Hongwei (Vincent) **Cai**

Master of Computer Science
Department of Computer Science
University of Iowa

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EDUCATION

2025 (Expected)	Master's, Computer Science	University of Iowa, IA
	Coursework:	GPA: 3.87/4.00

ECE 5450 Machine Learning
ECE 5995 Applied Machine Learning
MATH 4840 Mathematics of Machine Learning
CS 4420 Artificial Intelligence
CS 4300 Theory of Computation
CS 3620 Operating Systems
CS 4400 Database Systems
CS 4330 Design and Implementation of Algorithms
CS 4980 Designing Systems and Algorithms for Biomedicine
CS 3820 Programming Language Concepts
CS 2230 Data Structures
CS 2630 Computer Organization
CS 3330 Algorithms

2023	Ph.D., Composition	University of Iowa, IA
	Thesis: Path to the Third Pole for Sinfonietta	

2015	M.M., Composition	Oklahoma City University, OK
	Thesis: The Compositional process in Trio	

2012	B.Lit., Composition	Shenyang Conservatory of Music, China

EXPERIENCE

2024 Summer — **Software Engineering Intern – Commerce Integration Platform**
Casey's, Ankeny, IA

- Gained exposure to Agile methodologies and actively participated in Scrum ceremonies, developing effective communication and fostering teamwork throughout the software development lifecycle (SDLC)
- Acquired hands-on experience of CI/CD and DevOps practices by solely responsible for the tech debt project of upgrading all Commerce Integration Platform applications to .NET 8, ahead of the .NET 6 end-of-life in November 2024
- Supported various IT initiatives including decommissioning unused applications, documenting server vulnerabilities, removing EWS firewall rules by submitting tickets through ServiceNow
- Obtained in-depth exposure to data-driven decision-making and advanced data strategies through job shadowing in Marketplace Data, Platform Engineering, and Data Science teams
- Enhanced understanding of penetration testing and data loss prevention (DLP) through experience in Red Teaming, Data Assurance, and Cyber Intelligence within Cyber Operations

2023 – current — **Graduate Teaching Assistant**
Department of Computer Science, University of Iowa
CS:2230 Data Structures

- Led weekly discussion sessions teaching Java programming, guiding students in algorithm analysis for time and space complexity, and data structures selection for various tasks
- Supported students in implementing data structures, understanding their operations, and applying object-oriented programming (OOP) principles

CS:3820 Programming Language Concept
- Supported instruction in the functional programming language Haskell and programming proofs using Agda
- Established open communication via office hours, email, and resolved issues in collaboration with fellow TA

CS:2630 Computer Organization
- Instructed two cohorts of 20 students during 75-minute classroom sessions in a supportive learning environment
- Assistant in teaching C programming, Bash, assembly language programing, X86 Instruction Set Architecture (ISA), memory management, and CPU pipelining

2018 – 2019	**Graduate Research Assistant**
	Center for New Music, School of Music, University of Iowa

- Studied musical scores in detail, gaining a deep understanding of the composer's intentions, musical structure, and interpretive nuances
- Assisted in coordinating concerts, workshops, and various events at the Center for New Music
- Offered artistic input during rehearsals, discussions with the director, and interpretation of musical pieces
- Offered technical support for equipment and displays employed in new music research to enhance concert experiences
- Assisted in ensuring the ensemble's performance meets the recording requirements

2017 – 2020	**Course Instructor**
	School of Music, University of Iowa

- Taught Music Composition course MUS: 1020 and MUS:1139
- Coached non-major students in one-on-one setting to enhance their composition skills and musicianship
- Developed lesson plans from weekly course outlines and crafted examples to suit needs of the class
- Assessed assignments and final project

PROJECTS

2024	**Automatic Speech Recognition (ASR) System**
	Python, Numpy, Kaldiio, JSON

- In progress

2024	**Cross-Modality MRI Synthesis with CycleGANs**
	Google Colab, PyTorch, NumPy, Pandas, Matplotlib, MONAI, Slicer, Horos

- Replicated a 2D CycleGAN model to translate between MRI modalities (T1&T2) using Vestibular-Schwannoma-SEG dataset
- Implemented advanced deep learning techniques including PatchGAN discriminators and residual-based generators for robust image transformation

