Shih-Chi Liu

LEED AP Interior Design + Construction
Fitwel Ambassador

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EDUCATION

2017   **Master of Science, Civil Engineering**
University of Washington

- ADVISOR: Carrie Sturts Dossick
- RELEVANT COURSES: Advanced Environmental Systems, Sustainable Construction, Engineering Computing
- OVERALL GPA: 3.91/4.00

2016   **Master's Studies, Architecture**
University of California, Berkeley

- ADVISOR: Dan Spiegel

2013   **Bachelor of Science, Civil Engineering**
National Cheng Kung University

- MINOR: **Architecture**
- MINOR: **Urban Planning**

PROFESSIONAL EXPERIENCE

2021-present   **Construction Costs Estimator**
Tenant Improvements Group, Hathaway Dinwiddie Construction Company

- Design and implement dozens of customized computational solutions, from plug-ins to scripts, to enhance the performance of existing building information modeling and estimating software, facilitating faster and more accurate estimations.
- Employ value engineering methodology to adhere to cost budgets, while simultaneously upholding the integrity of design objectives and stringent engineering criteria.
- Estimated and managed a diverse portfolio comprising 100+ projects, spanning from offices, hospitality, amenities, research facilities, culture, retail, to housing, totaling up to $1B and 2.5M square feet.
- Collaborated with 200+ subcontractors across disciplines such as architectural, structural, plumbing, mechanical, and electrical.

2018-2021   **Preconstruction Engineer**
Tenant Improvements Group, Hathaway Dinwiddie Construction Company

2016   **Research Assistant**
Research Center for Building Information Modeling (BIM) & Management, National Taiwan University

Research & Design Projects

Machine Learning

2023 **chatHDC** (lead researcher: Peter Spier)
- Designed and implemented a virtual assistant powered by ChatGPT and wired by LangChain for company-specific information retrieval using natural language inquiries via a web-based user interface, hosted on and secured by Azure AI.
- Integrated both structured and unstructured data from 5 previously siloed databases, delivering comprehensive responses and references in seconds.

2021 **Algorithm-based Estimate: An Alternate Approach of Construction Cost Prediction in Early Stage of Design**
- Developed a fine-tuned XGBoost regression model, trained on a proprietary database enriched with company-specific cost data and domain knowledge. The model processed 4 numerical and 11 categorical inputs to output an estimated cost.
- Achieved an accuracy at 0.93 R^2 score and run-time in seconds, outperforming conventional estimation approaches with approximately 0.80 R^2 score and processing duration in weeks.

Building Science

2017 **Lighting Analysis: Fire Department, Bothell, WA**
- Performed illuminance, Useful Daylight Illuminance (UDI), and luminance analyses during key seasonal transitions with DIVA (now ClimateStudio).
- Re-designed with shading and skylight systems and material alternatives to improve the UDI desirable range from 34% to 61% with high lighting adequacy year-round.

2017 **Thermal Analysis: Mid-rise Office, Minneapolis, MN**
- Conducted insulation analysis on unobstructed surfaces to quantify maximum energy gains.
- Analyzed thermal performance attributes to determine the optimal combination among 2 façade alternatives, 3 glazing options, and 3 shading device scenarios.

2017 **Solar Analysis: Office Building & Site for New Development, Seattle, WA**
- Designed 2 shading devices to eliminate any undesired sunlight penetration on work surfaces from spring to autumn equinox, validated by sun pattern studies.
- Optimized the geometry of a new development to guarantee maximum sunlight permeation to the neighborhood, adhering to planning requirements.

Lifecycle Analysis

2017 **Lifecycle Costing: Photovoltaic System, Architecture Hall, University of Washington**
(collaborative project)
- Established a cost baseline, factoring in first cost and overall system capacity, with deterministic inputs such as panel types, structural configuration, and usable space.
- Developed a probabilistic cost model to incorporate inherent uncertainties, such as system loss rate, inverter efficiency, and maintenance cost, with Monte Carlo simulation.
- Justified economic implications via net present values and simple payback periods.

2017 **Lifecycle Assessment: Structural Systems, Architecture Hall, University of Washington**
(collaborative project)
- Investigated the environmental implications of structural systems with inventory analysis and impact assessment, in compliance with ISO standards, for informed decision-making.
- Assessed environmental metrics, including global warming and ozone depletion potentials, primary and non-renewable energy consumptions, and fossil fuel consumption, for systems such as foundations, walls, columns and beams, roofs, floors, and supplementary materials.

