited datasets.
- **Research on the Social, Ethical, and Legal Aspects of Artificial Intelligence:** Conducted a comprehensive survey and synthesis of existing research related to the social, ethical, and legal implications of artificial intelligence, aiming to highlight key challenges within the field.

During the master's program

- **Comprehensive Improvement of Interdisciplinary Teaching/Research Facilities:** Provided guidance in statistical analysis, encompassing experimental design, non-parametric analysis, and post-hoc testing, to significantly enhance the capabilities of interdisciplinary teaching and research infrastructures.
- **Development of Phytosanitary Treatment and Risk Assessment Techniques - Research of Automated Detection Technologies for Significant Quarantine Pests:** Leveraged statistical analysis using Python to advance the research and development of automated detection technologies for identifying significant quarantine pests.

- **Digital Spectral Mammography Tomography Reconstruction Combining Scatter and Angular Correction:** Employed statistical analysis using R to refine digital spectral mammography tomography reconstruction techniques.
- **Development of Phytosanitary Pest System Management and Quarantine Treatment Techniques - Development of Plant Quarantine Treatment Technologies:** Utilized statistical analysis using SAS to facilitate the optimization of plant quarantine treatment technologies.

## TEACHING EXPERIENCE

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**National Taiwan University** Teaching Assistant September 2019 – Current

- **Python:** Mentored 100+ students in their team projects and contributed to designing assignments. Earned 4.35/5.0 score from students' feedback on the teaching assistant's course evaluation.
- **C#:** Received the National Summer College Excellent Teaching Assistant Award. Earned 4.89/5.0 score from students' feedback on the teaching assistant's course evaluation.
- **Genetic Algorithms:** Actively engaged in note-taking during lectures and made these notes available for student review post-class, facilitating deeper understanding and retention of course material. Earned 4.96/5.0 score from students' feedback on the teaching assistant's course evaluation.
- **Artificial Intelligence and Machine Learning:** Taught in English, this course required a nuanced understanding of both subject matter and language to effectively communicate complex concepts. Earned 4.0/5.0 score from students' feedback on the teaching assistant's course evaluation.
- **Calculus:** Played a crucial role in calculus tutorial sessions by addressing students' questions, thereby enhancing their comprehension and problem-solving skills in this fundamental mathematical discipline.

## HONORS & AWARDS

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- **Outstanding University Youth Award** at NTU 2023
- **Student Altruism Award** at College of Electrical Engineering and Computer Science, NTU 2023
- **Excellent Teaching Assistant Award** at National Summer College, NTU 2022
- **Commencement Speaker** for the Master's Degree in Statistics at NTU 2018
- **Awarded U-stat Plan** at National Taiwan University of Science and Technology (NTUST) 2018
- **Awarded 1st Place** in 2nd Yunus Prize on Social Innovation/Entrepreneurship Competition 2017
- **Club Excellence Award** during my tenure as President of Islamic Cultural Club at NCCU 2016