

The Louisiana Biomedical Research Network Bioinformatics, Biostatistics, & Computational Biology Core



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Bioinformatics, Biostatistics, & Computational Biology Core
Louisiana Biomedical Research Network



LBRN

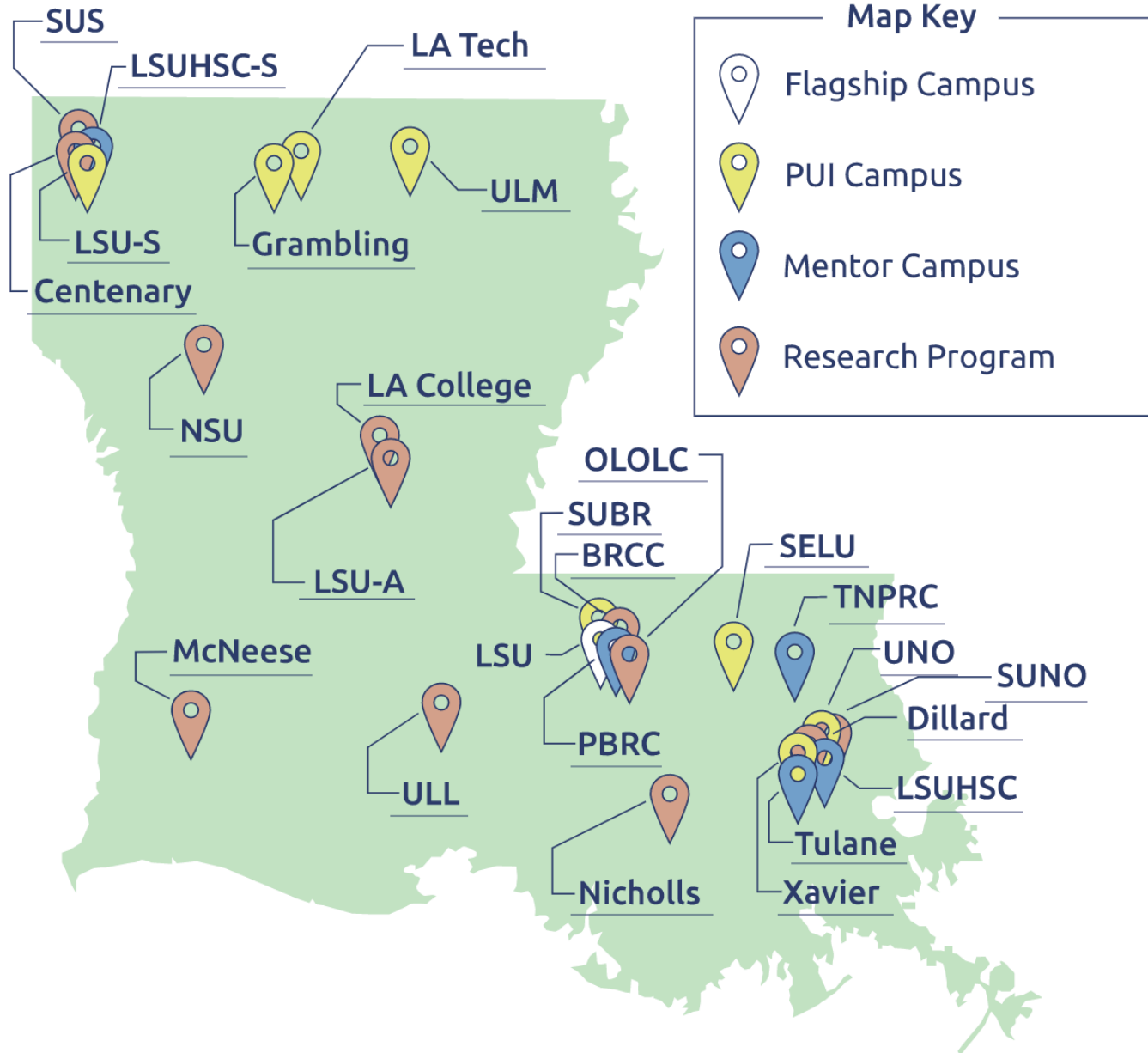
Louisiana Biomedical Research Network

The Mission



- ❧ The Bioinformatics, Biostatistics, and Computational Biology (BBC) Core of the Louisiana Biomedical Research Network (LBRN) serves to train and support LBRN researchers and enhance translational research activities across the network
 - ❧ Assist with connecting appropriate collaborators
 - ❧ Provide essential computational and analytic expertise to LBRN researchers to enhance competitiveness
 - ❧ Educate LBRN researchers in Bioinformatics techniques
 - ❧ Expose LBRN researcher to latest research methods

Louisiana Campuses



BBC Core Organization



Christopher Taylor
(BBC Core Director)

