

Kuofu Liu

E-mail: kuofuliu@usc.edu | Tel: (+1) 323 633 5952 | Homepage: <https://kuofuliu.github.io/>

EDUCATION

University of Southern California

Los Angeles, CA

Bachelor of Science in Industrial and Systems Engineering (ISE),

09/2022-05/2024 (Expected)

Specialization in Applied Analytics

- ♦ **GPA:** 3.81/4.0; **Major GPA:** 3.87/4.0
- ♦ **Research Assistant** at Center for Undergraduate Research in Viterbi Engineering (09/2022-05/2024)
- ♦ **Core Courses:** Applications of Machine Learning (A), Operations Research: Deterministic Model (A), Operations Research: Stochastic Model (A), Supply Chain Design (A)

Sichuan University - Pittsburgh Institute (SCUPI)

Chengdu, China

Bachelor of Engineering in Industrial Engineering (IE)

09/2020-06/2024 (Expected)

- ♦ **GPA:** 3.88/4.0; 91.2/100
- ♦ **Teaching Assistant** for [Analytical Geometry & Calculus 3](#) (2022 Spring)
- ♦ **Core Courses:** Information Systems Engineering (A), Differential Equations (A), Human Factors (A), Statistical Testing & Regression (A), Matrices & Linear Algebra (A), Productivity Analysis (A)

RESEARCH EXPERIENCE

Design and Optimization of Closed-Loop Supply Chain (CLSC) for Electric Vehicle (EV) Battery Recycling in the U.S.

Los Angeles, CA

Supervised by [Prof. Randolph Hall](#) / USC

08/2023-Present

- ♦ Awarded by Center for Undergraduate Research in Viterbi Engineering (CURVE) Fellowship.
- ♦ Explored the present state of CLSC for EV battery recycling in the U.S., and synthesized optimization methodologies within the CLSC domain through a literature review and text analysis.

Parameters Estimation and Global Sensitivity Analysis of Time Varying SEIRD Compartmental Model Based on State-level Covid-19 Data in the U.S.

Los Angeles, CA

Supervised by [Prof. Randolph Hall](#) & Dr. Mingdong Lyu / USC

12/2022-08/2023

- ♦ Awarded by Center for Undergraduate Research in Viterbi Engineering (CURVE) Fellowship.
- ♦ Estimated 8 parameters (4 shape parameters for 2 sigmoid functions of reproduction number and fatality rate at the start and end of the simulation period) for each state using data on Covid-19 cases and deaths.
- ♦ Formulated an extended SEIRD compartmental model wherein the transmission rate (beta) and fatality rate (alpha) evolve chronologically based on two sigmoid functions, resulting in an average relative root mean square error (RRMSE) of 1.54% for cases and 1.20% for deaths.
- ♦ Implemented a Monte Carlo simulation based on pre-fitted values for sensitivity analysis spanning 245 days from March 13, 2020, in California and New York, to explore various scenarios for 8 parameters sampled from 5 probability distributions (uniform, normal, lognormal, gamma, and truncated normal).
- ♦ Performed a state-level sensitivity analysis for the SEIRD model with 410 parameters, accounting for the impact of state-to-state transportation on the transmission of Covid-19 within the 50 U.S. states.

Investigation on Optimal Chest Compression Point (OCCP) During Cardiopulmonary Resuscitation (CPR)

Chengdu/Nanjing, China

Supervised by Prof. Jan Reinhardt / Jiangsu Province Hospital

09/2022-Present

- ♦ Conducted an ambi-directional observational cohort study (Ethics Code: 2018-SR-274; Chictr.org.cn ID: ChiCTR2300069851 2023-03-28) to determine OCCP during CPR based on a cohort of extracorporeal membrane oxygenation (ECMO) adult patients with cardiac arrest.
- ♦ Estimated 9 linear mixed effects models with random intercept for study participants to compare OCCP and current guidelines, among ECMO/medical checkup/inpatient cohorts, and within the same ECMO patients at two stages (cardiac arrest concurrently with ECMO CPR and with spontaneous circulation).