- Integrated Adam optimizers with exponential decay schedulers to optimize GAN training, ensuring stable and efficient model convergence

2024 **Predicting functional annotations in Gene Ontology with maps of protein structure space**
Python, PDB, GO, FATCAT, DALI, Unknome, PCA, MDS

- Replicated algorithms to predict protein functions by analyzing structural similarities using dimensional reduction techniques
- Mapped protein structure space and identified functionally similar clusters based on pairwise structural comparisons
- Generated and analyzed protein similarity matrices using structural alignment tools and predicted Gene Ontology annotations
- Validated functional predictions by comparing them with known annotations, adjusting the model based on validation results

2024 **Enhancing Image Super-Resolution Using EDSR**

- Replicated the Enhanced Deep Super Resolution (EDSR) model, using its deep architecture and residual blocks, gaining insights into advanced image resolution techniques compared to traditional methods like SRCNN and SRResNet in image resolution
- Applied a modular block-based approach in a single-scale EDSR model to convert low-resolution images into high-resolution outputs, significantly enhancing visual details

2023 **FoodShareConnect,** HACKUIOWA Project
Python, Django, JavaScript, ReactJS, HTML, CSS, MariaDB, Git

- Managed front-end development, collaborated efficiently with back-end teammates for seamless integration
- Facilitated effective communication, driving efficient issue resolution, idea sharing, and timely project delivery
- Utilized GitHub for version control, fostering a collaborative development environment

2023 **Combination Tone Generator**
Python, Flask, JavaScript, HTML, CSS, PyCharm, Git

- Implemented input validation for error reduction and enhanced tool reliability
- Designed a user-friendly responsive interface with CSS adaptable to various screen sizes
- Developed an note frequency caching mechanism for improved responsiveness

2023 **Website Building and Design**
HTML, CSS, JavaScript, VS Code, Front-end Development, Git

- Rebuilt personal website from scratch, refining HTML, CSS and JavaScript skills for an engaging user experience
- Created a user-centric, responsive interface with adaptable CSS for seamless browsing on different screen sizes
- Improved website's SEO, increasing search engine visibility and organic traffic

2022 **Build ARM Processor**
Logisim, Python, Bash, Linux, GitLab

- Designed a complex digital system, adding new instructions to the datapath and control during implementation

- Applied combinational logic to build ARM processor components in Logisim and created Python test programs
- Employed robust testing methodologies for digital logic design, ensuring accuracy and reliability

ARTISTIC ACTIVITY

Selected Compositions and Performances

2023   Path to the Third Pole for sinfonietta

2021   Scapulis Suis for SSA choir a cappella

2021   How Soon Hath Time for mixed choir divisi a cappella on John Milton's Sonnet

2021   Dal niente, al niente, a song set to Shelley's "Ozymandias" for soprano, flute, and harp
- The ensemble Dal Niente, University of Iowa (Apr 18, 2021)

2021   Collapsing Shells for solo double bass and live electronics
- Will Yager, double bass, University of Iowa, May 9, 2021
- Will Yager, double bass, University of Iowa, Mar 28, 2021

2020   String Quartet No.2 "Poppies Bursting into Bloom in the Wind and Rain"
- The JACK Quartet, Merkin Concert Hall, NYC, Mar 10, 2021

2020   Impulse for solo trombone
- Mark Rheaume, trombone, University of Iowa, Nov 17, 2020

2020   Unrest for solo clarinet
- Arianna Edvenson, clarinet, University of Iowa, Sep 28, 2020

2019   Soaring Over a Storm
- Yixue Snow Zhang, violin, University of Iowa, Dec 8, 2019
- Yixue Snow Zhang, violin, Indiana University, Nov 9, 2019

2019   Tempest in Yellow
- Eva Richards, cello, University of Iowa, Sep 8, 2019

2018   String Quartet No.1 Attainment of The Other Shore
- SCI Online National Concert and Workshops, May 6, 2021
- Contemporary Directions Ensemble, University of Michigan, Apr 10, 2021
- The JACK Quartet, University of Iowa, Mar 13, 2019

2018   You Came from Our Hometown for solo voice, poem by Wang Wei (699-761)
- Anika Kildegaard, soprano, University of Iowa, Sep 9, 2018

