STUDENT HANDBOOK

Division of Biostatistics & Bioinformatics

College of Medicine
Department of Environmental Health

UNIVERSITY OF Cincinnati

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Division of Biostatistics and Bioinformatics webpage

Introduction:

Biostatistics is a data science field concerned with application of statistical reasoning in the biomedical and public health research. Biostatisticians develop statistical methodologies that are tailored to address specific biomedical data analysis problems. Biostatisticians are also members of interdisciplinary biomedical research teams whose role is to ensure optimal use of data to answer specific biomedical research questions.

Bioinformatics is an interdisciplinary field that develops methods and computational tools for understanding high-dimensional biomedical data. Bioinformatics combines computer science, statistics, mathematics, and engineering to manage, process and analyze biomedical data. There are many overlaps between Biostatistics and Bioinformatics in terms of methodologies utilized and domains of application in biomedical research. However, Bioinformatics tends to be more focused on the analysis and interpretation of high dimensional datasets such as genomics, proteomics and metabolomics. Furthermore, Bioinformatics research objectives often involve development of software tools that facilitates management and analysis of large and complex datasets.

Both Biostatistics and Bioinformatics are integral parts of the new emerging field of Biomedical Data Sciences. Data Sciences in general is a field dedicated to extraction of knowledge from data. In the context of the biomedical and public health research, data sciences integrate traditional statistical reasoning with the technological and computational solutions needed to organize, integrate and analyze relevant data. The biomedical and public health research is increasingly becoming data-intensive and data-driven. The challenges and opportunities offered by accessing, managing, analyzing, and integrating datasets of diverse data types (exposure, health, behavioral, genomics, genetics, etc.) is captured by the term "Big Data". The graduate programs and research within our division reflect rapidly increasing role that the data sciences play in contemporary biomedical and public health research.

Current methodological research undertaken by division faculty includes statistical methods for multiple hypothesis testing, statistical genetics, supervised and unsupervised Bayesian and machine learning methods for genomics data analysis, methods for next generation sequencing data analysis, statistical geospatial modeling, integrative statistical models for Big Data, computational drug screening, and protein structure modeling. A few examples of interdisciplinary biomedical research projects that involve division faculty are study of predictive transcriptional signature for juvenile idiopathic arthritis, genomic determinants of kidney cancer, cancer treatment clinical trials, and numerous biomedical projects investigating gene-environment interactions.

This handbook will complement the University of Cincinnati Graduate School Handbook. You will reference both handbooks often as a student in the program.

Division Seminar BE8029:

The Division of Biostatistics and Bioinformatics hosts a weekly divisional seminar series each Friday during the Fall and Spring semesters from 1:00pm-2:00pm. The objective of the series is to create a vibrant discussion forum for faculty and graduate students to discuss methodological biostatistics and bioinformatics research. Graduate students of the Division are required to attend weekly and all faculty interested in biostatistics and bioinformatics methodological research are encouraged to attend as well. Any faculty or graduate students who are interested in introducing their research interests or projects at the seminar should contact the seminar chair and Division Academic Director: MB Rao, PhD raomb@ucmail.uc.edu (graduate students in both the biostatistics MS and PhD programs who need to receive credit for the seminar will register for BE8029 with Dr. Zhang listed as the instructor).

Graduate School Policies

Time Limitations:

The Board of Trustees stipulates that all degree requirements must be completed within a defined span of years starting from the date of matriculation into the degree program, regardless of whether students are full time or part time. This time span is 5 years for Master's students and 9 years for PhD students. Under extenuating circumstances, a program may petition the Director of the Graduate School, on behalf of the student, for extension of the time limit for attaining his or her degree. Prior to the program petitioning the Graduate School for an extension, the student must communicate with his or her program advisor and/or director to review his or her degree completion to date and form a plan for degree completion. All this information should be included in a petition submitted to the Director of the Graduate School who will review this petition and make a final decision.

Academic Misconduct:

Academic misconduct or dishonesty is defined in the University of Cincinnati, Student Code of Conduct and includes, but is not limited to, acts of cheating, plagiarism, falsification, and misappropriation of credit.

The Student Code of Conduct defines behavior expected of all University of Cincinnati students. It is each student's responsibility to know and comply with the University's Student Code of Conduct. Disciplinary procedures are explained in a step-by-step manner, and the procedures for appeal of decisions are stated. Students within the Division of Biostatistics are required to adhere to this code.

