Zoe De Simone

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EDUCATION

Massachusetts Institute of Technology (MIT) ↗ (Sep 2022 - Jun 2024)
Dual M.S. Electrical Engineering and Computer Science & Building Technology (GPA: 4.9/5.0)
Advisors: Ashia Wilson, LIDS; Arvind Satyanarayan, CSAIL; Christoph Reinhart, Building Technology.
- **Programming Coursework:** Machine Learning; Computer Vision; Interactive Data Visualization; Optimization; AI & Decision Making.
- **Building Science/ Sustainability Coursework:** Computational Design & Optimization; Environmental Technologies in Buildings; Engineering, Economics & Regulation of Electric Power, US Energy Policy.

Cornell University↗(Aug 2017 - May 2022)
Bachelor of Architecture, Focus in Computer Science (GPA: 3.9/4.0) (Class Rank:1)

EXPERIENCE

MIT Computer Science and Artificial Intelligence Laboratory, Research Assistant ↗ (Jan 2023 - Present)
Designed and developed analytics and ML tools to help users assess the underlying biases and worldviews of Generative AI Image models, and postprocessing techniques to edit model outputs towards user-defined notion during model runtime, without re-training.

MIT Sustainable Design Lab, Research Assistant ↗ (Sep 2022 - Present)
Developing an environmental, financial modeling and decision-making tool and workflow in Python to assist cities in achieving their 2050 carbon neutrality goals, by reducing carbon emissions of the building stock through energy efficiency improvements.

Cornell Environmental Systems Lab, Research Assistant ↗ (Jan 2018 - Aug 2022)
Designed and developed an airflow modeling software tool and workflow in C#, to help designers and building stakeholders assess the impact of 3D building designs on airflow movement and airborne spread of Sars-CoV-2 resulting in over 20,000 downloads.

Foster+Partners, Applied Research and Development, Design System Analyst ↗ (Jun 2021 - Aug 2021)
Contributed to top architecture firm's research and development developing software tools to facilitate virtual project design reviews using VR deployed to 1000+ employees built in Unreal Engine.

Cornell Robotics Construction Lab, Research Assistant ↗ (Aug 2020 – Aug 2021)
Lead the software and hardware design and implementation of a manufacturing process using industrial robotic arms to construct curved wooden panels in C#.

SOFTWARE PROJECTS

Personal Website: Website Repo made in CSS/HTML from scratch(for additional information and projects)

Carbon Emission and Financial Modeling Software (2022-present)
• Developing a decision-making toolkit in Python to assist cities in achieving their 2050 carbon neutrality goals by decarbonizing their building stock.
• Developing a stochastic optimization model to analyze the impact of financial incentives on homeowner's willingness to pay for energy efficient home renovations using time series data.
• **Utilized:** Python, Linear Regression, Stochastic Optimization, Git.

Real-Time Airflow Modeling Machine Learning Model and Interface (2022)
• Developed a 10k dataset and trained a Machine Learning surrogate model for real-time airflow analysis in buildings, reducing computational run time of simulations, which typically take 3+ hours to 1 second.
• **Utilized:** Python, PyTorch, Deep Learning, cGANs, OpenCV, Git.

Airflow modeling toolkit Software Congressional Technology Briefing Cornell News 20k+ downloads (2021)
• Developed an airflow modeling software tool using C# that allows users to analyze the spread of SarsCoV-2 in a 3D space, integrating OpenFOAM (a Computational Fluid Dynamics model) into an easy to use and automated 3D modeling application.
• **Utilized:** C#, OpenFOAM, Git.

Generative AI fairness analysis and editing toolkit Paper Repo; Used in 200+ person AI course at MIT (2023)
• Designed and implemented a generative AI web application and dashboard using Python and Gradio that allows users to explore the biases underlying AI models and edit model outputs through latent space ML model conditioning.
• Conducted user studies and gathered feedback on user expectations and interaction with the tool.
• **Utilized:** Python, CSS, Gradio, Git.

Data visualization and Storytelling WebApp Repo Demo (2023)
• Designed and implemented an interactive web application and visual storytelling experience to depict the experience and motivations migrants face when migrating to the US from South America built using Svelte, D3.js, Python and Flask.
• **Utilized:** Svelte, Python, Flask, Git.

PUBLICATIONS

3 first author journal and conference papers; 1 conference presentation; 3 first author manuscripts under preparation.

(2023) What is a Fair Diffusion Model? Designing Generative Text-To-Image Models to Incorporate Various Worldviews. (Preprint)
Zoe De Simone, Angie Boggust, Arvind Satyanarayan, Ashia Wilson.
Paper Repo Used in 200+ person AI course at MIT

(2023) FlexiArch: A computational tool to assess the longevity of buildings through flexibility. Journal of Building Engineering.
Zoe De Simone, Tingxin Zheng, Tong Bill Xu, Saleh Kalantari.
Paper Repo

(2021) Towards Safer Work Environments During the COVID-19 Crisis: A Study of Different Floor Plan Layouts and Ventilation Strategies for Simulation-based Feedback in Design. International Building Performance Simulation Conference.
Zoe De Simone, Patrick Kastner, Timur Dogan.
Project Software Paper Video Congressional Technology Briefing Cornell News

FELLOWSHIPS AND AWARDS

National Science Foundation Graduate Research Fellow (2022-Present)
Award from the National Science Foundation supporting graduate education who have demonstrated their potential for significant research achievements in STEM across the entire US. NSF provides a $138,000 stipend during the fellowship tenure.

Cornell Hunter Rawlings III Presidential Research Scholar (2020-2022)
$10,000 Award given to undergraduate students at Cornell to support their personal research.

Cornell Charles Goodwin Sands Memorial Medal (2022)
Awarded for the top thesis in the Cornell B.Arch. program.

Cornell Clifton Beckwith Brown Memorial Medal (2022)
Awarded to the top-ranking architecture GPA, in the Cornell B.Arch program.

The Addison G. Crowley, B. L. Arch '38 Prize (2020)
Awarded for the top studio GPA in 3rd-year B.Arch.

The Seipp Prize (2019)
Winner of 3rd year Cornell design competition

The Baird Prize (2019)
Winner of 2nd year Cornell design competition.

The York Prize (2019)
Winner of 1st year Cornell design competition.

Cornell Dean's List (2017-2022)
Awarded for academic excellence during all semesters of my undergraduate degree.

SKILLS

Programming Languages: (proficient): Python, C#, PyTorch, HTML/CSS, JavaScript, Git; (familiar): Java, Julia, OCaml, Svelte.