Education

- Ph.D. in Civil and Environmental Engineering
  Rice University
- M.S. in Chemical Engineering
  Lamar University
- B.S. in Environmental Engineering
  Zhejiang University

Research Areas

Urban hydrology, urban flood analysis, flood warning and alert systems, flood control, water resources, water quality strategies, hydrologic and hydraulic modeling/design, stormwater management, pipeline systems, open channel flow analysis, inland flooding induced by severe storm surge, coastal resilience, 2-D and 3-D visualization of fluid modeling, remote sensing, UAV data collection, groundwater hydrology, contaminant transport mechanisms in groundwater, aquifer remediation strategies and modeling.

Research Statement

Dr. Fang is an assistant professor in civil engineering at the University of Texas at Arlington. He obtained his Ph.D. degree in Civil and Environmental Engineering at Rice University in 2008. He has been working on surface water and groundwater problems for over seventeen years including floodplain studies, hydrologic/hydraulic modeling, reservoir operations and management, water infrastructure, water treatment, hydrodynamic simulation, storm water management modeling, and water quality assessment for a number of watersheds and municipalities in Texas, Florida, Connecticut, California, and Louisiana. Not only has he accomplished many projects in drainage modeling and design, but he has also actively worked in the area of hydrologic/hydraulic analysis for flood prediction and warning in real time. Dr. Fang has enhanced a radar-based flood warning system to achieve more accurate and timely flood forecasts. He recently developed advanced features for a real-time flood alert system for the Texas Medical Center (TMC) based on the use of NEXRAD radar data. This system is currently delivered real-time on a web site (fas4.flood-alert.org) that has been tested on major flood events in Houston. This system has been operational during the last 50 storm events and successfully provided precise and timely information to the TMC emergency center. The state-of-the-art flood warning system has been able to successfully reduce millions of dollars of damage for local institutions and hospitals in the past 15 years. As a result of his work in the development of the advanced flood warning and control system for Houston and statewide model for Texas, Dr. Fang was funded by CASA, an NSF Engineering Research Center (ERC) to develop the next generation flood warning system by incorporating higher-resolution radar network and hydrologic/hydraulic prediction tools. His work is being expanded as a prototype to other flood-prone areas in the U.S. He had accomplished many projects for the United State Geological Survey (USGS), TxDOT, the Clear Lake City Water Authority (CLCWA), and the Cities of Grand Prairie, Carrollton and Sugar Land in the past. Before Dr. Fang joined the Civil Engineering Department at the University of Texas at Arlington, he worked as project manager and assistant to the director in the Severe Storm Prediction, Education, and Evacuation from Disasters (SSPEED) center at Rice University.

Dr. Fang has played key roles in the following development efforts and made significant contributions to the field of hydrologic/hydraulic modeling, drainage design, flood forecasting, flood alert, and remote sensing.
• In order to obtain reliable flood predictions to incorporate hurricane induced storm surges in Galveston Bay, Dr. Fang integrated storm surge model output with the revised hydraulic models within Geographic Information System (GIS) and NEXRAD radar data. This system is a powerful tool for predicting severe storm impact and will allow governmental agencies to make well-informed decisions on flood control, evacuation planning, and assist the allocation of funding for mitigation of flood problems caused by severe storm surge events.

• Dr. Fang has developed a predictive floodplain library by integrating various flood profiles for three major bayous of Houston to delineate floodplains and quantify water surface elevations. He ran both the hydrologic and the integrated hydraulic models to delineate floodplain maps under various spatial and temporal conditions associated with rainfall intensities. He also helped design a unique computing algorithm to link up with appropriate flood maps dynamically based on actual rainfall measurements for the storm in progress. This new feature enables emergency personnel to determine likely inundations based on future rainfall patterns and begin flood preparations with as much lead time as possible. This will help reduce economic losses by taking strategic measures early in a flood disaster.

• The traditional steady-state flood modeling method can cause up to several feet of error in elevation, which may result in huge economic and life losses during severe storm events, especially for areas with flat topographic conditions. To address this, Dr. Fang developed an unsteady-state model to depict dynamic changes of flow and stage hydrographs in magnitudes and timings and is more realistic and precise in delineating floodplain maps than the traditional methods that Federal Emergency Management Agency (FEMA) uses. This unsteady-state modeling approach is a new contribution to federal flood control and management initiatives and is the wave of the future.