Minimum Academic Performance:

Full-time graduate students will be registered for at least 10 graduate credits per semester. Students receiving a University Graduate Scholarship (UGS) must be registered for 12 graduate credit hours for each semester for which they are receiving support. If a student is registered for at least one (1) graduate credit, he or she will maintain graduate student status throughout the entire academic year, fall through summer. The Graduate School requires that a student must have an aggregate grade point average (GPA) of at least 3.0 to obtain a graduate certificate or degree at the University of Cincinnati.

Advanced Standing for Graduate Courses Taken Outside of UC:

1. Programs are permitted to award up to one third of the credits of a UC graduate program through advanced standing (e.g. 10 credits are eligible in a 30 credit program or 13 credits in a 40 credit hour program). The relevant number of credits is based on the minimum credits required to earn the advanced degree starting from the minimum degree qualification (usually a baccalaureate degree). Note that for doctoral students the advanced standing credit total will include any use of the ODHE allowance of up to 30 credits for a prior master's degree.
2. Any graduate course credits, including those earned from previously earned graduate or undergraduate degrees, are eligible as advanced standing credits.
3. Advanced standing can only be offered for courses (including electives) entered in ecurriculum for the UC program.
4. Program faculty must evaluate courses for equivalence or comparability prior to granting students Advanced Standing credit for courses taken at another institution, meeting all the following criteria;
    a. Courses taken at a recognized University or College
    b. Courses taken at the graduate level
    c. Requested advanced standing credits must be the lower of the following two choices
        i. Credits originally earned for the course b. Credits available in the UC course listed in e-curriculum
    d. For 1:1 course equivalency, one or more of the following criteria must be met when compared to the University of Cincinnati course for which Advanced Standing credit is sought:

i. Course was taken in the same field with the same title
ii. Course had similar topics
iii. Course had similar learning outcomes
iv. Course assignment and assessment requirements were similar
v. Course readings requirements are similar

e. This evaluation process should be documented for each case in which it is applied

5. The one third rule doesn't apply to dual degrees, sequential Masters to doctorate programs, or others with shared content that have received approval from the Graduate School.
6. Advanced standing credit recommended by program faculty must first be approved by the graduate program director and then submitted for final review by the Graduate School to assure the request complies with the criteria above.

Transfer Credit for Graduate Courses Taken at UC:

1. When leaving one graduate degree program to join another at UC, all UC graduate credits taken as part of the incomplete degree are eligible for transfer to fulfill requirements in the new degree program, based on faculty evaluation of the equivalence to courses in the new curriculum and program approval. This same policy will also apply when a student matriculated in an incomplete UC graduate certificate program matriculates into a graduate degree program.
2. When a non-matriculated student enters a graduate degree program at UC, non-matric UC graduate credits are eligible to be transferred toward obtaining the new degree, if the coursework is listed in e-curriculum as part of the degree requirements. Subject to program approval, students may transfer up to 12 credits or one third of the credits required to earn their UC graduate degree (whichever is greater).

Minimum Registration:

To maintain graduate status at the University of Cincinnati, students must register at UC for at least one graduate credit that contributes to degree requirements (as determined by the graduate program) in an academic year. If the student is registered for at least one graduate credit, he/she will maintain graduate student status throughout the entire academic year, fall through summer. (Credits that are audited or in which a student receives a W or UW do not count toward the minimum credit requirement). A student whose status has automatically terminated because of failure to register during an academic year will no longer be considered a graduate student but may seek reinstatement (see Reinstatements). Also note that students must register for at least one graduate credit hour during each semester (excluding summer semester) if they are using university resources such as libraries, university housing, campus laboratories, office space, equipment, recreational or computer facilities.

Grade Changes:

A change of grade is only appropriate for an I, an NG, an SP/UP, or an error made by the instructor. SP/UP grades must be converted to a final grade by the end of the following semester. Instructors may change an I or NG grade online in Catalyst for approximately one year (the interval extends from the initial grading semester to the last working day of the same term the following year). To request a change of grade for a non-research course for graduate credit after this period, or an F grade any time, the instructor must do an official, paper change of grade form and forward to the Director of the Graduate School along with a reason for requesting the grade change. The Director will approve or deny the request after consideration of the reason for the change.