Development of Outcome Prediction Models for Acute Diquat Poisoning Chengdu/Nanjing, China

Supervised by Prof. Jan Reinhardt / Jiangsu Province Hospital

09/2022-08/2023

- ♦ Conducted a multi-center ambi-directional cohort study (Ethics Code: 2021-SR-394) to predict 28-day survival outcomes for patients with acute diquat poisoning for triage purposes and further prognosis.
- ♦ Evaluated the importance of potential predictors using random forest to select the top four parameters into triage model based on self-reported information at admission (age, oral exposure dose, heart rate, and time from exposure to triage) and prognostic model based on biomedical indicators (initial plasma diquat concentration, white blood cell count, neutrophil count, and serum creatinine concentration).
- ♦ Developed 2 outcome prediction models using Cox regression, where the triage model achieved a concordance index (C-index) of 0.82 ± 0.05 with area under curve (AUC) of 0.89 (0.77, 0.97) in training and 0.95 (0.80, 1.00) in testing, while prognostic model realized a C-index of 0.87 ± 0.04 , and AUC of 0.92 (0.81, 0.99) in training, 0.90 (0.71, 1.00) in testing, and 0.75 (0.53, 0.93) in external validation.
- ♦ Established interactive web apps for [triage model](#) and [prognostic model](#) using the Shiny package in R.

Health Insurance Reform for Rehabilitation Services Based on WHO's Chengdu/Nanjing, China **International Classification of Functioning, Disability, and Health (ICF)**

Supervised by Prof. Jan Reinhardt / Nanjing Medical University

03/2022-Present

- ♦ Performed preliminary analysis on health insurance records including diagnosis-related groups (DRGs) information obtained from Wuxi Municipal Medical Insurance Bureau, and patient data (scores of 17 ICF items using an 11-point numeric rating scale at both admission and discharge, as well as demographic characteristics) collected from 5 hospitals located in Wuxi, China ($n=2,881$).
- ♦ Devised functioning-related groups (FRGs) based on patient data using a combination of model-based clustering and k -prototypes clustering techniques, and examined their interactions with DRGs.
- ♦ Employed multivariate imputation to fill in missing values in ICF items for stroke patients ($n=1,279$).
- ♦ Determined minimal important difference (MID) of ICF total score (sum of 17 ICF items), involving an anchor-based approach (Barthel index) and validation through a distribution-based approach, in order to identify patients demonstrating clinical improvements as the target study population ($n=365$).
- ♦ Built a prospective budgeting prediction model by 12 machine learning algorithms, where support vector machine (SVM) outperformed with root mean square error (RMSE) of 0.37 in training and 0.58 in testing.

Demand Prediction and Capacity Planning for Emergency Department Chengdu/Nanjing, China

Supervised by Prof. Jan Reinhardt / Jiangsu Province Hospital (JPH)

03/2022-08/2023

- ♦ Performed preliminary data analysis on the daily volume of emergency department (ED) visits collected at Jiangsu Province Hospital for 1,096 days (from 2019 to 2021), in conjunction with calendar time (lunar-based/solar-based), climate, air quality, and real-time information sourced from public databases.
- ♦ Developed 11 demand prediction models based on autoregressive integrated moving average (ARIMA) or long short-term memory (LSTM) networks, to predict ED visits with a lead time of 7 days.
- ♦ Adopted grid search technique to determine optimal hyperparameters, and compared model performance based on mean absolute percentage error (MAPE) during the overall period and Covid-19 period (from pre- to post- 7 days of the first day with newly confirmed COVID-19 cases in study center) of test set.
- ♦ Identified the best model as LSTM incorporating variational mode decomposition (VMD-LSTM) model, achieving MAPE of 5.529% during the overall period and 7.088% during the Covid-19 period of test set.
- ♦ Integrated a safety factor to proactively mitigate the risk of overburdening medical resources, along with a volatility rate for the hospital's resilience, to improve the model's robustness and generalizability.
- ♦ Performed simulations of capacity planning (number of doctors, etc.) across various scenarios to demonstrate the practical applicability of the established prediction model in real-world situations.

