Zack While

Data Visualization, Accessibility, and Computer Vision

Personal Information

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Education

Current Sept 2018	**UMass Amherst** *MS/PhD in Computer Science* **Advisor**: Prof. Ali Sarvghad **Expected Graduation**: May 2024	Aug 2014-May 2018	**Youngstown State University** *BS with Honors, Summa Cum Laude* **Majors**: Computer Science, Mathematics **Overall GPA**: 3.97/4.0

Research Experience

Current

Research Assistant at University of Massachusetts Amherst (MA)
Data Visualization, Human-Computer Interaction Research
Research focusing on data visualization accessibility.
Advisor: Prof. Ali Sarvghad

May-Aug 2021

Research & Development Intern – Computer Vision at Kitware (NY)
Summer Internship (Remote)
Low-shot object detection for internal and government-contracted research and development projects.

May-Aug 2020

Research Assistant at University of Massachusetts Amherst (MA)
Computer Vision, Graphics Research
Studied the application of Neural Radiance Fields to the task of scene relighting. Rendered a new dataset of scenes with varying camera angles, materials, and backgrounds. Additionally compared the effectiveness of the neural radiance field as a prior for the tasks of super-resolution and inpainting. Funded by a grant from the NSF. Dataset generated using Mitsuba2 renderer, deep learning pipeline implemented using PyTorch.
Advisor: Prof. Rui Wang

May-Aug 2019

Research & Development Intern – Computer Vision at Kitware (NY)
Summer Internship
Carried out internal government-contracted research and development on two different projects, one focusing on object detection and the other focusing on object tracking. Utilized Kitware's open-source KWIVER project and contributed to the open-source VIAME computer vision project, integrating the SiamRPN object tracker.

June-Aug 2018

Technical Intern – Machine Learning at Ball Aerospace (OH)
Summer Internship
Developed predictive and generative deep learning models that utilize geosensor data for commercial use. Worked with both imagery as well as numerical data, prototyping neural network architectures and evaluating their performance on propriety datasets. Used Python with Keras.

May-Aug 2017

Undergraduate Researcher at University of Central Florida (FL)
NSF Research Experience for Undergraduates
Worked on an end-to-end, three-dimensional convolutional neural network architecture that segments the foreground object in video. The three-dimensional encoder-decoder framework takes eight frames as input and returns eight corresponding heatmaps, classifying each pixel as the object or background in each frame. Evaluated the model on the DAVIS 2016 video segmentation dataset.
Advisors: Prof. Chen Chen and Prof. Mubarak Shah

Publications

SceneGraphNet: Neural Message Passing for 3D Indoor Scene Augmentation
Y. Zhou, Z. While, & E. Kalogerakis
ICCV 2019

Detecting Compromised Implicit Association Test Results Using Supervised Learning
B. Boldt, Z. While, & E. Breimer
ICMLA 2018

Awards and Honors

May 2020   **Outstanding Teaching Assistant Award** — UMass Amherst College of Information & Computer Science

April 2018   **Clarence P. Gould Society Induction** — Youngstown State University
April 2018   **J. Douglas Faires Outstanding Student in Mathematics and Statistics** — YSU Math Department
April 2017   **Meritorious Designation** — COMAP Mathematical Competition in Modeling
April 2016   **Honorable Mention** — Barry M. Goldwater Scholarship
Aug 2015   **Pi Mu Epsilon Award for Excellence in Student Exposition & Research** — MAA Mathfest
June 2015   **Pi Mu Epsilon (PME) Honorary National Mathematics Society Induction**
Feb. 2014   **Eagle Scout Award** — Boy Scouts of America
Feb. 2014   **Leslie H. Cochran Full-Ride Scholarship** — YSU Honors College

Relevant Projects

Fall 2019 | **Line Drawings as a Prior** for Neural Style Transfer
Computer Vision Class at the University of Massachusetts Amherst

Using human-drawn sketches as an additional input to the CartoonGAN (CVPR 2018) architecture to evaluate their effectiveness as a prior. Used the Sketchy Database (SIGGRAPH 2016), which provided natural images with several different human-drawn images. Implemented in Python with PyTorch.

Spring 2019 | **Neural Style Transfer** for 2D Art Styles
Intelligent Visual Computing Class at the University of Massachusetts Amherst

Combining methods of CartoonGAN (CVPR 2018) and StarGAN (CVPR 2018) to improve upon the results from CartoonGAN in the task of transforming real-world images into cartoon scenes. Collected my own dataset of frames from 3 different cartoons to be used as the different domains for StarGAN. Implemented in Python with PyTorch.

