

## Zhongyi (Kurt) Gu

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therapyKG.github.io

Education	<p><b>Williams College</b>, Williamstown, MA</p> <p>Bachelor of Arts</p> <p><b>Majors:</b> Computer Science with Honors, Philosophy</p>	Sep 2017– June 2023
Research Experience	<p><b>Improving Power Efficiency in Energy Harvesting Devices</b></p> <p>Available at: <a href="https://doi.org/10.36934/TR2023_164">doi.org/10.36934/TR2023_164</a></p> <ul style="list-style-type: none"> <li>Honors Thesis Advised By Prof. Kelly Shaw</li> <li>Conducted independent research into energy harvesting devices used in remote data-sensing tasks. These devices power their operation by harvesting small amounts of energy from the environment, and often run out of power and shutdown until their battery is recharged. Examined existing approaches to improve the power efficiency of energy harvesting devices to decrease the frequency of shutdowns,</li> <li>Proposed new data preprocessing methods as an extension to existing approaches involving local inference. Constructed a hardware test system, implemented two new preprocessing methods as well as a simple software scheduler for evaluation.</li> <li>For local image classification tasks, the new methods successfully reduced the system’s average energy consumption by 21.4% in the best case compared to baseline with minimal loss in accuracy.</li> </ul> <p><b>Inverting Film Negatives Using Multilayer Perceptrons</b></p> <p>Available at: <a href="https://therapyKG.github.io/assets/pdf/film_ml.pdf">therapyKG.github.io/assets/pdf/film_ml.pdf</a></p> <ul style="list-style-type: none"> <li>Class research project for Machine Learning with Prof. Rohit Bhattacharya.</li> <li>Observing the increasing gap between film photography’s recent renaissance and the aging and stagnant technologies for film digitization, I proposed an unexplored interdisciplinary research problem to investigate if a neural network can learn the nonlinear transfer function between film negatives and the color-positive final prints.</li> <li>Scanned, processed, and organized 40GB of film image data to compile a dataset for training and modeling. Used this dataset to train and evaluate multiple small neural network models on an Nvidia RTX 3080 with moderate success.</li> <li>The model was able to predict color-positive prints based on film negatives scanned by a digital camera, showing potential for a fast and accurate film digitization technique that can greatly reduce the photopher’s time spent performing manual color corrections.</li> </ul> <p><b>Fireboy &amp; Watergirl is PSPACE-Complete</b></p> <p>Available at: <a href="https://therapyKG.github.io/assets/pdf/tqbf.pdf">therapyKG.github.io/assets/pdf/tqbf.pdf</a></p> <ul style="list-style-type: none"> <li>Class research project for Theory of Computation with Prof. Aaron Williams.</li> <li>Proved that <i>Fireboy &amp; Watergirl</i>, a maze-solving game, is PSPACE-Complete in terms of computational complexity. Constructed a puzzle level in-game that served as a reduction from the True Quantified Boolean Formula (TQBF) problem to the game.</li> <li>Designed the level for two players to collaborate and solve the puzzle in parallel, taking advantage of the game’s cooperative nature. Compared to TQBF reductions typically found in other games, where one player has to enumerate through all possibilities of the boolean formulas, our reduction was more efficient and required less repetition from the players.</li> <li>This project has been selected as part of the reading material for this class.</li> </ul>	<p>Sep 2022– June 2023</p> <p>Fall 2022</p> <p>Spring 2022</p>
On-going Project	<p><b>High-resolution Energy Harvesting Imaging System</b></p> <p>Investigating the viability of using commercially available CMOS image sensors to construct</p>	

a batteryless, high resolution energy harvesting camera system for tasks in extreme environments.

### **A Data-Driven Deep Learning Approach for Negative Film Inversion**

Continuing my previous research on "Inverting Film Negatives Using Multilayer Perceptrons" by incorporating aspects of color science and a larger, cleaner dataset.

#### **Other Experience**

**CSCI 237: Computer Organization**, Teaching Assistant Sep 2022– June 2023

Worked as a teaching assistant for Williams's computer architecture course with Professor Kelly Shaw. Hosted TA sessions 3 times a week, answered student questions and provided feedback on code quality.

**meShare Inc.**, Software Engineering Intern Summer 2022

Worked as a front-end software engineer for IoT applications using the ReactJS framework. Contributed to the company's migration from native mobile development to ReactJS for a more consistent experience across platforms.

**Introduction to Film Photography**, Tutorial Leader Jan 2022

Led a 4-week tutorial during the January semester, introducing fellow classmates to the film photography process thorough hands-on guided activities in capturing, developing, and digitizing film photographs.

#### **Honors and Awards**

**Sigma Xi** 2023

**Ward Prize for Best Student Project in Computer Science**, Nominee 2023

Nominated for my research project on "Inverting Film Negatives Using Multilayer Perceptrons"

#### **Community Involvement**

**Center for Learning in Action, Williams College**, Teaching Volunteer 2018

Volunteered as a teaching assistant for local teachers at North Adams Elementary for fifth-grade computer science classes. Introduced Scratch to students and mentored coding projects.

**Education Without Barriers**, Co-Founder 2015– 2019

Education Without Barriers focused on providing online tutoring for underprivileged students in remote regions with scarce educational resources. EWB recruited over 150 student volunteers and worked with local teachers to set up computer equipment for tutoring sessions. Primary day-to-day responsibility included designing, deploying, and maintaining the organization's IT infrastructure to ensure the classes went as smoothly as possible.