• Dr. Fang leads research on the “MavAir” unmanned aerial vehicles (UAVs) at UTA to advance our capabilities for surveying terrain to help flood experts collect and assess complex data for commercial, environmental, energy, utilities, agricultural and urban planning. Due to many uncertainties in existing datasets that prevent critical questions from being answered in the fields of hydrology and hydraulics, Dr. Fang and his team believe that UAVs are the perfect fit to advance our research including collecting timely and ultra-high resolution data. MavAir No. 1 (see video) is an octocopter UAV system selected by Fang and his team to provide high payload capacity, long flight duration and stability, which supports several remote sensing applications, including LiDAR. Currently, his main research goal in UAVs for the SSPEED center is to collect, process and integrate all of these different pieces of information like terrain, vegetation, waterbodies, bridges, and flood inundation extension to a comprehensive and precise hydrologic/hydraulic model.

Besides his strong background in surface and groundwater hydrology and hydraulics, experience in environmental engineering, Dr. Fang also possesses in-depth knowledge and experiences of hydrologic, hydraulic, and groundwater packages such as HEC-HMS, HEC-RAS, GW-Vistas, XP-SWMM, Visual MODFLOW, and ArcGIS. Additionally, he has investigated and modeled numerous groundwater contaminated sites in Texas, Louisiana, Florida, and Connecticut.

Experience

• Assistant Professor, University of Texas at Arlington, TX. (October 2013 – Present)
  • Perform research in urban water resources management, storm water management, water infrastructure, radar-based flood warning in real time, unmanned aerial vehicles (UAVs) application in water resources, drought prediction, urban sustainability design and planning, and Low Impact Development.
  • Conducting collaborative research to build a GeoAI Data-Fusion Framework for real-time assessment of flood damage and transportation resilience by integrating complex sensor datasets
Nick Z. Fang’s Resume (Page 3)

with researchers from the University of Wisconsin – Madison and the University of Hawaii – Manoa (NSF # 1940163 - $97,250/PI – 2020-2022)

• Conducting research in identification of urban flood impacts caused by land subsidence and sea level rise for the Houston-Galveston Region (NSF #1832065 - $180,000/PI – 2018-2020)


• Performing water resources review and research, hydrology and hydraulic Studies of the Trinity River and Guadalupe River for the U.S. Army Corps of Engineers ($254,000/PI – 2017-2020/recurring for the following 4 years – up to $770,000 as total).


• Performing Hydrology Infrastructure Data Collection and Analysis Services for Community Development Block Grant - Disaster Recovery Programs by the Texas General Land Office (TxGLO) ($499,981/PI – 2019).

• Developing a Water Management and Planning Tool for the Trinity River Authority ($60,000/PI – Phase II – 2019-2020).

• Conducting an In-Situ Study using Unmanned Aerial Vehicles to Evaluate the Effectiveness of Native Vegetation on Soil Infiltration for Harris County Flood Control District (HCFCD) ($49,992/PI – 2019).

• Performing research sponsored by the U.S. Department of Agriculture (USDA) through ALFA-IoT: Alliance for Smart Agriculture in the Internet of Things Era ($295,000/Co-PI) (2018-2022).

• Developing an advanced flood warning system for the City of Carrollton ($78,530/PI – 2018-2019).

• Developing an advanced flood warning system for the City of Grand Prairie – Phase II ($69,980/PI – 2018-2019).

• Developed a Water Management and Planning Tool for the Trinity River Authority ($60,000/PI – 2018-2019).

• Performed Dallas-Fort Worth Regional Assessment of Fair Housing for the City of Dallas and other cities ($918,930/Co-PI – 2016-2018)


• Developed an advanced flood warning system for the City of Grand Prairie – Phase I ($48,355/PI – 2016-2017).

• Performed research on climate forecast-aided drought decision support for North Central Texas with funding support from NOAA ($298,130/Co-PI – 2015-2017)

• Conducted storm water monitoring for Village Creek with the Trinity River Authority (TRA) and USGS with funding support from the City of Kennedale, Texas ($87,492/PI – 2015–2016)

• Conducted hydrologic analysis of urbanization, infiltration, and moving standard project storms for the Fort Worth Floodway (TRWD - $233,831/PI - 2014-2016)

• Conducting research in stormwater modeling and urban flooding, particularly in integrative sensing and prediction of urban water for sustainable cities (NSF#1442735 - $1,196,295/Co-PI/$718,622 - UTA share – 2014-2018)

• Research Scientist/Project Manager, Rice University, Houston, TX. (May 2007 – October 2013)

• Managed the hydrologic and hydraulic analysis project for the Yuna River watershed in the Dominican Republic; collaborated researchers and engineers from the Dominican Republic’s Water Resources Authority (INDRHI) and the Center for Space Research (CSR) at UT Austin to analyze and pinpoint areas for the LiDAR survey in order to develop digital elevation derived hydrologic and hydraulic models; led the team to develop hydrologic and hydraulic models and delineate floodplains
for this watershed in order to carry out appropriate flood control design for the local government ($150,000).

