

# PAN XINXIN

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Research Interests: Sediment Transport; NbS for Coastal Processes; Numerical Methods.

## EDUCATION

**National University of Singapore (NUS), Singapore** **Aug 2023 - Jun 2024**

Master of Science, Civil Engineering in Sustainable Climate Resilience (Digital Water)

- **GPA:** 3.6/5.0
- **Coursework:** Sediment Transport and Coastal Processes, Numerical Methods for Environmental Flows, Nature-based Solutions (NbS) for Coastal Protection, Open Channel Hydraulics, Eco-Hydrology, Climate Science, Water Resources Modelling, Hydro-Informatics.

**Hohai University (HHU), China**

**Sep 2016 - Jun 2020**

Bachelor of Engineering, Water and Hydropower Engineering

- **GPA:** 4.15/5.0 (Ranking in the top 25%)
- **Coursework:** Hydraulics and Hydraulic Experiment, Water Structure Design (Dams & Channel), River Dynamics, Applied Elasticity and Finite Element Method, Structural and Soil Mechanics.
- **Awards:** Honorable Prize in the International Mathematical Contest in Modelling (top 15%); Outstanding Graduate of HHU in 2020; Artistic and Athletic Scholarship at HHU (top 5%).

## ACADEMIC PROJECTS

**Analytical Solutions and Lab Experiments of Sediment Transport** **Mar 2024 - May 2024**

*Programming and Experiments for SSC and Bedforms within Wave and Current Led by Prof. Pearl*

- Derived formulae of sediment transport mechanics in Fredsoe's study, and translated analytical solutions into MATLAB code, including grain-size effects on SSC distribution.
- Applied these solutions for coastline modeling within wave driven long-shore currents, and compared different model for breaker bar simulation with constraint on cross-shore sediment.
- Experienced in lab experiments and data post-processing about sand motion and bedform transition.

**Sensitivity Analysis of Eco-hydrology Properties & NbS Design** **Feb 2024 - May 2024**

*A Simulation of Vegetation Productivity in Singapore and a Living Shoreline Design in Byron Bay, AUS*

- Quantified impacts of soil properties and variation in meteorological forcing of vegetation productivity (i.e., NPP&GPP, photosynthesis) using T&C MATLAB code, and analysed by Python.
- Designed artificial reefs as NbS to mitigate erosion in foreshore zone, and defined 40% of the wave attenuation effect; Optimized its size as coastal and terrestrial parameters by SWASH model results.

**Study of Numerical Methods for Ocean Hydrodynamics using Delft3D** **Sep 2023 - Dec 2023**

- To define maximum allowable discharge limits into oceans, considering thermal plume constraints, collected, cleaned, and processed oceanographic data, including wave properties and bathymetry; created flexible mesh and enhanced model accuracy by diffusivity coefficient, time-lag parameters.
- Mixing/Diffusion Model: Simulated tide-dominated estuarine circulation for salinity and stratification, and assessed salt wedge change with increasing tidal amplitude.

**Rainfall-runoff analysis using QGIS, WFLOW & ANN Algorithm** **Jan 2024 - Apr 2024**

- Built rainfall-runoff models by observation and parameters to estimate possible extreme flooding.
- Collected hydrologic data and rainfall events; Preprocessed datasets and trained an ANN LSTM model in python and a MLP model in R, both showing more than 90% forecast accuracy.

**A Practice of Transient 2D Heat Conduction Model by MATLAB** **Aug 2023 - Oct 2023**

*A Systematical Study for Numerical Methods and Solved PDEs using MATLAB.*

- Solved PDEs for heat conduction using various schemes (e.g., BTCS and FDM) and implemented them in MATLAB code.

- Proposed analytic solution for transient 2D heat conduction problem and compared variances in CDM and FSTM for stable results.

#### **Assessment of Sediment in a Widening Channel Interfered by Weirs**

**Sep 2023 - Dec 2023**

*(Team Leader) A Project about Open Channel Hydraulics at NUS (Highest Scoring Thesis)*

- Demonstrated overall effectiveness of a channel optimization by assessing Fr number pre- and post-implementation within a river channel; Verified asymmetric weir effects in flow velocity and sediment, and illustrated how an optimal size of weir reduced TKE and suspension sediment.
- Contribution: Proposed research methodology and completed the final report; Simulated water level in two scenarios by DHI MIKE and turbulence around various weirs by *RNG k-ε* model in FLOW3D, and assessed sediment and erosion rate using flow conditions.

#### **Improved Wedge-shaped Block as Flip Bucket at the Dam Spillway**

**Mar 2019 - Jan 2020**

*(Team Leader) An Innovative Project Executed in the Hydraulics Lab at HHU Led by Prof. Fu*

- Proposed an innovative X-shaped block to enhance turbulence and energy dissipation at a spillway; Validated conceptual design by FLOW3D and by a physical test.
- Contribution: Collected dissipating efficiency within *RNG k-ε* model; Processed flow velocity in physical measurements; Built a linear model to choose optimal scheme; Conducted the final thesis.

### **ACADEMIC PAPERS AND PATENTS**

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- Analysis of the Influence of River Cross-Section Shape on the Hydraulic Characteristics of River Based on Flow3D Model, *Technology Information* (ISSN: 2096-4390, CN: 23-1600/N) (09/2019)
- Application of Macroscopic Fluid Dynamics Simulation in Mathematical Modeling of Crowd Movement, *Science and Technology Innovation* (ISSN: 1672-3791, CN: 11-5042/N) (06/2019)
- Patent: Improved Wedge-shaped Energy Dissipating Blocks Based on Flip Bucket (05/2020)

### **WORK EXPERIENCE**

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#### **Hydraulic Structural Engineer in Water Engineering Department**

**Jul 2020 - Jun 2022**

*Shenzhen Water Planning & Design Institute Co., Ltd., China*

- Involved in a seawall project with mangroves in the foreshore; In the absence of guidelines for quantifying wave attenuation in mangrove scenarios, applied theoretical formulas and case studies to determine a 20% reduction in wave height; Proposed a more cost-effective seawall design.
- Led a team to evaluate a road-river cross-engineering and proposed an effective interdisciplinary solution, using geotechnical simulation MIDAS and hydrological model DHI MIKE and QGIS.
- Completed several seawall reconstruction projects in estuary considering SLR and extreme climate; Calculated wave and sediment properties; Improved digital design methods by Civil3D combine spatial conditions and construction calculation; Calculated the seepage stability by AutoBank FEM.
- Took charge of the safety assessment and structural design of 2 medium reservoirs and dams; Analysed structural stability and hydrological features; Conducted technical reports and calculation.

### **SKILLS AND SELF-EVALUATION**

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- Software: 1) **Modelling:** Delft3D, DHI MIKE, FLOW3D, QGIS, MidasGTS, Civil3D; AutoBank; 2) **Script:** MATLAB, R, Python; 3) **Others:** Zotero, Tableau, SPSS, CAD, RevitBIM, SketchUp.
- Strong academic background in coastal and fluvial processes, including sediment dynamics in wave-current, eco-hydrology modelling and analytical solutions of cross- and long-shore modelling.
- Proficiency with numerical methods, lab experiments, field works, data processing and analysis about sediment particles and aquatic plants.
- Extensive experience in proposing methodologies and academic writing.
- Strong leadership and execution abilities, with high level of self-motivation.
- Certified Water Structural Assistant Engineer in China with proven problem-solving skills, and experienced in engineering solution for SLR and NbS in tidal marshes.