Spring 2019 | **Adversarial Machine Learning** for Convolutional Neural Networks
Advanced Information Assurance Class at the University of Massachusetts Amherst

Reimplemented experiments from "Distillation as a Defense to Adversarial Perturbations against Deep Neural Networks" (IEEE S&P 2016) and "Towards Evaluating the Robustness of Neural Networks" (IEEE S&P 2017). Tested to adversarial example generation. Evaluated on MNIST and CIFAR-10, implemented in Python with Keras.

Spring 2018 | **Image Classification** for Video Game AI
Undergraduate Research Class at Youngstown State University

Created a bot to play the video game *Rocket League* that only uses the current screen as input and returns the chosen button-presses. Modeled task of in-game decision-making as an image classification problem, where each image's label is the correct set of button presses. Used *ResNet* architecture, implemented in Python using PyTorch.

Spring 2016 | **Mathematical Modeling** with Crime Data
Preparing for Industrial Careers in Mathematics Class at Youngstown State University

Used logistic regression to model crime movement in Youngstown, OH and assess the impact of city revitalization efforts on crime rates. Evaluated the statistical significance of city neighborhood intervention on crime rates.

Summer 2015 | **Applied Group Theory** at Youngstown State University
Mathematics Research and Presentation

Researched an abstract algebra algorithm that utilizes products of distinct transpositions, made famous by an episode of the acclaimed animated television series *Futurama*; presented at the 2015 National MAA Mathfest conference. Received an *Award for Excellence in Student Exposition and Research* from the Pi Mu Epsilon Math Honors Society.

Teaching Experience

Spring 2022 **Spring 2021**	Teaching Associate at The University of Massachusetts, Amherst, MA *COMPSCI 240: Reasoning Under Uncertainty* Held office hours, designed course content for discussion sections, ran a discussion section, contributed to homework/exam design, and graded exams. Gave class lectures for 2-3 weeks of the semester. **Co-Taught With:** Prof. Andrew Lan
Fall 2021 **Fall 2020**	Teaching Associate at The University of Massachusetts, Amherst, MA *COMPSCI 191: First-Year Seminar* In charge of first-year seminar for freshman in the College of Computer Science & Information Systems. Seminar topic is math puzzles, and duties include course material design, weekly lecture, and weekly office hours. Discussed various mathematical models used to solve puzzles as well as introductions to GitHub, LaTeX, and terminal commands.
Winter 21-22 **Fall 2021**	Teaching Assistant at The University of Massachusetts, Amherst, MA *COMPSCI 121: Introduction to Problem-Solving with Computers* Class introduces first-year computer science students to programming, using the Java language. In charge of running a weekly lab section, grading assignments, answering questions on Piazza, and assisting with POGIL activities. **Taught By:** Spencer Lane, Prof. Cheryl Swanier
Fall 2020 **Fall 2019** **Fall 2018**	Teaching Assistant at The University of Massachusetts, Amherst, MA *COMPSCI 240: Reasoning Under Uncertainty* Class covered introductory topics in probability theory and combinatorics. Held office hours for an hour as well as running a discussion section for 50 minutes per week. Graded midterms and homework assignments. Head TA for Fall 2020 semester, in charge of designing course content for discussion section and contributing to exam design. **Taught By:** Prof. Jie Xiong, Prof. Ivan Sunghoon Lee
Spring 2020	Teaching Assistant at The University of Massachusetts, Amherst, MA *COMPSCI 373: Introduction to Computer Graphics* Class teaches basic methods in Graphics pipeline using the `three.js` library. Held two hours of office hours each week, answered question on class forum, and grading homework and exams. **Taught By:** Prof. Rui Wang
Summer 2019	Teaching Assistant at The University of Massachusetts, Amherst, MA *COMPSCI 187: Introduction to Programming with Python* Class teaches introductory programming through Python for non-computer science majors. Held office hours for 3 hours per week. Graded homeworks, projects, and exams. **Taught By:** Prof. Timothy Richards, Prof. Gordon Anderson
Spring 2019	Teaching Assistant at The University of Massachusetts, Amherst, MA *COMPSCI 119: Introduction to Programming with Python* Class teaches introductory programming through Python for non-computer science majors. Held office hours for 3 hours per week. Graded homeworks, projects, and exams. **Taught By:** Prof. William T. Verts

Programming Skills

Basic Knowledge	C#, CSS, HTML, Maple, PHP, SQL, C
Working Knowledge	Python, Javascript, Keras, PyTorch, Tensorflow, R, C++, Java, Javascript, LaTeX, MatLab, Git