- Developed a real-time flood warning system for the Highway 288 junction over Brays Bayou, a highly flood-prone section, using calibrated hydrologic/hydraulic models and real-time NEXRAD rainfall data. Highway 288 is a major evacuation route from the Gulf coast. The recently developed hydraulic prediction tool (FPML) was incorporated into this flood warning system to visualize floodplain in near real time; designed and developed another real-time radar-based flood warning system for two flood-prone locations: Mandell St. near SH-59 and Tellepsen Rd near IH-45 in Houston, Texas for TxDOT; calibrated the SWMM models for both locations and developed rainfall – water surface elevation correlations with a detailed hydrologic/hydraulic study in order to provide flood warning information in real-time based on radar rainfall information. This project is funded by TxDOT with $200,000 for two years.

- Designed and developed a real-time flood warning system for several cross sections over Oyster Creek in Sugar Land, Texas. The flood alert system is based real-time NEXRAD radar rainfall data, a well-calibrated hydrologic model, and an operational data transfer platform. The project is funded by the City of Sugar Land with $80,000.

- Re-evaluated the stormwater system in Harris Gully with updated drainage information, hydrologic & hydraulic models, land use information, and recently-installed flood control facilities. The project was funded by the Texas Medical Center with $50,000.

- Re-evaluated the stormwater system and floodplain maps within the Rice University and its surrounding areas with updated land use information and flood control improvement. The project was funded by Rice University with $45,000.

- Performed an analysis of inland flooding and storm surge risk for the Clear Lake City Water Authority (CLCWA) using information collected during Hurricane Ike (2009) and hydrologic & hydraulic models; the research results were used to inform local residents and governmental agencies how to deal with floods and hurricane induced storm surge; funding for local infrastructural improvements can be allocated upon these research results as well. The project was funded by CLCWA with $65,000.

- Performed a pilot project that integrates a comprehensive coastal flood warning system with a “lifeline” evacuation analysis of the roadways and bridges on the Clear Lake areas in Texas. This project was funded by the Shell Sustainability Center with $42,000.

- Coordinated major research universities (UT-Austin, TAMU, LSU, UH, etc.) and other public and private entities to collaborate and exchange technical information of inland flooding induced by severe storms for the Center of Severe Storm Prediction, Education, and Evacuation from Disasters (SSPEED) with funding from Houston Endowment ($2.5 Million).

- Performed a study of storm surge impacts on the Houston Ship Channel using collected Hurricane Ike storm surge information, the results from Advanced Circulation Model (ADCIRC), and a 2-D MIKE-FLOOD model. This research was sponsored by the SSPEED center.

- Performed a study for a land development project within the Cypress Creek watershed using a distributed hydrologic model (Vflo™) in order for the local agency to control and monitor overland runofffs from developed areas. The sizing and locations of detention ponds were determined by my simulated results. The results and recommendations were also published in the ASCE Journal of Hydrologic Engineering providing conceptual land planning suggestions.

- Conducted a hydrologic/hydraulic study for the confluence of Oyster Creek and Ditch B to provide multiple tailwater conditions. The located is about 700 feet downstream of Dulles Ave. in the City of Sugar Land. The tailwater conditions were simulated based on the calibrated Oyster Creek models and were developed for FEMA frequencies (10%, 2%, 1%, and 0.2%).

- Developed groundwater flow and transport models (GW-Vistas) to evaluate groundwater directions under fluctuations of Mississippi River and operations of city supply wells in Myrtle Grove in Louisiana. Different scenarios and boundary conditions were set up and simulated to see negative impact from a Dow refinery plant on the surrounding neighborhood. This work was done to provide expert opinions as support for a litigation case.
• Conducted numerous detailed hydrologic and hydraulic studies for the purpose of evaluating flood risk and the causes of flooding events for the litigation cases from California, Florida, Louisiana, and Texas.