Research on Trends in Platelet (PLT) Counts with Age Variation

Chengdu, China

Supervised by Prof. Zheng Yang / SCUPI & West China Hospital

09/2021-08/2022

- ♦ Built a group-based trajectory model with expectation-maximization algorithm, and identified the best model in conjunction with iterations of group number and polynomial order for each group's trajectory.
- ♦ Investigated trends in PLT counts over a ten-year period in the general population and subgroups (by gender and age at baseline) using longitudinal data from 7,808 individuals.

PROJECTS

Reduction of Peak Electricity Usage for ASCO Sintering Co.

Los Angeles, CA

Supervised by Prof. Paul Lu | USC & ASCO Sintering Co.

08/2023-Present

- ♦ Senior Design Training in collaboration with ASCO Sintering Co. by Daniel J. Epstein Department of Industrial & Systems Engineering (ISE) at University of Southern California.
- ♦ Performing exploratory data analysis of sinter runtime and power consumption information.
- ♦ Proposing a simulation model to identify underlying factors contributing to peak electricity consumption.

Design of an AI-infused Platform for Laboratory Management

Chengdu, China

Supervised by Prof. Zheng Yang | SCUPI

09/2020-08/2021

- ♦ Awarded Excellent Project by National Students' Innovation and Entrepreneurship Training Program.
- ♦ Analyzed data on usage duration and abnormal laboratory equipment records from database using SQL.
- ♦ Implemented a proactive early-warning feature within the platform, leveraging Convolutional Neural Networks (CNN) to provide timely maintenance alerts for laboratory equipment.
- ♦ Operated rigorous systematic functional testing of the platform to assess its performance and efficacy.

PUBLICATIONS

- ♦ Integration of Dynamic Disease Transmission Modeling with Spatial Interaction Analysis (Co-author; Manuscript in preparation for *Transportation Research Part A: Policy and Practice*)
- ♦ Optimal Vaccine Allocation Methods Considering Dynamic Transmission in the United States (Co-author; Manuscript in preparation for *European Journal of Medical Research*)
- ♦ It Is Time to Reconsider the Optimal Point for Chest Compression During Cardiopulmonary Resuscitation: Lessons Learnt from the Chinese ECMO-CPR Cohort (Co-author; Manuscript in preparation for *Circulation*)
- ♦ Survival Prediction Models for Triage and Prognosis in Acute Diquat Poisoning (**Co-first author**; Submitted to *Annals of Emergency Medicine*)
- ♦ Prospective and Performance Oriented Insurance Payment Based on Application of WHO Framework to Real World Data from Stroke Rehabilitation (Co-author; Manuscript in preparation for *Bulletin of the World Health Organization*)
- ♦ Time-series Predictions on Emergency Department Visits: 7 days in Advance (Co-author; Manuscript in preparation for *Lancet Global Health*)
- ♦ Investigation on the Dynamic Trajectory of Platelet Count in Healthy Population from 2010 to 2021 in Sichuan Han Adult by Group Based Trajectory Model (Co-author; Submitted to *Medical Care*)

HONORS & AWARDS

- ♦ USC Center for Undergraduate Research in Viterbi Engineering Fellowship (2023 & 2022)
- ♦ USC Dean's List (Fall 2022 & Spring 2023)
- ♦ Sichuan University Outstanding Student (2021-2022)
- ♦ Sichuan University Excellent Student Scholarship (2021-2022)
- ♦ SCUPI Dean's List (2021-2022)
- ♦ SCUPI Academic Scholarship (2020-2021)
- ♦ Third Prize, Sichuan Provincial Undergraduate Safety & Emergency Innovation Competition (11/2021)

OTHER INFORMATION

- ♦ **Programming Languages:** Proficient in **Python**, R; Advanced in MATLAB, SQL, Latex
- ♦ **Technical Skills:** Proficient in Arena, MS Office (Word, Excel, PowerPoint, Access)