Software Skills

Basic Knowledge	GIMP, SPSS
Working Knowledge	Tableau, Weka, Blender, Unity, Microsoft {Excel, PowerPoint, Word}, Ubuntu

Poster Presentations

November 2019	Object Cartoonizing with Sketch-Photo Pairs **UMass Amherst Computer Vision Course Poster Session**
April 2018	Using Deep Learning to Play Rocket League **YSU STEM Showcase**
July 2017	Video Object Segmentation Using Deep Learning **UCF Computer Vision REU 30-Year Celebration**
April 2017	Creating an AI Opponent for the Board Game "Onitama" **YSU STEM Showcase**
July 2016	Analyzing Historic Crime and Neighborhood Stabilization in Youngstown, Ohio **SIAM Annual Meeting, PIC Math Session**

Conference-Style Presentations

Aug 2019	Methods in Object Detection & Tracking **Kitware Summer Internship Presentation**
Aug 2018	Frame Prediction for Geosensor Data **Ball Aerospace Summer Internship Presentation**
Oct 2017 Oct 2016 Oct 2015	Exploring the Mathematics of the Rubik's Cube **YSU Mathfest**
Feb 2017	Evaluating Kostant's Weight Multiplicity Formula **Midwest Undergraduate Mathematics Symposium**
Aug 2016	Using Machine Learning to Identify Cheaters in Implicit-Association Tests **National MAA Mathfest Conference**
April 2016	Examining and Predicting Crime in Youngstown, Ohio **Youngstown Neighborhood Development Corporation Presentation**
Feb 2016 Aug 2015	The Ultimate Mind-Bender: Futurama's Mind-Switching Problem **National MAA Mathfest Conference** **YSU Pi Mu Epsilon Regional Conference**

Extra-Curricular Activities

Current	**Community Outreach Student Team (COST)** — UMass College of Information & Computer Science
2020-2021	**Graduate Student Senator** — UMass College of Information & Computer Science
2016-2018	**YSU Honors College Journal, the Emperor** — Student Editorial Board
2016-2018	**Society of Industrial and Applied Mathematics**
2016-2018	**YSU Basketball Pep Band** — Tuba Section Member (2016-2017), Tuba Section Leader (2017)
2015-2018	**YSU Association for Computing Machinery Chapter** — Student Member
2015-2018	**Pi Mu Epsilon National Math Honor Society** — Webmaster (2015), Vice President (2016-2018)
2015-2018	**YSU Quizbowl Team** — Vice President, Co-Founder
2014-2017	**YSU Marching Band** — Baritone (2014), Tuba (2015-2017) Section Member

Academic/Community Service

2022	Teaching Email Basics to Older Adults (CICS COST)
2021	IEEE VIS Conference Student Volunteer
2021	HackUMass Judge
2021	UMass Amherst CICS Undergraduate Research Volunteers Program (URV)
2015-2018	YSU Honors College Big & Little Program
2014-2018	Directing High School *National Academic Quiz Tournaments* (NAQT) Tournaments
2014-2018	Reading for Collegiate NAQT Tournaments
2015-2017	YSU MathFest Presenter
2015-2017	FIRST Lego League (FLL) District, Regional Competition Volunteer
2015-2016	Oh WOW! Silly Science Sunday Demonstrations & Outreach
2015-2016	YSU Honors College Penguin Pen Pals
2014-2015	FIRST Robotics Competition (FRC) Regional Competitions

Relevant Graduate Coursework

- Internet Law & Policy
- Database Design & Implementation
- Artificial Intelligence
- Computer Vision
- Advanced Algorithms
- CS Research Writing Practicum
- Advanced Information Assurance
- Intelligent Visual Computing
- Adversarial Machine Learning Seminar
- Machine Learning
- Combinatorics and Graph Theory
- Teaching Assistants as Tomorrow's Faculty Seminar

Relevant Undergraduate Coursework

- Artificial Intelligence in Gaming
- Biometrics
- Robotics
- Problem-Solving & Programming
- Data Structures & Objects,
- Advanced Object-Oriented Programming
- Computer Organization
- Operating Systems
- Software Engineering
- Data Structures & Algorithms
- Graphics & Animation in Gaming
- Undergraduate Research Seminar
- Computer Projects
- Calculus 1-3 (Honors)
- Differential Equations (Honors)
- Linear Algebra & Matrix Theory
- Numerical Analysis
- Operations Research
- Probability & Statistics
- Bayesian Statistics
- Real Analysis
- Abstract Algebra
- Undergraduate Research
- Preparing for Industrial Careers in Mathematics