ALAN WANG

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EDUCATION

University of Virginia (UVA) Charlottesville, VA
Ph.D. in Computer Engineering (GPA: 3.85, h-index: 3) *Jan. 2018 – Expected May. 2023*

University of Southern California (USC) Los Angeles, California
Bachelor of Architecture (GPA: 3.45), minor in Applied Computer Security (GPA: 3.91) *Aug. 2012 – May 2017*

RESEARCH INTERESTS

- Resilient and adaptive infrastructure, incorporating artificial intelligence and autonomous sensing

- Data-driven visualizations and interactions (integrating BIM, VR, and AR) for improved decision-making in the design, and operation of built environments

- Integration of advanced sensing, visualization, and automation technologies for improving occupant comfort and energy savings

RESEARCH EXPERIENCE

Data Science for the Public Good Arlington, VA
UVA Biocomplexity Insitute, Social Decision and Analytics Division *Summer 2022 - Present*

- Designed and deployed an Open Source Routing Machine (OSRM) verification workflow to improve boundary condition routing times for merged open street map files. I identified and corrected errors in the previous system, increasing accuracy of floating catchment detection critical for quantifying accessibility to key infrastructure resources such as food, and healthcare facilities
- Created a proof-of-concept toolkit that aims to track innovation activities sustainably using Really Simple Syndication (RSS) queries and news source text extraction supported by open-source modules and browser automation. The toolkit completed the comparison of representative samples of internet-scraped company innovation profiles, and that of the government statistical agency

Engineering in Medicine Charlottesville, VA
University Hospital, University of Virginia *Fall 2019 - Present*

- Created, deployed, managed, and maintained an indoor environmental monitoring network for over 30 hospital patients. Combined annual air quality, lighting, and noise data collected from the monitors with a smart actigraphy watch to investigate the relationship between environmental disruptions and sleep quality
- Utilized statistical modeling and signal processing techniques including mixed-effect-modeling, dynamic time warping, and density estimations to analyze relationships between sleep, environment, and medical events

Mobile Sensing Unit Charlottesville, VA
Link Lab, University of Virginia *Summer 2022 - Present*

- To optimize data collection and sensor deployment, I developed an MQTT publisher subscriber workflow connecting our living lab framework to a Temi Robot for on-demand sampling of indoor environmental conditions.

Virginia Commonwealth Cyber Initiative Richmond, VA
Virginia Commonwealth University *Summer 2021*

- Submitted a proposal and was awarded $5,000 in funding to investigate lighting-based indoor privacy quantification using light sensors and lighting simulation
- Combined sensor deployment, algorithms, and building simulation in grasshopper-Rhino to find metrics to infer quantifiable indoor states for any arbitrary deployment scheme

Solemma Symposium Los Angeles, CA
HOK Architects *Spring 2020*

- Conducted customer discovery activities based on NSF Innovation-Corp training relating to the quantification of indoor lighting metrics
- Attended the Solemma symposium to explore challenges and technologies related to advanced daylight and energy simulations, discovering ClimateStudio, 3D printed glass, and smart windows

Living Link Lab Charlottesville, VA
Link Lab, University of Southern California *Spring 2018 - Present*

- Led a team to design and deploy a tech stack consisting of Django, Grafana, InfluxDB, and Qualtrics to support interdisciplinary research that combines over 200 sensors with multiple modalities to study indoor occupant comfort and trends at the Link Lab

Multi-Agent Form-Finding and Virtual Reality Designs, NSF REU   Los Angeles, CA

iLab, University of Southern California   *Fall 2015 - Spring 2017*

- Designed and implemented a multi-agent form-finding loop in Rhino Grasshopper that consolidated month-long simulations to explore design alternatives on the Pareto frontier for form-finding in Rhino, Processing, and Honeybee Grasshopper
- Built virtual reality environments in Unity to explore novel user-building interactions for occupant behavior research and construction documentation

WRITING

ACCEPTED PUBLICATIONS

- **Wang, A.**, Su, J., Heydarian, A., Campbell, B., & Beling, P. (2020, November). Is my sensor sleeping, hibernating, or broken? A data-driven monitoring system for indoor energy harvesting sensors. In Proceedings of the 7th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (pp. 210-219).

- **Wang, A.**, & Heydarian, A. (2019). Exploring the Effects of Lighting Brightness and Color on Occupancy and Emotions. In Computing in Civil Engineering 2019: Smart Cities, Sustainability, and Resilience (pp. 1-7). Reston, VA: American Society of Civil Engineers.

