

Curriculum Vitae

PERSONAL INFORMATION

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EDUCATION BACKGROUD

Sun Yat-sen University (SYSU)	Aug. 2017-Jun. 2019
■ Master of Hydraulic Engineering	Guangzhou, China
■ GPA: 87.4/100	
South China University of Technology (SCUT)	Sept. 2013-Jun. 2017
■ Bachelor of Water Resources and Hydro-power Engineering	Guangzhou, China
■ GPA: 3.68/4.0 or 86.09/100	Rank: 3 th /53

HONOR AND AWARD

- Outstanding Students Awards of SCUT in 2014, 2017
- Undergraduate Fellowship of SCUT in 2014, 2016, 2017
- Postgraduate Fellowship of SYSU in 2018 (*Top 3 in a class of 30*)

RESEARCH EXPERIENCE

Project 1: *Dynamic prediction and regulation of water resources carrying capacity in the Pearl River Delta (2016YFC0401305), National Key Research and Development Program of China*, 2016-2020

Experience: Engage in modeling the response of river network to land use changes in the context of urbanization of Foshan city. (*Bachelor Thesis Theme*)

- The goal was to quantitatively characterize the evolution of urban river, and analyze the spatial response of urban river reduction and its causes.
- Use stepwise regression analysis to get driving factors of river network changes, and then develop both spatial auto-regression and geographic weighted regression models to quantify contributions of driving factors.
- Results showed that the expansion of industrial land was the primary cause, while the impact of land use changes has obvious spatial differences.

Project 2: *Study of estuarine saltwater intrusion and salinity time series prediction (51879289), General Program of National Natural Science Foundation of China*, 2019-2022

Experience: Engage in developing data-driven prediction models for salinity time series to serve estuarine water resources management. (*Participate in the preparation of fund application; Master Thesis Theme*)

- The goal was to construct an effective daily-scale prediction scheme for the water quality of the estuary under the complex interaction of sea and land factors.
- Input variables selection, data transformation, uncertainty analysis and machine learning were involved and coupled to construct hybrid machine learning models.
- The non-linearity and non-stationarity of salinity time series were handled by hybrid models, and the developed time-invariant wavelet-based model was practical for estuarine salinity prediction.

PUBLICATION AND SOFTWARE

Research paper:

- Hu, J., Liu, B. (2019). Analysis of River Network Changes Based on Spatial Auto-regression and Geographic Weighted Regression Model. *Hydrology*, 039(002), 7-13. (**Chinese Core Journal**)
- Hu, J., Liu, B., & Peng, S. (2019). Forecasting salinity time series using RF and ELM approaches coupled with decomposition techniques. *Stochastic Environmental Research and Risk Assessment*, 33(4-6), 1117-1135. (<https://www.researchgate.net/profile/Jiayu-Hu-9>)
- Zhou, F., Liu, B., Hu, J., et al. (2020). Study of Estuarine Salinity Prediction Based on Wavelet Artificial Neural Network. *Hydrology*, 240(06):57-64. (**Chinese Core Journal**)

Software copyright:

- Liu, B., Hu, J.. Software for iterative predictors selection for hydrological and water environment prediction based on HP-OPELM model (V1.0), 2019SR0470866.

SKILL AND EXPERTISE

Application of data-driven forecast/prediction models for water resources system

1. Machine Learning

- Artificial neural network; Extreme learning machine; Random forests

2. Data Preprocessing and Feature Engineering

- Data transformation: Time-invariant wavelet; Empirical mode decomposition
- Input determination: (Partial) mutual information; Forward iterative selection

3. Uncertainty Measurement

- Sample with bootstrap technique; Sample with Bayesian method and Markov Chain Monte Carlo

Spatial econometric analysis

- Spatial auto-correlation analysis; Spatial regression analysis

Tools for data analysis, statistical modeling and data visualization

- Python/ Matlab/ Arcgis (skilled); R/ SQL (average)

WORK EXPERIENCE

Guangdong Provincial Design Institute of Water Conservancy and Electric Power

Jul. 2019-

- Assistant engineer of hydrology and water resources Guangzhou, China
- Use engineering hydrology, GIS and scientific programming tools for regional water infrastructure engineering planning and water hazard prevention consultation

Selected project:

1. West Guangdong Water Diversion Optimization Based on Genetic Algorithm

(<https://github.com/Napolepburn/Water-Diversion-Optimization-Based-on-Genetic-Algorithm>)

- Make a daily-scale water resources allocation system with Python (involving the joint dispatch of 4 reservoirs).
- The combinations of 57 decision variables (e.g., design diversion, reservoir operation) were optimized to reach Pareto-fronts for irrigation water supply guarantee rates of multiple reservoirs.

2. Monthly Probabilistic Streamflow Improvement for East River with Machine Learning Method

(<https://github.com/Napolepburn/Probabilistic-Streamflow-Improvement-with-Machine-Learning-Method>)

- More than 50 years of historical runoff records, point precipitation, climate phenomenon indices and the lead-time information of predictors were involved.

- Wavelet transformation was used to improve point and interval forecasts with a forecast period of one month, which was implemented with machine learning.

3. *Emergency Plan for Exceeding Standard Floods (1%) in Liuxi River, Guangzhou*

- Figure out the flood control engineering system, including the flood control standards of embankments, reservoirs and barrage dams.
- Calculate to get the exceeding standard flood water surface line and obtain the maximum possible affected range.
- Development of emergency population transfer programs and selection of temporary flood storage areas for multiple river segments on the watershed.

4. *Applicability Analysis of Statistical Parameter Contour Maps of Storm Rain for Small- and Medium-sized Watersheds in Guangdong Province*

- Applicability analysis of statistical parameters (i.e., mean and coefficient of variation) of maximum precipitation (e.g., 10min, 1h, 6h...), which were for design flood calculations in ungauged watersheds in Guangdong Province and obtained more than a decade ago.
- The latest rainfall data were added and fitted with Pearson-III curve to obtain statistical parameters for comparison with the old ones.

5. *Feasibility Study Report on Huangmaogang Pumped Storage Power Station Project in Jiangmen City*

- Calculation of hydrometeorology and sediment transport in the basin of the dam site (without observation data), including multi-year monthly runoff, design flood, evaporation and sedimentation expectation, water level-flow relationship curve and water level-reservoir capacity curve.
- Determine the characteristic water levels of the upper and lower reservoirs based on the expected installed power generation capacity, the electric generation output formula and the optimization of the engineering construction program (dam height, topography, investment).