ARCHITECTURE DESIGN [LINK]

2015 **Trinity House, Philadelphia, PA**
2015 **Other People's Properties: A Remodeling of Gwathmey House** (collaborative project)
2014 **Make a House a Home, Taipei, Taiwan**

URBAN PLANNING [LINK]

2013 **Router of Valley, Taichung, Taiwan** (collaborative project)
2013 **Cohesive City, Chiayi, Taiwan** (collaborative project)
2012 **Metamorphosis Urban, Tainan, Taiwan** (collaborative project)

DIGITAL HUMANITIES [LINK]

2020 **Deconstructing the Construction: The Female Images in Chinese Detective Films, 2010-2020**
(collaborative project)

CONFERENCE PRESENTATIONS

2023 "**Leveraging AI-based Solutions to Realize Faster and More Accurate Construction Cost Estimation**," *Advancing Construction Analytics*, Hanson Wade, June 27
2021 "**Algorithm-based Estimate: An Alternate Approach of Construction Cost Prediction in Early Stage of Design**," *AI in AEC Conference*, Finnish Association of Civil Engineers, March 24

TEACHING EXPERIENCE

2024
(expected) **Mentor**, Region 7 Design Build, Associated Schools of Construction (ASC) Regions 6 & 7 Student Competition and Construction Management Conference, February 7-10
2022 **Guest Lecturer**, CM260 Digital Tools, Department of Construction Management, University of Washington, February 14

AWARDS, FELLOWSHIPS, & GRANTS

2020 **AEC Excellence Awards - Innovator of the Year** (finalist), Autodesk
2019-2020 **Professional Development Grant**, $3,000, Hathaway Dinwiddie Construction Company
2018-2023 **Conference Travel Grant**, $7,000, Hathaway Dinwiddie Construction Company
2016 **Paul B. Liao Endowed Regental Fellowship**, Department of Civil & Environmental Engineering, University of Washington
- Two years of support with a monthly stipend of $2,087 plus coverage of tuition, insurance, fees, and other benefits
2015 **Admission Fellowship**, $12,000, Department of Architecture, University of California, Berkeley

CERTIFICATES

2024
(expected)
Foundations in Computer Science Graduate Certificate, Stanford University
- COURSES: Design & Analysis of Algorithms (A), Mathematical Foundations of Computing (A+), Organization & Systems (A)

2023
Fitwel Ambassador, Center For Active Design

2018
LEED AP Interior Design + Construction, US Green Building Council

PROFESSIONAL DEVELOPMENT

2022
CRASH COURSE: **Introduction to Structured Query Language**, University of Michigan

2019-2020
NANODEGREES: **Deep Learning**, **Machine Learning**, & **AI Programming with Python**, Udacity

SKILLS

PROGRAMMING LANGUAGES	C, Python, JavaScript, Google Apps Script, Grasshopper for Rhino, Dynamo for Revit
MACHINE LEARNING LIBRARIES	PyTorch, scikit-learn, NumPy, pandas
BUILDING SIMULATION TOOLS	DIVA (now ClimateStudio), CONFEN, Ecotect, Climate Consultant, Twinmotion
LIFECYCLE ASSESSMENT TOOLS	Embodied Carbon in Construction Calculator (EC3), Tally, Athena Impact Estimator
3D MODELING SOFTWARE	Rhino, Revit, Sketchup
CREATIVE SOFTWARE	Photoshop, Illustrator, InDesign, Premiere
TYPESETTING SOFTWARE	LaTeX, XƎLaTeX

ACADEMIC SERVICE

2016
Editor, Proceedings of the *4th International Workshop on Design in Civil and Environmental Engineering*

2016
Organizer, *Q2 Building Information Modeling (BIM) and Management Trend Forum*, National Taiwan University, June 22

2016
Organizer, *Texas A&M Summer Study Abroad in Taiwan*, National Taiwan University, June 1-30

PROFESSIONAL LEADERSHIP

2023-present
Vision Leader, *Artificial Intelligence Implementation Team*, Hathaway Dinwiddie Construction Company

2022-present
Chair, *Construction Data Research Group*, Hathaway Dinwiddie Construction Company