Previously recorded grades may not be changed to W or I after the close of the term. Both I and W grades must be awarded while the course and semester are still in progress, and cannot be awarded retroactively. W reflects an official withdrawal that took place by the 58th calendar day of classes, and I indicates work remains to be completed and the student did not earn a final grade. Students cannot withdraw from a class retroactively or be given additional opportunities to seek a different final grade retroactively. If an F is in a

non-required course or the required course has since been retaken for a passing grade, the Program Director at certification may request a waiver of the F grade from the Associate University Dean of the Graduate School.

Graduate students are not allowed to add or drop courses, credit hours, or change the level or grading type of a course (e.g. undergraduate to graduate course, audit to pass/fail, etc.) after students are no longer able to perform these actions themselves using the 35 Catalyst self-service tool. Deadline dates describing each term's final opportunity for Catalyst self-service actions can be found on the Registrar's website.

Leave of Absence:

Under special circumstances, graduate students may apply for a leave of absence from full-time study at the university for a specific period up to one academic year. Assuming appropriate documentation is provided, the circumstances justifying a leave include but are not limited to personal or family medical conditions, call to active military duty, maternity leave, or death in immediate family. The rationale must be documented by the applicant.

An approved leave of absence preserves the student's status in his or her degree program, and the time off will not be counted against the time limits for awarding degrees. Consequently, registration is not required during the leave period. A leave may be renewed for up to one additional year. Renewal of a leave is subject to the approval of the program, college, and the Graduate School.

To apply for a leave of absence, a student must complete the Request for Leave of Absence Form and upload the appropriate documentation (e.g. doctor's letter or military orders) through GradTracker. The program will approve through GradTracker as well. Once the program has approved the request, the Director of the Graduate School will review the petition and if approved, the student and program will receive an email notification through their UC email

Note: Students with financial aid or student loans should confer with the Financial Aid Office prior to requesting a leave of absence to ascertain the consequences of a leave on their loan status. Students should also be aware that any scholarships or assistantships are not guaranteed to be available when a student returns from a leave of absence.

Withdrawal from Program:

Students must notify the DEH graduate studies office in writing regarding their intent to withdraw from their programs.

Residency (PhD students only):

Prior to admission to doctoral candidacy, all doctoral students shall complete a residency requirement by enrolling in 10 graduate credit hours (12 if funded by a Graduate Assistantship) per semester for two out of three consecutive semesters of study (including summer). Part-time students are not exempt from enrollment requirements to achieve residency. However, full-time UC employees using their tuition remission benefit to complete a part-time doctoral program may request a waiver of this requirement from the Associate Dean of the Graduate School.

Division Policies

Language Requirement:

This requirement is for PhD students and those who are going to be Teaching Assistants. All students who do not have English as a first language must take the English proficiency examination administered by the University by the end of their first academic semester (OEPT Requirements) or in the case of Teaching Assistants, before their assistantship starts. In case of failure, the student may take the examination again after an academic semester has elapsed, for a total of two (2) attempts per year. In any case, the student will not be awarded a degree until

the examination is passed. The Division policy on language holds that all students speak English when communicating with faculty, staff and other students. The overwhelming majority of scientific literature is communicated in English, so it is to the individual's benefit to become well-equipped to convey scientific studies by speaking and writing in the English language.

Statement of Intent:
The Statement of Intent (SOI) for M.S. Thesis or PhD Dissertation should be submitted to the student's Thesis/Dissertation Advisory Committee for approval early in their timetable. Each student should meet with his/her advisor to create a timetable of completion. Statements of Intent can be submitted before all qualification requirements are met.

The SOI should be a brief (not to exceed three single-spaced pages excluding references and time table) description of the proposed Thesis. The following headings need to be used when writing the statement.

- Background
- Objectives
- Hypothesis
- Specific aims
- Methods
- Significance/Relevance to Environmental Health
- Time Table for Completion
- Note concerning Institutional Review Board (IRB) and Institutional Animal Care & Use Committee (IACUC) approval, and
- References

The statement should indicate that the work will demonstrate the student's powers of critical evaluation.

All human research projects must be submitted to and approved by the University of Cincinnati Institutional Review Board (IRB). Projects originating in and/or involving other institutions (e.g., Children's Hospital) must also have approval of that IRB. Other permissions may apply (e.g., animal care, radiation safety).

Masters of Science-Biostatistics:

The Master of Science (M.S.) in Biostatistics degree is designed to provide graduate level training in the application and theory of biostatistics. The target audiences for this program include individuals who desire careers as collaborative biostatisticians in the basic, clinical, translational or population sciences. Masters students will have opportunities to work with real world applications under the supervision of experienced faculty.