2017   Moments for Chamber orchestra
- CCM Chamber Orchestra, University of Cincinnati, Oct 19, 2018
- Center for New Music, University of Iowa, Apr 6, 2018

2017   Nocturne for clarinet, cello, and piano
- The Ensemble Accroche Note, University of Iowa, Apr 27, 2019
- Maurício Silva, clarinet, Craig Hultgren, cello, Hongwei Cai, piano, University of Michigan, Nov 11, 2017

Selected Performances as a Pianist

2018   John Adams: *Gnarly Buttons*
- Center for New Music, University of Iowa, Dec 2, 2018

2018   John *Clay* Allen: *Light Pillars*
- Center for New Music, University of Iowa, Apr 6, 2018

2018   Qi Jing: *The Hesitation in Your Eyes*
- Center for New Music, University of Iowa, Apr 6, 2018

CONFERENCES

2021   Midwest Graduate Music Consortium
- Presented String Quartet NO.1 "Attainment of the Other Shore"

2019   Midwest Composers Symposium (University of Indiana)
- Premiered solo violin work "Soaring Over a Storm"

2018   Midwest Composers Symposium (University of Cincinnati)
- Presented chamber orchestral work "Moments" in the opening concert

2018   Exchange of Midwest Collegiate Composers (UIowa)
- Premiered orchestral work "Moments" in the opening concert

2017   Midwest Composers Symposium (University of Michigan)
- Premiered chamber music work "Nocturne"
- Participated in two other composers' works premiere as a pianist

2017   Exchange of Midwest Collegiate Composers (UMKC)
- Participated in two works premiere as a pianist

HONORS & AWARDS

2023	<u>Marcus Bach Graduate Fellowship</u> Awarded $10,500 for promoting intercultural communication and understanding of diverse religious perspectives	University of Iowa
2021	Graduate College Summer Fellowship Awarded $5,000 to support summer research	University of Iowa
2019	Henry and Parker Pelzer Fellowship Award Awarded $10,000 to one outstanding composer each year	University of Iowa
2017	Henry and Parker Pelzer Fellowship Award Awarded $10,000 to one outstanding composer each year	University of Iowa
2014	Graduate Music Talent Scholarship Awarded $9,000 to music major student each year	Oklahoma City University
2013	Graduate Music Talent Scholarship Awarded $9,000 to music major student each year	Oklahoma City University
2010	Won first place for the biannual Piano Competition	Shenyang Conservatory of Music
2010	SYCM Merit Scholarship	Shenyang Conservatory of Music

2009	SYCM Merit Scholarship	Shenyang Conservatory of Music

CAMPUS INVOLVEMENT

2023	HACKUIOWA, the University of Iowa Hackathon
2023	"Teaching as an International Student" Presentation at New TA Orientation

PROFESSIONAL AFFILIATIONS

2023	Association for Computing Machinery
2018	American Society of Composers, Authors, and Publishers
2017	Golden Key International Honor Society
2017	Phi Beta Delta Honor Society for International Scholars
2016	Society of Composers, Inc

PROFESSIONAL DEVELOPMENT

2023	Introduction to High Performance Computer using Argon Cluster
2023	Cloud Computing Workshop Series using Amazon Web Services
2020	Engaging Across Cultures: Navigating Intercultural Conflicts
2015	Composing for Video Games with Thomas Chance

TECHNICAL SKILLS

Programming Languages: Python, Java, C#/.NET, C/C++, JavaScript, Java, Haskell, HTML5/CSS3

DS/ML Libraries: PyTorch, Scikit-Learn, NumPy, Pandas, Matplotlib, Seaborn

Databases: MySQL, PostgreSQL, Microsoft SQL, MongoDB

Tools & Technologies: Jira, New Relic, Confluence, ServiceNow, Microsoft Azure, Azure DevOps, Git/GitHub, Docker, Linux, HPC

OTHER SKILLS

- Teaching
- Music Engraving (Avid Sibelius, Finale)
- Post Audio production (Avid Pro tools, Logic Pro)
- Reference Management (Endnote)
- Audio-Visual Interface (Max/MSP/Jitter)

LANGUAGES

- English (American) – Full professional proficiency
- Mandarin Chinese – Primary proficiency