

# Peter J. Lawson

NSF FELLOW - PHD CANDIDATE · BIOINNOVATION

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## Education

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### Ph.D. Candidate in Bioinnovation, NSF-IGERT Fellowship

*New Orleans, Louisiana*

TULANE UNIVERSITY

*Aug. 2014 - May. 2020 (Anticipated)*

- **Significant Coursework** Data Visualization, Management of Technology and Innovation, Intermediate Biostatistics, Advanced Machine Learning, Biomedical Imaging and Processing

### B.S. in Computer Science and Biology (Honors), Minor in Philosophy

*Wilmington, North Carolina*

UNIVERSITY OF NORTH CAROLINA AT WILMINGTON

*Aug. 2011 - May. 2014*

- **Significant Coursework:** Scientific Computing, Parallel Programming, Database Design and Implementation, Software Engineering, Computer Networks, Bioethics, Cellular and Ecological Systems

## Skills

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### Research

**Programming:** (Python, R, MATLAB, C, Java), **Data Visualization:** (R-Shiny, Bokeh, Plotly, ggplot2, matplotlib, D3), **Version Control:** (Git & Mercurial, Github & Bitbucket), **Web Development:** (HTML/CSS/Javascript, Hugo & Jekyll), **API Development:** (REST API Client development - .xml and .json payloads)

### Data Librarianship

**Workshop Development:** (2 Workshops developed for Tulane Library: Data Visualization & Data Cleaning), **Library Education:** (2 LibGuides, 1 Wiki developed), **Digital Scholarship Tools:** (OpenRefine, Tableau, Zotero)

### Communication

**Technical Writing** (3 Publications, 4 Funded Grants), **Presentation Skills** (3 Workshops, 4 Oral Presentations, 2 Invited Talks), **Mentorship** (5 Undergraduate & 2 Graduate Students), **Business Development** (Participation in 3 Prominent Startup Accelerators, > 4 Million USD of Fundraising), **Project Management** (Jira based SCRUM)

## Experience

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### Tulane University

*New Orleans, LA*

PHD CANDIDATE - NSF FELLOW

*Aug. 2014 - Present*

- Designed and conducted research in computational topology, resulting in the development of robust computational descriptors for whole-slide pathology images, enabling supervised and unsupervised machine learning approaches for the prediction of prostate cancer aggressiveness. Developed a visualization dashboard in R-Shiny to communicate results to pathologists and collaborators.
- Implemented and deployed a digital pathology annotation platform and custom REST API client, ingesting and converting Aperio Imagescope .xml annotations to compliant .json, enabling multiple research studies under a unified cyberinfrastructure and eliminating dependence on costly proprietary software. Developed consistent metadata schema for linking annotations to images. Created a website [guide.tu-biophotonics.org](http://guide.tu-biophotonics.org) to onboard new pathologists to the platform.
- Mentored and trained five undergraduate students to perform image analysis, machine learning, and conduct independent research.
- Implemented a laboratory data management system including redundant off-site backups, on-site multi-client data repository, and a wiki documentation system.

### Tulane University Howard-Tilton Memorial Library

*New Orleans, LA*

LIBRARIAN VOLUNTEER

*Oct. 2019 - Present*

- Developed a data curation tutorial LibGuide in Springshare designed to guide researchers through the process of data curation consistent with FAIR data principles, reducing the number of personal needed for one-on-one data curation consultations. Utilized custom CSS and HTML formatting to enhance the aesthetics and functionality of the libguide.
- Assisted in the development of a data cleaning workshop - implemented regular expressions in Jython to demonstrate the capabilities of the OpenRefine platform to workshop attendees.
- Developed and led an introductory workshop on Python for data visualization that, due to high demand, was expanded into a series of workshops serving graduate students, faculty, and librarians.
- Provided guidance in system architecture to Tulane technical services for the development of an institutional data repository linked to existing high performance computing resources.
- Completed Carpentries instructor certification, certified to teach Data Carpentry, Software Carpentry, and Library Carpentry workshops.

## **Instapath Inc.**

*New Orleans, LA*

COFOUNDER AND CTO

*Nov. 2016 - Oct. 2019*

- Conducted user needs assessment for digital pathology user interface, converted user statements into technical requirements.
- Implemented and managed an agile project management system, based on the SCRUM methodology, in Jira.
- Implemented GPU parallel processing approach in MATLAB for real-time post processing of gigapixel fluorescence images.
- Developed web-based gigapixel image viewer utilizing OpenSeadragon for display of histopathology images acquired from custom microscopy hardware, and enable the remote evaluation of those images by an off-site pathologist.
- Competed in MassChallenge, TMCx, and Y Combinator startup accelerators, facilitating seed investment of over 1.7 million.

## **Federal Drug Administration (FDA)**

*Silver Springs, MD*

INTERN - CENTER FOR DEVICES AND RADIOLOGICAL HEALTH (CDRH)

*May. 2015 - Aug. 2015*

- Integrated and cleaned data from disparate FDA databases to enable analysis of reporting trends by post-market surveillance analysts.
- Developed a dashboard in Python that ingests, visualizes, and monitors medical device adverse event reports to identify trends predictive of potential medical device failure, enabling potential device recall prior to significant impact.

## **NSF CyVerse (Previously iPlant Collaborative)**

*Wilmington, NC*

RESEARCH ASSISTANT

*Jun. 2013 - July. 2014*

- Implemented and improved the Genome Wide Association Study workflow to enable intuitive user experiences in the CyVerse cyberinfrastructure.
- Conducted software testing and integration for new applications developed for the CyVerse project.