Advisor and Course of Study:

Students are assigned an academic advisor in consultation with the Division Director and the Division Academic Director. If appropriate, a different advisor may be requested at a later date. In the event of a change in advisor, the student shall send a communication to the Graduate Studies Office (GSO) that includes the signatures of the assigned and proposed advisor and the Division Director indicating concurrence. The course of study for the M.S. degree will be planned in consultation with the student's advisor. The student's program is subject to approval by the program faculty and must show a reasonable degree of concentration on interrelated subjects

Credit Hours

To graduate with a M.S. Degree from the Division, students must complete a minimum of 30 graduate credit hours (including Thesis research). In addition to the successful completion of course work, a thesis based upon laboratory, field, or clinical research is required for the M.S. degree. Students must complete a minimum of 2 thesis credit hours (ENV7091). Students transferring to the MS program from a MS program in another institution may transfer up to 50% of the credits required for their degree at the University of Cincinnati. The transferable credits for each student are determined by the Division Academic Director.

Research Credit

Students registering for research credits must obtain approval from their assigned academic advisor and research mentor (if different from their assigned academic advisor) prior to registering for research credits. The Research Credit Pre-Approval Form (available on the Division Student Resources Page) must be filed in the Graduate Studies Office (GSO), prior to registration.

Students are responsible for documenting their work during the semester in which they are registered for research credits. Before a grade can be assigned, a progress report and/or other meaningful products resulting from the student's work must be presented to the assigned academic advisor and research mentor (e.g., meeting abstract, poster, manuscript). Students must also submit a Research Credit Verification form (available on the Division Website and at the back of this handbook), signed by their assigned academic advisor and research mentor (if different from their academic advisor) before the end of the semester in order to receive a passing grade. Verification forms can also be submitted in the GSO. ***The assigned academic advisor is responsible*** for evaluating the student's work and providing an appropriate grade at the conclusion of the academic semester.

Thesis Advisor Committee:

Students must fill out the departmental Proposed Thesis/Dissertation Committee Request form to the Office of Graduate Studies before their first Thesis Committee meeting. Students must select their Thesis Advisory Committee according to the Graduate School. They are to be composed of at least two full-time faculty members with professorial rank, at least one of whom is a member of the All-University Graduate Faculty. In addition, the Chair of the committee must be part of the Biostatistics and Bioinformatics Division. Typically, the academic advisor is the Chair of the Thesis Advisory Committee. The advisor may act as chair, convener, and voting member of the Thesis Advisory Committee. The final judgment on acceptability of the Thesis will be made by this Committee, by a unanimous vote if there are only two members, or else with no more than one dissenting vote.

Thesis:

The M.S. Thesis is intended to demonstrate the student's ability to communicate and evaluate critically. The Thesis needs to be the result of independent research. Information concerning the Thesis form, submission deadline dates, and the mechanics of preparing the final draft and abstract can be located at the ETD website

1. Thesis Research

a. Thesis research may be part of the ongoing work of the Thesis laboratory but must be separately identifiable. The Thesis research should reflect advisor guidance but mainly be the independent work of the student.
b. It is the responsibility of the student and the faculty advisor to see that a Thesis Committee is formed and that the research plan is finalized. The Thesis Committee must confirm that the student's work is not, to a large extent, carried out by technical assistants or other personnel.
c. A Thesis may be written in the form of a publishable research paper, conforming to the publication guidelines of the student's journal of choice (e.g., *JAMA, Pediatrics, AJE, etc.*). This option must be approved by the student's Thesis Advisor and Thesis Committee. The research must be conducted while the student is enrolled in the program and the student must be the first author of the manuscript. The manuscript should not be submitted for publication until approval by the Thesis Committee. The student must place an embargo on the Thesis prior to submission of his or her manuscript for publication (see section 5 for further instructions).
d. In agreement with the function of the Thesis Committee, as specified by the rules of the University of Cincinnati Graduate School, any decisions about the quantity and quality of the work done are the responsibility of the Thesis Committee.
e. After the student leaves the University the Thesis research results may be used as the basis for continuing investigations by the student and/or by the laboratory in which the Thesis research was done. The student and the laboratory are entitled to retain copies of the data and analyses for their use.