Core Leadership Team

Ronald Horswell
(Associate Director)

Ram Ramanujam
(Associate Director)

Michal Brylinski
(Associate Director)

Urska Cvek
(Associate Director)

Nayong Kim
(Associate Director)

Xue Wen

John Quebedeaux
Lyndon Coghill

Leadership Support

Core Liaison Officers

Seetharama
Jois
ULM

Thomas
Bishop
LA Tech

April
Wright
SELU

Paul
Kim
Grambling

Patrick
Mensah
SUBR

Urska
Cvek
LSU-S

Matthew
Hayes
Xavier

Tamjidul
Hoque
UNO

Core Liaison Officers



- ❧ Core Liaison Officers are appointed for one year renewable terms and provide a point of communication for each campus to the core
 - ❧ Identify the needs for each campus and LBRN faculty
 - ❧ Communicate needs to the BBC Core leadership
 - ❧ Communicate educational opportunities to faculty
 - ❧ Review Core Bucks applications from faculty and provide recommendations for funding to the Core
 - ❧ Describe future needs for their campus and investigators who could take advantage of the Core

Core Bucks Program



- ❧ Provides a pool of funding for LBRN member institution investigators to apply to receive BBC Core services to assist with data analysis
 - ❧ All reasonable requests are recommended for funding
 - ❧ Can utilize funds for any services available with a schedule of listed fees
 - ❧ GeneLab NGS Bioinformatics – LSU-BR
 - ❧ Microbial Genomics Resource Group – LSUHSC-NO
 - ❧ Bioinformatics Core – LSUHSC-Shreveport
 - ❧ Pine Biotech through LSU partnership



Could you use \$1500 in core bucks for use with any of the services provided by the LBRN Bioinformatics, Biostatistics and Computational Biology Core?

The Bioinformatics, Biostatistics, and Computational Biology Core (BBCC) serves to train and support project investigators and their teams across Louisiana. It works to enable Louisiana Biomedical Research Network project PIs and their teams to employ Louisiana cyberinfrastructure (especially high performance computing), and to provide bioinformatics services, training, and educational support.

The core provides bioinformatics training, conducts workshops, and provides bioinformatics analysis services. The core also provides access to the IBM Delta Cluster and has a dedicated BBC allocation for the high performance computing resources at LSU.

The BBC Core maintains software licenses and access to Ingenuity Pathway Analysis (IPA), Partek Flow, DNASTAR, and Ion Torrent analysis software. In addition, several open source tools for bioinformatics such as bowtie, tophat, cufflinks, samtools, GATK, QIIME, DADA2, Phyloseq, etc. are installed and maintained.

Some examples of standard bioinformatics workflows that can be supported through core bucks requests:

- Gene Pathway Analysis
- RNA-Sequencing Processing and Analysis
- 16S rRNA Microbial Community Analysis
- ITS2 Fungal Community Analysis

Other workflows can be developed or adapted from existing software on an as needed basis.

For more information, see: <http://lbrn.lsu.edu/resources/cores>

Hardware Infrastructure



- ❧ LONI HPC - Available to all researcher in Louisiana
 - ❧ Eric, Queenbee2 - Supercomputing resources
- ❧ LSU CCT HPC - Available to LBRN Researchers
 - ❧ Delta Cluster
- ❧ LSU HPC - Available to LBRN Researchers
 - ❧ Philip, SuperMike-II, SuperMIC
- ❧ LSUHSC-NO - (Coming Soon)
 - ❧ Tigerfish Cluster - NSF Grant awarded to CMT
 - ❧ 1440 total compute cores, 193.6 teraFLOPS

Software Infrastructure



- ❧ An array of bioinformatics software is maintained on the computing infrastructure with licensed software made available to LBRN researchers through partnership with the campus owning licenses
- ❧ ALLPATHS-LG, BAMtools, Barracuda, bedtools, Bfast, Bioconductor, BioPython, Boost, Bowtie, Bowtie2, BWA, ClustalW, Cufflinks, EBSEQ(R), EMBOSS, FASTA, FastQC, gnuplot, Graphviz, HMMER, HTSeq, htplib, IGV, iSAAC, Matplotlib, Mothur, NCBI BLAST+, Numpy, Oases, Picard, PLINK, Pysam, Python, QIIME, R, RSEM, Samtools, SHRiMP, SOAP3-DP, SOAPaligner, SOAPbuilder, SOAPdenovo2, SQLite, STAR, tabix, TMAP, TopHat, Trinity, variant_tools, Velvet, etc.