• **Ph.D. Rice University, Houston, TX** (March 2004- May 2008)
  - Developed advanced features of real-time flood forecast and control systems for flood-prone areas by incorporating real-time radar and storm surge data. This research was supported on the center of Collaborative Adaptive Sensing of the Atmosphere (CASA) from the National Science Foundation (NSF).
  - Developed unsteady state hydraulic modeling system to accurately delineate flood maps. This research was supported by CASA, an ERC of NSF.
  - Developed a hydraulic prediction tool, floodplain map library (FPML) for FAS2 to dynamically respond to real-time radar rainfall. This system can provide emergency personnel more lead time to initiate strategic measures. This research was supported by CASA from NSF.
  - Managing Flood Alert System (FAS3) for the Texas Medical Center and Brays Bayou area to keep the system running properly on a daily basis for the past years.
  - Developed and improved distributed models for Harris Gully area including the Texas Medical Center; incorporated pipe flow mechanism into the system to account for pressure flow; simulation results matched well with the measured data for historical rainfall events; awarded USGS Research Grant ($5000) for this research work.
  - Investigated in modeling groundwater flow for a former airplane jet repair facility in Connecticut, which was contaminated by chlorinated compounds used as grease detergent for many decades; modeled groundwater flow around a Dow Chemical facility in Louisiana; developed models for a contaminated site in Jerome, Florida to simulate creosote transport in groundwater using MODFLOW &MT3D.
  - Accomplished a hydrologic and hydraulic analysis by using HEC-HMS and HEC-RAS for many local projects under various flooding scenarios.

• **Research Assistant, Lamar University, Beaumont, TX** (Jan 2001-May 2003)
  - Developed natural attenuation models accounting for injection of oxygen releasing compound; planned to design the injection, so as to optimize the increase in dissolved oxygen content in groundwater.
  - Established a regression analysis of concentration versus distance for stable plumes as an analytical solution for one-dimensional, steady state, contaminant transport; quantified biodecay rate constants based on field data; performed sensitivity analysis on the total decay rate constants.

**Scientific Societies**
1. Texas licensed Professional Engineer (P.E.#109861)
2. Member of SIGMA XI
3. Member of American Society of Civil Engineers (ASCE)
4. Member of American Water Resources Association (AWRA)
5. Member of American Geophysical Union (AGU)
6. Member of Madison Who’s Who

**Honors**
- Gold Medal Recipient, American Council of Engineering Companies (ACEC) of Texas (April, 2019)
- Eleanor & Mills Bennett Fellowship ($24,000). (May, 2007)
- BP Student Travel Award ($500) from American Institute of Hydrology (AIH) (May, 2006)
- Award from USGS through Texas Water Resources Institute ($5,000) (March, 2005)

**Reviewer for Technical Journal Papers and Funding Agencies**
1. Reviewer of the Journal of Climate Risk Management (Elsevier)
2. Reviewer of the Journal of Hydrologic Engineering (ASCE)
3. Reviewer of the Journal of Hydrometeorology (AMS)
4. Review of the Journal of Hydrology (Elsevier)
5. Reviewer of the Journal of Water Resources Planning and Management (ASCE)
6. Reviewer of the Journal of Natural Hazards Review (ASCE)
7. Reviewer of the Journal of the American Water Resources Association (AWRA)
8. Reviewer of the National Institutes of Water Resources (NIWR) – USGS National Competitive Grants Program.

**Funded Proposals**

3. **Texas General Land Office (TxGLO)** - Hydrology Infrastructure Data Collection and Analysis Services for Community Development Block Grant - Disaster Recovery Programs ($499,981) (six months in 2019) -PI (Funded).
4. **National Science Foundation (NSF)** - Identification of urban flood impacts caused by land subsidence and sea level rise for the Houston-Galveston Region (NSF #1832065) ($180,000) (2018-2020) – PI
5. **Harris County Flood Control District (HCFCD)** - Conduct an In-Situ Study using Unmanned Aerial Vehicles to Evaluate the Effectiveness of Native Vegetation on Soil Infiltration for Harris County Flood Control District (HCFCD) ($49,992) (2019) – PI (Funded).
6. **Texas Department of Transportation (TxDOT)** - Develop a Generalized Skew Update and Regional Study of Other Measures of Distribution Shape for Texas Flood Frequency Analyses (TxDOT 19-203) ($125,862) (2018-2021) – PI (Funded).
11. **City of Carrollton** – Developing an Advanced Flood Warning System for the City of Carrollton ($78,530) (2018-2019) – PI.
13. **U.S. Army Corps of Engineers (USACE)** – Water Resources Review and Research, Hydrology and Hydraulic Studies for the U.S. Army Corps of Engineers, Fort Worth District ($254,000/1") (2017-2020) (The same funding will recur for the following four years with a total of $770,000) - PI
14. **City of Dallas and Dallas Housing Authority** - Performing Dallas-Fort Worth Regional Assessment of Fair Housing ($918,930) (2016-2018) – Co-PI
15. **Western Michigan University (WMU)** – Assessing the Impact of Air Pollution on Public Health Along Transit Routes ($103,324) (2017-2018) – Co-PI (Funded).
17. **City of Kennedale** – Conduct Storm Water Monitoring for Village Creek ($87,492) (2015-2016) - PI