2. Policy for External Thesis Research for Master's Degree Program.

Thesis research outside the department requires careful coordination between the department and the collaborating institution. There are circumstances where it is in the interest of the student, the department, and an outside laboratory of academic stature, such as elsewhere in the University, or at a Federal Agency, to permit pursuit of graduate Thesis research outside the department. The requirements of external Thesis research are:

a. A departmental faculty advisor who has expertise in the field of Thesis research;
b. Appointment of the external supervisor to the Thesis Committee;
c. An explicit understanding that, as in the case for Thesis research carried out within the department, every effort will be made to ensure that the Thesis research, when initiated, will be supported to its conclusion;
d. Adherence to the same rules and governance procedures used for Thesis research within the department. These include the clear understanding that the results are available for publication as a Thesis and in the open literature, and it is the responsibility of the Thesis Advisory Committee to make final decisions about the direction and extent of work. Attention is also drawn to the requirement that the Thesis Advisory Committee meet at least twice each year;

3. ***Guidance on UC Medical IRB Review of Graduate Student Activities that involve Human Subjects Research in the Department of Environmental Health.***
    a. Refer to the Office of Research Human Research Protection Program website for information regarding IRB Review.

IRB Review and Approval Requirements of Student Projects that Involve Human Subjects

4. ***Embargo of Thesis***

    You can request an embargo be placed on your thesis for two years initially, with the option of extending the embargo a third year. An embargo is simply a hold on publishing your thesis in OhioLINK. If you plan to submit your thesis in part or whole for publication it is vital that you embargo your work for a period of time. Some journals still consider a thesis that is published on the internet a "publication." In order to avoid the fact or appearance of a "duplicate" publication it is important to embargo your document. You request an embargo electronically when you upload your thesis for final approval by your chairperson. As a further protection, you should acknowledge in any submitted manuscripts based upon your graduate research that the work was completed in partial fulfillment of the requirements for the MS in biostatistics. See your advisor if you have any questions regarding the embargo of your work.

5. ***Submitting your Thesis***

    The University of Cincinnati Electronic Thesis or Dissertation (ETD website) has all the details you need to submit your final thesis. In short, you will need to submit your full thesis in PDF form to OhioLINK following the directions on the ETD website, along with a scanned PDF of your fully signed Committee Approval form. If you publish part or all of your thesis, you should add the following acknowledgement to your publication: "This work was completed in partial fulfillment of the Master of Science degree in Biostatistics in the Department of Environmental Health, Division of Biostatistics & Bioinformatics, University of Cincinnati College of Medicine. The advisor must approve a thesis after it is uploaded to ETD, so the student should submit early to allow the advisor time to submit approval.

Master of Science Biostatistics Curriculum (Course descriptions available on the Course Catalog)

Course Number	Course Title	Credits	Required or Elective	Semester Offered
MS Biostatistics Core Courses: 18 credit hours			***ALL semester course offerings are subject to change***	
BE 7024	Computational Statistics	3	Required	Spring
BE 7088	Regression Analysis	3	Required	Spring
BE 7089	Experimental Design	3	Required	Fall
BE 8029	Biostatistics Seminar **(2 semesters)**	2	Required	Fall/Spring
GNTD 7003	Ethics in Research	1	Required	Spring
STAT 6021	Mathematical Statistics I	3	Required	Fall
STAT 6022	Mathematical Statistics II	3	Required	Spring
Biostatistics Credits: 3 credit hours **Select one course from the list below**			Required	
BE 7026	General Linear Models	3		Spring (varies)
BE 7090C	Applied Survival Analysis	3		Fall 2019
BE 7091	Applied Multivariate Analysis	3		Fall 2020
Biomedical Credits: 3 credit hours **Select a minimum of 3 credit hours from the list below**			Required	
BE 7076	Introduction to Epidemiology	2		Fall/Spring
CB 8080	Cancer Biology & Therapeutics	4		Spring
GNTD 7001	Molecular and Cellular Biology	1-4		Fall
GNTD 8001C	Introduction to Functional Genomics	3		Fall
MCP 6031C	Computational Systems Biology	2		Spring
TOX 7082	Survey of Toxicology	2		Spring
Research Credits: 2 credit hours - Research Pre-Approval Form & Advisor Meeting Required for Permission to Enroll				
ENV 7091	Master's Thesis Research	2	Required	Fall/Spring/Summer
Free Electives: ≥ 4 credit hours - Select remaining credits from Course Catalog List (fill-in with advisor)				
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
Total Credits		**30**		

- 3.0 GPA (B average) or higher required for graduation.
- All required courses must be completed with a B- or higher.
- "I" (Incomplete) or "NG" (Not Graded) grades must be removed from academic record prior to applying for graduation.
- Students must take a minimum of one graduate credit that contributes to degree requirements per academic year (fall-summer) to maintain active status.
- All requirements for the master's degree must be completed within five consecutive academic years of the date of matriculation into the program.
- Students are expected to meet with their advisor at least once a semester to discuss their academic progress.
- Electives must be determined with a consultation from your advisor.

