Jason Haydel Collins III
Computational Mechanics. **Email:** Jason.Collins@duke.edu **Website:** *https://jhcollins.github.io*

Education & Certification:

Duke University, Durham, North Carolina, August 2021 - Present
PhD Candidate; Computational Mechanics. Department of Civil and Environmental Engineering.
Under the advisement of Dr. Guglielmo Scovazzi

Louisiana State University, Baton Rouge, Louisiana, August 2017
Master's Degree in Coastal Engineering, Thesis Option. August 2017
Under the advisement of Dr. Clinton Willson
Thesis Title: Quantifying Strength of Floating Marsh & Interaction with Hydrodynamics
Available at: http://etd.lsu.edu/docs/available/etd-06042017-123347/

Bachelor's Degree in Environmental Engineering. May 2014
Dean's List: Spring 2013, Spring 2014.

Research & Publications:

Papers:

- J. Haydel Collins, Alexei Lozinski, Guglielmo Scovazzi,
  A penalty-free Shifted Boundary Method of arbitrary order,
  Computer Methods in Applied Mechanics and Engineering, 15 December 2023.
  https://doi.org/10.1016/j.cma.2023.116301.

- Christopher E. Kees, J. Haydel Collins, Alvin Zhang,
  Simple, accurate, and efficient embedded finite element methods for fluid–solid interaction,
  Computer Methods in Applied Mechanics and Engineering, 01 February 2022.
  https://doi.org/10.1016/j.cma.2021.114404.

- Manuel Quezada de Luna, J. Haydel Collins, Christopher E. Kees
  An unstructured finite element model for incompressible two-phase flow based on a monolithic conservative level set method.
  International Journal for Numerical Methods in Fluids, 03 February 2020.
  https://doi.org/10.1002/fld.4817

- Dimakopoulos, Aggelos; Sklia, Maria; Collins, J. Haydel; Kees, Christopher; de Lataillade, Tristan
  Advanced Wave Generation Systems for Numerical Modelling of Coastal Structures.
  In: Goseberg, Nils; Schlurmann, Torsten (Hg.): Coastal Structures 2019. Karlsruhe: Bundesanstalt für Wasserbau. S. 712-722.
  https://doi.org/10.18451/978-3-939230-64-9_071

Talks:

- ***A New Approach For The Enforcement of Neumann Boundary Conditions With The Shifted Boundary Method.*** *July 2024,* Vancouver, BC, *16th World Congress on Computational Mechanics. Session: Immersed-boundary variational methods: Theory, data structures, and applications.*

- ***Using computational fluid dynamics in overtopping analysis.***
  July 2020, USACE Coastal Working Group Seminar, New Orleans District, LA, USA

- ***Multiphase Flow Applications using Proteus.***
  August 2018, CHL Research Forum Seminar, Coastal Hydraulics Laboratory, Vicksburg, LA, USA

- ***Quantifying Thin Mat Floating Marsh Strength and Interaction with Hydrodynamic Conditions***
  June 2016, State of the Coast, New Orleans, LA, USA

Posters:

- Haydel Collins, Maria Sklia, Max Agnew, David Fertitta, Aggelos Dimakopoulos, Matt Halso, Chris Kees.
  Applying a multi-scale decoupled modeling approach to evaluation of New Orleans flood defenses. AGU Ocean Sciences 2020, San Diego, CA. February 16-20
- Christopher E. Kees, Jason H. Collins, Tristan de Lataillade
  Level Set Methods for Modeling Air-Water-Grain Interactions at the Microscale.
  AGU Fall Meeting 2019, San Francisco, CA. December 09-13
- Jason Haydel Collins, Charles Sasser, Clint S Willson
  Quantifying Thin Mat Floating Marsh Strength and Interaction with Hydrodynamic Conditions.
  AGU Fall Meeting 2016, San Francisco, CA. December 16
- Jason Haydel Collins, Charles Sasser, Clint S Willson
  Quantifying Thin Mat Floating Marsh Strength and Interaction with Hydrodynamic Conditions
  LSU Graduate Research Conference, Louisiana State University, Baton Rouge, LA. February 2016

Theses:

Haydel Collins
Method for Quantifying Floating Marsh Strength and Interaction with Hydrodynamics.
LSU Master's Theses. 4615. 2017 https://digitalcommons.lsu.edu/gradschool_theses/4615

Other:

- International Assoc. for Hydro-Environmental Engineering Research The Hague, NED July 2015
- WERC Engineering Competition Las Cruces, NM. April 2014

Work Experience:

United States Army Corps of Engineers:

Civil Engineer (Hydraulics), May 2017 – July 2021;

2020 Annual Appraisal: 5 out of 5, Outstanding

2019 Annual Appraisal: 5 out of 5, Outstanding

2018 Annual Appraisal: 5 out of 5, Outstanding

- Served leading & supporting roles for both civil works & military engineering projects.
- Successfully brought in projects and funding from outside sources.
- Provided technical guidance & training to entry level & senior level engineers.
- Published research in the field of CFD modeling & coastal hydraulics.
- Developed software, scripts, & models to assist fellow engineers perform work more efficiently.
- Served a 6-month detail at the Coastal Hydraulics Lab in the ERDC
- Presented multiple educational seminars to fellow employees and team members
- Served in multiple flood fights, hurricane teams, & disaster relief efforts.

Projects:

Military Engineering (Supporting Engineer)

- 3D FSI modeling of the Improved Navy Lighterage System (INLS).
- Analyzed the hydrodynamic loads on the Improved Ribbon Bridge (IRB).
- Developed python Jupyter notebooks for analysis of the IRB shore anchoring system.
- Assisted with physical modeling for the Trident Pier System at the UMaine wave facility.

- Assisted with testing a developmental Discrete Element model called Mosaic at CRREL.
- Assisted HR Wallingford in running their 3D FSI simulations of Semi-Submersible wind turbine base.

South Central Coastal Louisiana Project (Lead Hydraulic Engineer)

- Lead Hydraulic engineer for BBA-18 congressionally authorized study.
- Developed an expanded Atchafalaya River model to assess riverine flooding.
- Utilized existing ADCIRC data to estimate coast-wide surge hazard and risk.
- Provided technical guidance to the multi-disciplinary Project Design Team (PDT)
- Compiled technical reports in support of project design milestones.

Navier-Stokes/Fluid Structure Interaction Community of Practice (Co-Originator)

- Conducted training course on programming with Python and using CFD.
- Assisted in developing Statements-of-Need for agency-wide guidance for CFD modeling.
- Received funding from USACE HQ to do validation comparison of CFD codes.
- Aiming to develop policy and guidance for USACE use of CFD models.

East Atchafalaya Backwater Study (Lead Hydraulic Engineer)

- Developed HEC-RAS model to analyze backwater flooding in the Morgan City, LA area.
- Analyzed multiple alternatives for both riverine and rainfall events.
- Used project as a training opportunity for other engineers in the office.

Upper Barataria Basin (Supporting Engineer)

- Created the 2D HEC-RAS model for the project area with rushed schedule.
- Utilized existing hurricane data to estimate surge inundation.
- Trained a senior engineer on how to model using HEC-RAS.
- Utilized personally developed software to produce synthetic rainfall events.

HSDRRS PCCP Modeling (Supporting Engineer)

- Developed HEC-RAS & Delft-3D models for the 17 th St & London Ave pump stations.
- Ran various scenarios analyzing velocities through gate structures & near pump outflows.
- Assisted in reviewing correspondence between contractors and USACE during litigation.

Zydeco Ridge Wave Study (Supporting Engineer)

- Assisted in conducting wave study for borrow pit in Lake Pontchartrain.
- Developed wind conditions for use in AdCIRC + SWAN simulations.
- Ran models on HPC's and post processed figures using Matlab.
- Wrote technical report describing the modeling effort.

Comite Diversion (Reviewer)

- Conducted a technical review of a Delft3D-FM model for Brook's lake area.
- Performed additional Delft3D-FM modeling scenarios for the study.
- Providing technical guidance to employee on detailed assignment.

Lake Maurepas Diversion Project (Reviewer)

- Conducted a technical review of a Delft3D model for the Lake Maurepas diversion study.