---

Tel: (817) 272-5334 Email: nickfang@uta.edu Web: http://fang.uta.edu
Civil Engineering Department, the University of Texas at Arlington, P.O. BOX 19508, Arlington Texas 76019-0308.
21. **Texas Medical Center** – Harris Gully Storm Water System Analysis ($50,000) (2010)
22. **Rice University** – Rice University Floodplain Re-evaluation ($45,000) (2010)
23. **Clear Lake City Water Authority** – Flood and Storm Surge Risk Analysis ($ 65,000) (2009-2010)
24. **INDRHI** – H&H Study for the Dominican Republican Yuna River ($150,000) (2008-2010).
25. **City of Sugar Land** – Real-time Flood Alert System for Oyster Creek ($ 80,000) (2009).
27. **USG** - Enhancing a Distributed Hydrologic Model for Storm Water Analysis within a GIS Framework in an Urban Area ($5,000) (2005)

http://water.usgs.gov/wrri/05grants/2005TX193B.html

### Workshops and Teaching Experience

1. Water Resources Engineering (CE3342) at UTA (2016 to Present)
2. Advanced GIS and Hydrologic/Hydraulic Modeling (CE4326/5349) at UTA (2014 to Present)
3. Water Systems Design (CE4328) at UTA (2014 to Present)
4. Advanced Hydrology (CE5347) at UTA (2013 to Present)
5. Engineering Hydrology (CIVE6361) at University of Houston (2012 to 2013)
7. Urban Hydrology and Floodplain Analysis (CEVE412) at Rice University. (2004 to 2013)
8. GIS and its Applications (CEVE 512) at Rice University. (2004 to 2013)
9. Engineering Geographic Information System (CIVE7342) at University of Houston (Fall, 2010)
10. Flood Alert System Training Session at Texas Medical Center (August, 2015)
11. Flood Alert System Training Session at Texas Medical Center (May, 2014)
12. Flood Alert System Training Session at Texas Medical Center Library (September, 2010)
13. Flood Alert System Training Session at TxDOT (January, 2009)
14. Flood Alert System Training Session at Transtar (February, 2009)
15. Flood Alert System Training Session at Rice University (January, 2008)
16. Flood Alert System Training at Texas Medical Center Library. (March, 2007)

### Invited Seminars and Talks

2. ASCE Environmental Water Resource Institute (EWRI), Dallas and Fort Worth Branches (2018)
5. ASCE Dallas Section Annual Meeting, Invited Keynote Speaker (2017)
7. Civil and Environmental Engineering Department, Rice University (2017)
9. Society of American Military Engineers (SAME), Dallas Chapter (2016)
10. Spatiotemporal Storms, ASCE EWRI (2016)
11. Texas Weather Conference, The University of Texas at Austin (2016)
12. American Concrete Pipe Association (ACPA), The University of Texas at Arlington (2016)
17. Beijing Meteorological Bureau, China (2015)
19. Industrial and Manufacturing Department, The University of Texas at Arlington (2015)
21. Civil and Environmental Engineering Department, Rice University (2014)
22. Catchment-based Hydrologic Model Data Assimilation (CAHMDA) and Hydrologic Ensemble Prediction Experiment (HEPEX-DAFOH) Joint Conference – Invited Lunch Speaker (2014)
23. Stormwater Management Department, The City of Fort Worth (2014)
24. Interagency Coordinating Meeting, Tarrant Regional Water District (TRWD)
25. CP&Y Engineering, Inc. (2014)
26. ASCE Summit on Flood Risk Management (2013)
27. Civil & Environmental Engineering Department, Rutgers University (2013)
28. Civil, Environmental & Oceanic Engineering Department, Stevens Institute of Technology (2013)

Publications
Peer Reviewed Journal Papers


Books or Chapters


Conference Papers and other Technical Publications


48. Fang, Z. and Bedient, P.B. (2014). “An Operational Radar-based Flood Warning System for Highly Urbanized Area in Texas”, Invited Lunch Speaker at the Catchment-based Hydrologic Model Data Assimilation (CAHMDA) and Hydrologic Ensemble Prediction Experiment (HEPEX-DAFOH) Joint Workshop, the University of Texas at Austin, September 8-12.


Dissertation and Thesis


References Available Upon Request