M.S. Degree Graduation Checklist

- ☐ English Proficiency requirement met for international students (OEPT must be taken by the end of your first academic year). Letter attesting to satisfactorily completed OEPT submitted by examiner to program director and Graduate Studies Office (GSO).

- ☐ Course work required for M.S. Degree completed satisfactorily, and all grades from previous terms have been confirmed (no outstanding "I" or "NG" grades). Academic status confirmed with GSO or program office.

- ☐ If applicable, all necessary IRB approvals have been obtained (see page 10).

- ☐ Proposed M.S. Thesis committee members submitted to Graduate Studies Office.

- ☐ After your Statement of Intent is approved, you should meet regularly with your Committee members to discuss progress, questions, and keep on a timeline for completion.

- ☐ Thesis preparation: You should give the draft to your Thesis committee members **at least one month** and your final Thesis to committee members **at least two weeks** before the deadline on the Graduate School page to give them ample time to review and send back comments. Committee members have approved it and signed the Committee Approval form found on the Graduate School page.

- ☐ Complete "On-Line Graduation Application" on the Graduate School page. Graduation paperwork filed with GSO and University Officials (see official dates in GSO).

- ☐ Thesis uploaded submitted electronically following the instructions found at the ETD Formatting Guidelines page. Current information regarding Thesis and electronic submission can be obtained on the Graduate School page.

Doctor of Philosophy Biostatistics:

Advisor and Course of Study

The Doctor of Philosophy (PhD) in Biostatistics prepares students for advanced study and research in biostatistics and bioinformatics. The program targets students with strong skills and training in mathematics and statistics who are interested in applications in biomedical research, public health and health care. The PhD program aims to train independent researchers in biostatistics and bioinformatics applications and methodology. An applicant to the Departmental Doctoral Program is admitted as a Doctoral degree student upon recommendation of the Director of Graduate Studies and the program Admissions Committee, following faculty evaluation. An initial advisor is assigned by the Associate Director of the Division in consultation with the Division Director and program directors. If appropriate, a different advisor may be requested at a later date. In the event of a change in advisor, the student shall send a communication to the Graduate Studies Office that includes the signatures of the Division Director and both the assigned and proposed advisor indicating their concurrence.

The course of study to be pursued for the Doctoral degree will be arranged with each student by his/her advisor following the guidelines specific to the program. Course work in other departments may be scheduled according to the needs of the individual student. In all cases, the aim of the Doctoral program will be a reasonable concentration and a breadth of study, designed to develop competence in research, scholarship, teaching, and professional performance in general.
Full-time first year PhD students receiving Graduate Assistantships are expected to participate in research activities in their advisor's laboratory on an average of 12 hours per week during the academic year. Exact hours and research activities will be planned with the advisor.

Big Data Track

The biomedical research enterprise is increasingly becoming data-intensive and data-driven. Massive streams of data are being generated to interrogate biological systems and improve health care. Biomedical Big Data (BBD) is characterized by high dimensionality, complexity and diversity. It has become abundantly clear that effective statistical methodologies are essential for processing, analyzing and mining BBD. The Big Data Biostatistics program aims to train the next generation of data scientists, addressing regional and national demands for experts in statistical methods for BBD analysis.

The new track provides rigorous foundations in probability theory, statistics and computational sciences, combined with a broad knowledge of applications to biomedical research. The core curriculum consists of traditional Biostatistics coursework such as: Probability Theory, Mathematical Statistics, Linear Models and Multivariate Analysis; core computational competency coursework such as Design and Analysis of Algorithms, Database Design and Programming; and biomedical research oriented coursework such as: Functional Genomics, Bioinformatics, and Medical Informatics.