- Rantas, J., Wang, D., Jarrard, W., Sterchi, J., **Wang, A.**, Varnosfaderani, M. P., Heydarian, A. (2021, April). A User Interface Informing Medical Staff on Continuous Indoor Environmental Quality to Support Patient Care and Airborne Disease Mitigation. In 2021 Systems and Information Engineering Design Symposium (SIEDS) (pp. 1-6). IEEE.

- Pisello, A. L., I. Pigliautile, M. Andargie, C. Berger, P. M. Bluyssen, S. Carlucci, G. Chinazzo et al. "Test rooms to study human comfort in buildings: A review of controlled experiments and facilities." Renewable and Sustainable Energy Reviews 149 (2021): 111359.

- Rantas, J., Wang, D., Jarrard, W., Sterchi, J., **Wang, A.**, Varnosfaderani, M.P. and Heydarian, A., 2021, April. A User Interface Informing Medical Staff on Continuous Indoor Environmental Quality to Support Patient Care and Airborne Disease Mitigation. In 2021 Systems and Information Engineering Design Symposium (SIEDS) (pp. 1-6). IEEE.

- Heydarian, A., Pantazis, E., **Wang, A.**, Gerber, D., & Becerik-Gerber, B. (2017). Towards user centered building design: Identifying end-user lighting preferences via immersive virtual environments. In Automation in Construction, 81, 56-66.

- Gerber, D. J., Pantazis, E., & **Wang, A.** (2017). A multi-agent approach for performance-based architecture: Design exploring geometry, user, and environmental agencies in façades. In Automation in Construction, 76, 45-58.

- Gerber, D. J., Pantazis, E., & **Wang, A.** (2017). Interactive Design of Shell Structures Using Multi Agent Systems: Design Exploration of Reciprocal Frames Based on Environmental and Structural Performance.

- Pantazis, E., Gerber, D., & **Wang, A.** (2016). A Multi-Agent System for Design: Geometric Complexity in Support of Building Performance. Proc. SimAUD, 137-146.

WORK IN PROGRESS

- **Wang, A.**, Yi, F, Nasir, N. Mobile Sensing Unit: Continuous Robotic Indoor Environmental Sensing

- **Wang, A.**, Tu, L., Heydarian, A., Campbell, B. Towards Simulation Augmented Privacy-Aware Light Sensors

- **Wang, A.**, Kaur, N., Tavakoli, A et al. Exploring the Relationship Between Sleep Disruptions and the Hospital Environment Using IoT Devices

- Le, T., **Wang, A.**, Yao, Y., Feng, Y., Heydarian, A., Sadeh, N., Tian, Y. Occupants' awareness, perception, and notification preference of IoT Devices in Smart Buildings

- Kaur, N., **Wang, A.**, Pahlavikhah, M., Nikseresht, F., Guo, X. Yan, R., Barnes, L. Heydarian, A. A Survey of Indoor Well-being Sensing

Proposals

- Figures, National Science Foundation (NSF) FW-HTF-RM: Preserving Worker Privacy in Data-Driven Smart Workspaces, *Fall 2019*

- Figures and edits, NSF CPS Medium: User-Centered Design for Preserving Privacy in Human-Building Interactions, *Fall 2019*

Patents

- Arsalan Heydarian, Brad J. Campbell, Peter Beling, **Alan Wang** and Jianyu Su. Data-Driving Monitoring System for Energy Harvesting Sensors and Related Methods Thereof. U.S. Provisional Patent 63/107,204, filed on October 29, 2020.

Technical Skills

Coding Languages: Python, R, Java, C#, C++, C
Data Analysis software/packages: Pandas, Matplotlib, Seaborn, Scikit-learn
Web Development: Django, Selenium, Bootstrap, JavaScript, JQuery, Beautiful-Soup, OWASP
Design Software: Unity, Photoshop, Illustrator, InDesign, Figma, Rhinoceros, Grasshopper, Honeybee/Ladybug, VRay, Revit, Maya, AutoCAD

Awards

- **USC Human Building Interaction Hackathon**, "One-Click" Third-Place, *Summer 2022*

- **UVA Engineering Endowed Fellowship**, $10,000, *Fall 2021*

- **UVA Link Lab Student Flash Talk Award**, *Fall 2021*

- **NSF Cyber Physical Systems Principle (CPS) Investigators Meeting**, Graduate Student Presentation, "A Machine for Living in", Second Place, *Summer 2021*

- **Virginia Commonwealth Cyber Initiative (CCI)**, $5,000, Building Aware Light Sensing, *Summer 2020*

- **NSF Innovation-Corps,** $2,700, Oct/Nov Cohort, *Fall 2019*

- **NSF Innovation-Corps**, $2,700, May/June Cohort, *Summer 2019*

- **NSF Graduate Research Fellowship Program**, Honorable Mention, *2019*

- **NSF Research Experiences for Undergraduates**, Undergraduate Researcher, *2016 - 2018*