Educational Resources



- ❧ The LBRN hosts a variety of training sessions on HPC utilization, scripting, and software utilization
- ❧ Personnel are available to assist with LBRN researcher usage of HPC resources
 - ❧ Contact BBC Associate Director Nayong Kim for details: nykim@cct.lsu.edu
- ❧ Exposure to research methods and ongoing LBRN activities is provided at the LBRN Annual Meeting, Summer Research Program, and Annual Conference on Bioinformatics and Computational Biology

Annual Conference

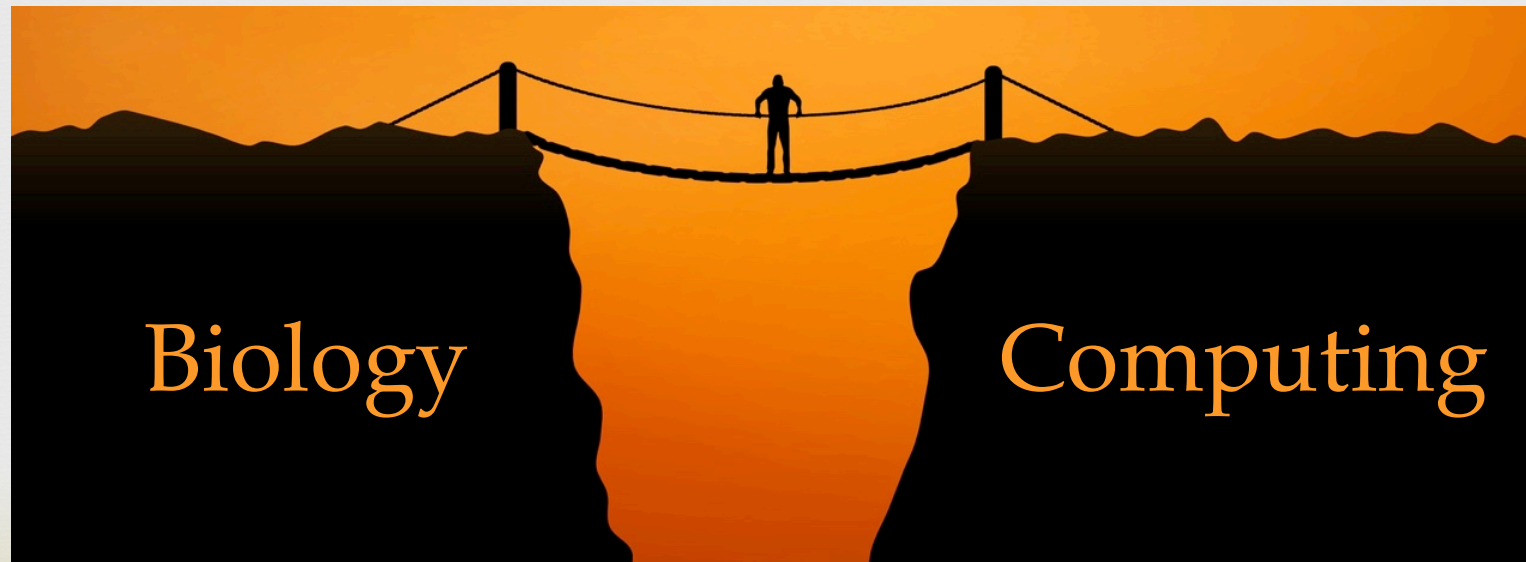


- ❧ Our 8th Annual Conference planned for April 2020 had to be cancelled due to the emergence of COVID-19
- ❧ Rescheduled to April 15-17, 2021: Annual LA Conference on Computational Biology and Bioinformatics
 - ❧ <http://lbrn.lsu.edu/conference-on-biology-and-bioinformatics.html>
 - ❧ NIH STRIDES Session (led by Todd Reilly NIH/CIT)
 - ❧ Keynote expected from Amazon Web Services Research
 - ❧ Keynote expected from Google Cloud Research
 - ❧ Other eminent bioinformatics and computational biology speakers being rescheduled for this year (coming soon)

The Changing Landscape



- ❧ Bioinformatics is no longer a niche area that can be served by a handful of specialized researchers
- ❧ Nearly every discipline within biomedical research now has the need for bioinformatics methods



The Challenge



- ❧ There is a need to train a larger cohort of biomedical researchers empowering them to perform analysis
 - ❧ These researchers need not be bioinformatics specialists
- ❧ Diverse backgrounds lead to challenges with the traditional format of educational programs
 - ❧ Students with varying backgrounds either fall behind a normal pace or are held back with a slower pace
- ❧ Emerging Solution: More reliance on technology to provide online learning opportunities that allow students to move at their own pace

Lectures on Informatics



- ❧ Lectures conducted at LSUHSC-NO (Spring 2016 & 2017)
 - ❧ Recorded via mediasite capture with our A/V team
 - ❧ Broadcast via live streaming for remote viewing
 - ❧ Participation via group forum for questions, announcements, and distribution of material
- ❧ Recorded lectures persist available for viewing on demand at
 - ❧ <http://metagenomics.lsuhscc.edu/lectures/introinformatics>
 - ❧ <http://metagenomics.lsuhscc.edu/lectures/intromicrobiota>
- ❧ Slide sets, videos, and other lecture material are also available for download at the above URLs

Broader Impact



Dear Dr. Taylor,

We are writing to introduce ourselves and to request permission to link our CTR website to some of the training materials available on your website.