Consistent with the overall goals of the PhD program in biostatistics, the Big Data track has been designed to provide rigorous foundations in statistics and computational sciences, combined with a broad knowledge of applications to biomedical research. This is achieved by a mixture of both foundational courses in statistics, mathematics, and biostatistics from the existing curriculum, as well as additional computer science, and application oriented core courses and electives included in the proposed curriculum. This will enable graduates of the Big Data Biostatistics Track of the PhD Program to take a full advantage of data driven revolution in biomedical sciences and the society at large.

Credit Hours

To graduate with a Doctor of Philosophy Degree from the Division, students must complete a minimum of 90 graduate credit hours of which 60 must come from didactic course work. The last 30 credits, exclusive of research credits, must be completed at the University of Cincinnati or under its direction. Students must register for at least 7 PhD Dissertation research credits (ENV9091), but they may not do so before passing the Qualifying Exam. Students matriculating into the traditional track with a confirmed master's degree are required to take 34 didactic credit hours, 7 dissertation research credit hours, and 10 free elective credit hours. Students matriculating into the Bid data track with a confirmed master's degree are required to take 40 didactic credit hours, 7 dissertation research credit hours, and 13 free elective credit hours. In no case, however, will a degree be granted solely on the basis of accumulation of the required number of credits. The Division will recommend students for a degree only after they have developed the necessary intellectual abilities and have fulfilled all requirements of the Department and the Division.

Doctoral degrees are conferred on the basis of sustained study and high scholarly attainment in a special field of learning. In no case will the degree be granted for less than 3 years of full-time graduate study or its equivalent, of which the last year must be in residence in the University of Cincinnati or under the University's direction.

Qualifying Examinations

Before a Doctoral student becomes a candidate for a Doctoral degree, he/she is required to take an examination for candidacy, i.e., the Qualifying Examination. The purpose of the examination as a whole is that of determining the candidate's potential for PhD work. Prior to Qualifying Exam, the student must have completed essentially all required course work in his/her respective program and maintained a grade point average of B (3.0) or better in all Doctoral course work. Students who enrolled in the program after Fall of 2014 will follow the instructions, topics, and format of the revised Qualifying Exam listed below. Students who were enrolled into the program before Fall of 2014 will have a selection between the revised Qualifying Exam and the previous version which includes the three mini proposals.

Revised Qualifying Exam
June 2017- MB Rao, PhD Academic Director

Qualifying Exam: Part 1 + Part 2 Format

Part 1: Testing Core Knowledge

> ***Component 1***: A three-hour written exam, testing competency in Biostatistics, Mathematical Statistics, Design of Experiments, and Regression
>
> ***Component 2***: A three-hour written exam, testing computational skills covering Biostatistics, Mathematical Statistics, Design of Experiments, and Regression
>
> ***Component 3***: A weekend project assignment testing data analysis and reporting skills

Part 1 is conducted once a year before the start of the Fall semester. Two chances are given at the most to pass Part 1.

Part 2: Proposal defense

Students who pass Part 1 proceed to Part 2. The eligible student chooses a research topic and should have completed preliminary research to show feasibility before proceeding to defense. Typically, the student chooses a research mentor for guidance. The mentor advises the student whether or not the student has accomplished enough research before proceeding towards defense. The steps outlined below have to be followed.

> ***Step 1:*** Compose a dissertation committee. The dissertation committee includes, at a minimum, the research mentor (typically the chair) and at least two other research faculty members. The chair should be primary faculty from our division and part of the graduate faculty. The research mentor could be any

one from our division or one of the secondary faculty. Students wanting their chair to come from secondary faculty need approval from the Academic Director or Division Director.

Step 2: Prepare a statement of intent and submit it to your dissertation committee for approval. The statement of intent should be of maximum 5 pages long excluding the references.

Step 3: Prepare a full research proposal document a la NIH R01 format (maximum number of pages: 12 excluding the references). Send the document to the Dissertation Committee for approval.

Step 4: Schedule the defense in consultation with the Dissertation Committee. Announce publicly the date of defense.

Step 5: Defend the proposal. All faculty members are welcome. All students are welcome. Questions and comments are solicited from the audience.

Step 6: The Dissertation Committee deliberates whether the student has passed the Part 2 exam unconditionally or conditionally subject to modifications in the proposal, or failed. If the student fails, the Committee gives in writing why he/she failed.

Step 7: If the student fails, he/she is given another chance to defend his revamped proposal or different proposal, possibly under a new Dissertation Committee. If there are any changes to your Committee due to a change in topic or recommendation please resubmit your Dissertation Committee Request Form to the Graduate Studies Office (refer to steps 1 & 2).