Developmental Works and Innovation:

Proteus (Supporting Engineer)

- Work with multi-disciplinary team of researchers and engineers on code development.
- Actively test and troubleshoot new numerical methods developed for use in multiphase
- flow applications. i.e. the CLSVOF method and immersed boundary methods.
- Developed an effective CFD training repository for new engineers and researchers.
- The open source code can be found here: https://github.com/erdc/proteus

HHC-Tools (Lead Engineer)

- Led development of a suite of tools designed to expedite common hydraulic engineering tasks. https://github.com/jhcollins/MVN
- Trained fellow engineers in python development, which resulted in their ability to contribute to the toolkit.

South Louisiana Master Model (SLaMM (Co-Developer)

- Worked with coworkers on developing a coast-wide HEC-RAS model.
- The model covers the entire Southern Louisiana watershed and coast, including the Lower Mississippi River, Atchafalaya River, New Orleans flood protection system, etc.
- SLaMM is also utilized as a forecasting tool during hazardous flood scenarios and emergency operations.

Synthetic rainfall time series generator (Developer)

- Developed Python script that will produce rainfall hydrographs built from NOAA ATLAS-14 statistics given duration, AEP, & Lat-Lon.

National historic rainfall time series generator (Co-Developer)

- Wrote Matlab tool that will return rainfall hydrograph given any duration and any Lat-Lon within the continental US.

LSU Department of Civil & Environmental Engineering:

Research Assistant, September 2014 – December 2016

- Conducted Louisiana Board of Regents funded eco-hydraulics thesis research.
- Constructed 3-D hydraulic models with ANSYS FLUENT & Delft 3D-FLOW.
- Utilized LSU's High Performance Computing (HPC) resources for CFD simulations.
- Implemented 2-D, 3-D, & coupled CFD-FEA models involving FSI.
- Designed & tested tensile strength measuring device for material stress-strain analyses.

Fluid Mechanics Lab Instructor, August 2016 – December 2016

- Course instructor for 75 undergraduate Civil Engineering students.
- Lectured on numerous fluid dynamics concepts requiring advanced knowledge.
- Prepared students with rigorous technical writing & scientific presentation exercises.

Teaching Assistant, August 2015 – May 2016

- Tutor & grader for 150+ Civil Engineering students for Fluid Mechanics Lecture CE 2200.
- Provided weekly office hours for students in need of assistance on assignments.

Technical Skills:

Programming Languages:

C++, Python, Matlab, LaTeX

Version Control and Package Manager Utilities:

Git (CLI), Anaconda

2D Modeling Software:

HEC-RAS, Delft-3D FLOW, Delft-3D FlexMesh, SWAN, SMS.

3D Modeling Software:

Poseidon, Proteus, ANSYS, GMSH, Pointwise

High Performance Computing:

Systems: Excalibur, Topaz, Onyx, SuperMikeII, Garnet.
OS: Linux, GNU/Bash

Other:

Jupyter Notebooks, ArcGIS, SciKit Learn, Paraview

Awards:

- Achievement Medal for Civilian Service: PCCP 2019, Col Clancy.
- Achievement Medal for Civilian Service: Debris Team Puerto Rico 2018, Col Clancy.
- Certificate and Medal of completion: ERDC U 2018, Dr. David Pittman.
- Medal Award for Excellence: ERDC U 2018, Col Clancy.
- Certificate of Completion: Hurricane Nate Response 2017, Col Clancy.
- Certificate of Completion: Flood Fight 2017, Col Clancy.

References:

- Guglielmo Scovazzi, PhD
  Professor in the Department of Civil and Environmental Engineering, Duke University
  Professor in the Thomas Lord Department of Mechanical Engineering and Materials Science
  Email: Guglielmo.Scovazzi@duke.edu

- Alexei Lozinski, PhD
  Professor in Applied Mathematics
  Laboratoire de mathématiques de Besançon Université de Franche-Comté
  Email: alexei.lozinski@univ-fcomte.fr

- Christopher Kees, PhD
  CSRS Distinguished Professor
  Department of Civil and Environmental Engineering, Louisiana State University
  LSU Center for Computation and Technology
  Email: cekees@lsu.edu