The Northern New England Clinical and Translational Research (NNE-CTR) Network <http://www.med.uvm.edu/nne-ctr/home> began on July 1, 2017 and is joint between Maine Medical Center, the University of Vermont, and the University of Southern Maine. We are co-directing the Clinical Research Design, Epidemiology and Biostatistics (CRDEB) core <http://www.med.uvm.edu/nne-ctr/researchresources/researchdesign>.

We have reviewed with great interest some of the training materials available on your website. They are all very high in quality and breadth of content, and we are confident that our CTR investigators would benefit greatly from access to these resources. Rather than "reinvent the wheel," we would like to link our CTR website to some of your training materials. We envision including a brief paragraph explaining to our investigators that the links take them to high-quality training materials outside of the NNE-CTR, with a heading that specifically names your center followed by a list of links to the specific materials.

PUI Usage



- ❧ These lecture series provide course material for the broader Louisiana Biomedical Research Network
 - ❧ LSU-Shreveport and Southern University Baton Rouge enrolled students from many disciplines through topical courses at their home institution
 - ❧ Remote viewing of lecture material was supplemented with on site experiences from the home instructor
- ❧ LBRN Partnership with Pine Biotech
 - ❧ Library of courses that students take at their own pace
 - ❧ Addresses part of critical need for education in this field

Pine Biotech Program



- ❧ Educational Initiative (est. Summer 2018) partnership with Pine Biotech and Tauber Bioinformatics Institute
- ❧ 25 Educational Licenses were purchased through LBRN for use by the LBRN PUI Campuses
- ❧ Additional licenses were supported through LSU-CCT
- ❧ Attendees worked through hands-on educational material provided at <https://edu.t-bio.info>
 - ❧ Intro, Genomics, Metagenomics, Transcriptomics 1, 2 & 3
- ❧ Students are encouraged to present project posters at the LBRN Annual Meeting
- ❧ This pilot has since been expanded into a partnership

Current Offerings Pine Bio

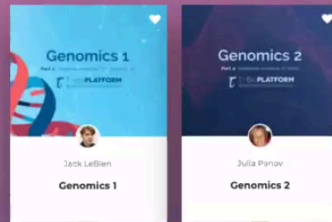
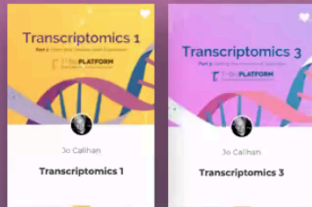


ONLINE BIOINFORMATICS COURSES

BASIC MEMBERSHIP FOR THE T-BIOINFO BIOINFORMATICS PLATFORM DESIGNED FOR STUDENTS

GENOMICS

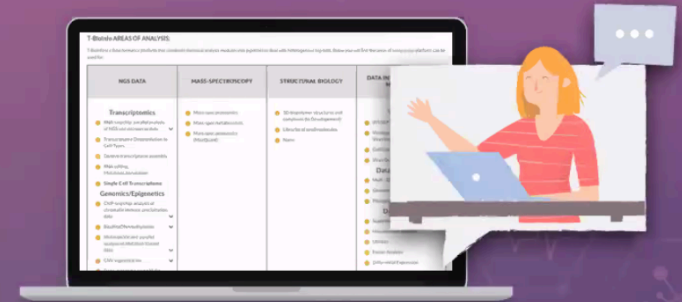
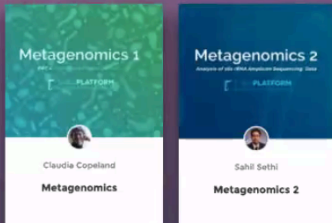
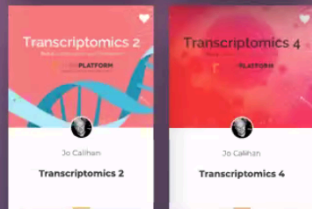
TRANSCRIPTOMICS



EPIGENOMICS



METAGENOMICS



- ✓ 16 HANDS-ON ASYNCHRONOUS COURSES
- ✓ ACCESS TO CLOUD RESEARCH TOOLS
- ✓ CODING PRACTICE IN R AND PYTHON
- ✓ ONLINE SUPPORT FROM INSTRUCTORS

Questions