- **USC First Generation Mentorship**, *Spring 2015*

Poster and Presentations Presentations

- Building Aware Light Sensing, Commonwealth Cyber Initiative (CCI) Central Virginia Node Summer Meeting, *Summer 2021*

- A Systematic Approach to Preserve Privacy in Smart Buildings , International Energy Agency (IEA) Energy in Buildings and Communities Programme (EBC) Annex 79, Occupant-centric building design and operation, *Spring 2020*

- Occupant behavior + interactions with building interfaces, IEA EBC Annex 79, *Fall 2019*

- Ubiquitous computing and human-centric sensing to enhance occupant experience and building operations, UVa Thornton Society, *Fall 2019*

- UVa Link Lab Open House, *Spring 2019, Spring 2018*

Leadership and Service

Cavalier Judo at UVA
Charlottesville, VA

President — *2022 - Present*
- Helped secure more than $8,000 in student activity funding to promote Judo principles of "Maximum efficiency with minimum effort", and "Mutual welfare and benefit" at the University
- Established new bylaws, created social media frameworks, and participated in culture fairs at the university to build sustainable Judo practices, leading to a growth of more than 50% in membership

Taiwanese Graduate Student Association at UVA
Charlottesville, VA

Vice President, Interim President, President — *2019, 2020, 2021 Fall - 2022 Spring*
- Established the Taiwanese Graduate Student Association at UVA as an official Contracted Independent Organization, increasing community size and funding
- Mobilized the Taipei Economic and Cultural Representative Office in the United States (TECRO) to help fund more than $1,000 in university-wide student activities promoting Taiwanese culture
- Arranged rides and meet-ups for incoming Taiwanese scholars to help establish bank accounts, mobile phone communications, and housing necessities

Link Lab Committee on Culture and Livability
Charlottesville, VA

Secretary, Founding Member — *2018 - 2019*
- Created a welcoming student environment by organizing community activities including local outreach, team-bonding events, community outings, and invited talks
- Recorded meetings and created system for sustainability of organization documents and history via constitution, by-laws, minutes, rosters, and financial records

Volunteers with International Students, Staff, and Scholars (VISAS)
Charlottesville, VA

Volunteer — *Spring 2018*
- Taught conversational English to a refugee nurse whose license was lost in a fire back in her hometown

Service to the Field
CA, VA

Service — *2012 - 2022*
- Manuscript Review for Science and Technology for the Built Environment, *Summer 2021, 2022*
- Manuscript Review for Building and Environment, *Spring 2020*

Coursework/Teaching

Official Coursework

Engineering Interactive Technologies (A+)
Computer Science

Professor Seongkook Heo — *Spring 2021*
- Final Project: [Augmented Reality Sandbox](#), an augmented reality sandbox game using Unity, Microsoft Kinect 2, and EM River 4 that challenges the traditional gamer roles by incorporating computer gamers and sandbox gamers together in a supervised interactive experience
- [Force Pedmoeter](#), A sock-based gaming interface using a force sensor, Processing, and an Arduino, for playing a modified game of pong

Robots and Humans (A)
Computer Engineering

Professor Tariq Iqbal — *Spring 2021*
- Final project: [How Can Robots Better Serve Food?](#), a human-robot interaction experiment that establishes a general food serving method for the NAO robot to give food suggestions based on calorie count with the combination of other features

Embedded Computing and Robotics (A)
Computer Engineering

Professor Joanne Dugan — *Fall 2019*
- Final project: [TI Robot Systems Learning Kit MAX](#), a line-reading robot using the MSP-EXP432P401R, TI-RSLK chassis board, 8 Channel QTRX sensor array for line sensing, and left and right bump switch sensors for obstacle detection, and 2x Gear motor and encoder assembly

Computer Architecture (CR)
Computer Engineering

Professor Ron Williams — *Spring 2020*
- Final project: Designing and Implementing a [RISC Processor in VHDL](#)

User Experience Design (A) Systems Engineering

Professor Gregory Gerling *Spring 2019*

- [Final Portfolio](): three user interfaces designed for three different clients ranging from the Albermarle Fire Department, alarm.com, and the University of Virginia

Defense Against the Dark Arts (B) Computer Science

Professor Jack Davidson *Spring 2019*

- Final project: [Fuzzing a Heart Model](), we explore two different types of heart models within Matlab Simulink as a way to extend the concept of fuzzing into the realm of cyber-physical systems: 1) a pacemaker model which paces the atrioventricular node and its relationship via conduction with the sinoatrial node, and 2) a Heart Systemic Pulmonary (HSP) model that models the human cardiovascular system, including the pulmonary and systemic circulatory systems

Principles of Modeling for Cyber-Physical Systems (A) Computer Science

Professor Madhur Behl *Fall 2018*

- [Report repository]() includes state space building and modeling, parameter estimation, transition systems, and linear temporal logic.