## **Developed and Presented Workshops**

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### **Introduction to Python for Data Visualization**

*Tulane University*

TULANE UNIVERSITY HOWARD-TILTON MEMORIAL LIBRARY WORKSHOP SERIES

*Jan. 2020*

### **Persistent Homology for Low-Dimensional Medical Images**

*College of Charleston*

NATIONAL SCIENCE FOUNDATION CBMS: TOPOLOGICAL METHODS IN MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

*May. 2019*

WORKSHOP

### **Introducing Shell and Basic Development on HPC Systems**

*Tulane University*

TULANE COMPUTATIONAL BIOLOGY LECTURE SERIES

*Jul. 2018*

## **Professional Presentations**

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### **Assessment of sampling adequacy using persistent homology for the evaluation of heterogeneity in 3D histology acquired through inverted selective plane illumination microscopy (iSPIM)**

*Munich, Germany*

ORAL PRESENTATION (INVITED TALK) - EUROPEAN CONFERENCE ON BIOMEDICAL OPTICS

*Jul. 2019*

### **Persistent homology for the automatic classification of prostate cancer aggressiveness in histopathology images**

*San Diego, CA*

ORAL PRESENTATION - SPIE MEDICAL IMAGING - DIGITAL PATHOLOGY

*Mar. 2019*

### **Quantifying prostate cancer morphology in 3D using light sheet microscopy and persistent homology**

*San Francisco, CA*

ORAL PRESENTATION - SPIE PHOTONICS WEST

*Jan. 2018*

### **Investigating topological descriptors for the grading of prostate cancer**

*Bozeman, MT*

ORAL PRESENTATION (INVITED TALK) MONTANA STATE UNIVERSITY

*May. 2017*

### **Topological descriptors for quantitative prostate cancer morphology analysis**

*Orlando, FL*

POSTER PRESENTATION - SPIE MEDICAL IMAGING HONORABLE MENTION BEST POSTER AT SPIE MEDICAL IMAGING.

*Feb. 2017*

### **Does combining different detection algorithms improve the robustness of whole-genome prediction when a mixed large and small underlying genetic architecture is present?**

*St. Charles, Illinois*

POSTER PRESENTATION - 55TH ANNUAL MAIZE GENETICS CONFERENCE

*Mar. 2013*

## Professional Publications

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- [1] **Peter Lawson**, Bihe Hu, Brittany Terese Fasy, Brian Summa, Carola Wenk, and J. Quincy Brown. *Assessment of sampling adequacy using persistent homology for the evaluation of heterogeneity in 3D histology acquired through inverted selective plane illumination microscopy (iSPIM)*. In *Clinical and Preclinical Optical Diagnostics II*, volume 11073, page 1107316. International Society for Optics and Photonics, July 2019.
- [2] **Peter Lawson**, Jordan Schupbach, Brittany Terese Fasy, and John W. Sheppard. *Persistent homology for the automatic classification of prostate cancer aggressiveness in histopathology images*. In *Medical Imaging 2019: Digital Pathology*, volume 10956, page 109560G. International Society for Optics and Photonics, March 2019.
- [3] **Peter Lawson**, Andrew B. Sholl, J. Quincy Brown, Brittany Terese Fasy, and Carola Wenk. *Persistent Homology for the Quantitative Evaluation of Architectural Features in Prostate Cancer Histology*. *Scientific Reports*, 9(1):1139, February 2019.

## Co-authored Funded Grants

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### **CPRIT Seed Awards for Product Development Research: Rapid pathology evaluation system for biopsies**

CPRIT DP190018 - FUNDED AWARD AMOUNT: **\$3,000,000**

*Cancer Prevention & Research  
Institute of Texas  
Feb. 2019*

### **STTR Phase I: An automated digital pathology lab for rapid on-site processing and imaging of tissue biopsies**

NSF 1820258 - FUNDED AWARD AMOUNT: **\$225,000**

*NSF: Division of Industrial  
Innovation & Partnership  
July. 2018*

### **QuBBD: Collaborative Research: Quantifying Morphologic Phenotypes in Prostate Cancer - Developing Topological Descriptors for Machine Learning Algorithms**

NSF-DMS 1664848 - FUNDED AWARD AMOUNT: **\$479,293**

*NSF: Division of Mathematical  
Sciences  
Aug. 2017*

### **QuBBD: Collaborative Research: Towards Automated Quantitative Prostate Cancer Diagnosis**

NSF-DMS 1557750 - FUNDED AWARD AMOUNT: **\$52,931**

*NSF: Division of Mathematical  
Sciences  
Sept. 2015*

## Honors & Awards

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- 2018 **\$25,000 Texas Medical Center Accelerator Prize**, Rice Business Plan Competition *Houston, TX*
- 2018 **\$15,000 Women's Health and Wellness Prize**, Rice Business Plan Competition *Houston, TX*
- 2017 **1st Place, \$10,000 Award**, Tulane Novel Tech Challenge *New Orleans, LA*
- 2017 **2nd Place**, Tulane National Business Model Competition *New Orleans, LA*
- 2017 **1st Place**, Cox Business/Inc. Magazine "Get Started" Pitch Competition 2017 *New Orleans, LA*
- 2017 **1st Place, \$30,000 Award**, International Business Model Competition *Mountain View, CA*