Cognitive Systems Engineering (A-) Systems Engineering

Professor Stephanie Guerlain *Spring 2018*

- Final project: [Charlottesville Time Bank](), design of a user interface based on Don Norman's *The Design of Everyday Things.*

Reinforcement Learning (A) Systems Engineering

Professor Peter Beling *Spring 2018*

- Final project: [Agents of Risk](), Explorations using different reinforcement learning methods such as Monte Carlo Tree Search and Long Short Term Memory to solve the game of Risk.

ADDITIONAL TRAINING

- **PhD+ Entrepreneurship Series**, Dr. David Touve, *Spring 2021*

- **Knowledge Entrepreneurship**, Dr. Bernard Carlson and Elizabeth Pyle, *Fall 2019*

- **Communicating Research**, Marlit Hayslett, *Fall 2019*

- **PhD+ Foundation Series**, Dr. Sonali Majumdar, *Fall 2018*

- **Graduate Writing Lab**, Dr. Kelly Cunningham, *Summer & Fall 2018*

WORK EXPERIENCE

JFAK Architects Los Angeles, CA

Architectural Designer *Summer 2021*

- Generated renderings of exterior views and patios using Rhino VRay, IES lighting, custom furniture, and Photoshop for night time and daytime views
- Crafted Rhino models for multiple façade schematic designs and assembled them into a print set using Python scripting and InDesign

Von Oeyen Architects Santa Monica, CA

Modeling Intern: [VVRM Residence]() *Fall 2014 - Spring 2016*

- Constructed 3d structural model of building using wood, steel, and aluminum members, based on dynamic plans, sections, and detail drawings ongoing from the design development phase to the construction documentation phase
- Compiled drawing set consisted of azimuth shifting camera angle renders using Rhinoceros, VRay, and Creative Suite automations

Palos Verdes Art Center Palos Verdes, CA

Designer, Garball *Summer 2013 - Fall 2013*

- Constructed 3d structural model of building using wood, steel, and aluminum members, based on dynamic plans, sections, and detail drawings ongoing from the design development phase to the construction documentation phase
- Compiled drawing set consisted of azimuth shifting camera angle renders using Rhinoceros, VRay, and Creative Suite automation techniques

Teaching / Mentorship

Teaching

Smart and Healthy Buildings Civil Engineering and Computer Science

Co-instructor *Fall 2021*

- Designed and taught labs relating to smart building data analysis using GitHub, Python, Pandas, and Seaborn
- Integrated Unity for computer-assisted annotation of occupant behavior in the Link Lab that helped to inform the final project direction for the students

Engineering Systems and Environment Capstone Systems and Civil Engineering

University of Virginia *Spring 2020 - Fall 2021*

- Course description: "A capstone is a project taken on by engineers at the university during their fourth year. These projects are usually sponsored by an outside client and provide a final integrated, real-world, hands-on experience relating to students' fields of study"
- Helped to co-instruct a team of UVa Engineering undergraduates for literature review, ideation, and writing, leading to a publication "A User Interface Informing Medical Staff on Continuous Indoor Environmental Quality to Support Patient Care and Airborne Disease Mitigation"

Yfalos Workshop Digital Futures

Co-instructor *Summer 2020*

- Designed and taught a course in Unity using Rhino, convex geometry, and Crest Ocean System to support convergent design of artificial reef systems

Mentoring

Feng-Yi Chang Computer Engineering

Master's Student *Summer 2021 - Present*

- Co-created documentation for software development supporting living lab infrastructure in Django, Python
- Assisted in English language development and literature review development for smart building research

Jacob Rantas Systems Engineering

Undergraduate Student *Spring 2020 - Spring 2021*

- Developed UML diagrams to document sensors and mixed event-driven and periodic sampling schemes
- Prepared, installed, and recorded the location of more than 200 energy harvesting sensors with QR codes, location in Rhino, and a website that redirects the information to the proper pages

Xingyu Zhang Architecture

Undergraduate Student *Fall 2018 - Spring 2019*

- Created an autonomous feedback loop to extract location-specific lux value results from lighting simulations using Honeybee in Rhino and Python

Eric Duong Architecture + Computer Science

Undergraduate Student *Fall 2018 - Spring 2019*

- Developed a virtual reality platform in Unity to visualize sensor values and occupant, seamlessly switching between plan view and first-person perspectives

Mary Robertson Civil Engineering

Undergraduate Student *Spring 2018*

- Developed 3D modeling skills to build a digital representation of the link lab and annotate it with the location of the sensors deployed

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