A majority of your Committee members have to approve your defense with a minimum of 3 signatures to move forward to candidacy.

If the student is unable to successfully defend their proposal a second time they will be dismissed from the program.

Step 8: If the student successfully defends his proposal, he will be admitted to the candidacy.

Once the student is in the 'candidacy' mode, he/she should strive to complete his research for final defense. The student is advised to meet with the Dissertation Committee periodically to make sure he/she is making progress towards completion and final defense.

<u>Suggested time-line:</u>
Completion of Part 1 – one year
Completion of Part 2 – one to two years
Final defense – one to two years

Topics for the three-hour exams

1. ***Biostatistics:***

Prospective and Retrospective studies; Observational studies; Laboratory experiments; Comparative studies; Cross-over experiments; Clinical trials; Cohorts; Case-control studies; Longitudinal studies; Discrete probability; Elementary distributions; Rudiments inference – estimation, testing of hypotheses; confidence intervals, p-values, and standard errors; Contingency tables and chi-squared test of independence; McNemar test; The kappa of concurrence; Log-linear models; Odds ratio; Rudiments of non-parametric tests; Simple Linear Regression; Logistic regression; Correlation; Analysis of Variance; Basics of Multiple comparisons; Rates and Proportions

References:

Lloyd Fisher and Gerald van Belle – Biostatistics, Wiley Interscience, New York

2. ***Mathematical Statistics:***

Probability; Conditional Probability and Independence; Random variables and their properties; Probability inequalities; Special distributions; Functions of random variables; Moment generating functions; Sampling distributions; Convergence in distribution; Convergence in probability; The Central Limit theorem; Point Estimation and Confidence intervals; Sufficiency and completeness; Variance bounds; Fisher information; Cramer-Rao bound; Rao-Blackwell theorem; Testing of hypotheses – UMP tests; Likelihood tests and asymptotics; Nonparametric methods; Multivariate normal distribution; Distribution of quadratic forms; The Bayesian paradigm; Sequential probability ratio test.

References:

Robert Hogg, Joseph McKean, and Allen Craig – Introduction to Mathematical Statistics, Pearson Education, Harlow, U.K.

3. **Design of Experiments**

Basic principles of design, randomization, treatment comparisons, family-wise Error rate, Tukey's method, Dunnett's method, analysis of variance table, random effects, fixed effects, mixed model, estimation of variance components, intraclass correlation coefficient (ICC), factorial design, block design, Latin square, split-plot experiments, randomization and blinding in clinical trial, parallel group design, cluster randomized design, crossover design, group sequential design.

Reference:

Robert O Kuehl - Design of Experiments: Statistical Principles of Research Design and Analysis, 2nd Edition, Cengage Learning, 1999.

Shein-Chung Chow and Jen-Pei Liu - Design and Analysis of Clinical Trials, 3rd Edition, Chapter 4 and 5, Wiley, New York, 2013

4. **Regression**

Simple Linear Regression model; Least squares method; Slope and intercept and their interpretation; Prediction, ANOVA table; Coefficient of determination; Correlation coefficient; Model assumptions; Residuals; Multiple linear regression, Partial correlation; Model selection; Polynomial regression; Dummy/indicator variables; Random and mixed effect models; Logistic regression models and odds ratios, Generalized linear models and link function; Multicollinearity; Leverage and influence; Ridge regression; Robust regression; Testing general linear hypothesis

Reference:

Douglas Montgomery, Elizabeth Peck, and Geoffrey Vining – Introduction to Linear Regression Analysis, John Wiley, New York

Qualifying Exam-Mini Proposal Option (Students Enrolled prior to Fall 2014)

Prior to Qualifying Exam, the student must have completed essentially all required course work in his/her respective program and maintained a grade point average of B (3.0) or better in all Doctoral course work. Full-time students should take the Qualifying Examination within two years from their admission as Doctoral students. Students are encouraged to be involved in research activities, if possible, before the examination. When the student is ready to take the qualifying examination, the student and advisor should submit the request to the Academic Director for appointment of a Qualifying Examination Committee, through the Graduate Studies Office (GSO) with a cover memorandum from student & advisor along with a statement from the Division Director that the candidate has met all formal requirements (courses, OEPT, annual progress reports). This request must also be accompanied by the student's three mini research proposals which will serve as the vehicle for his or her examination (see below).

Guidelines for the Qualifying Examination

The purpose of the doctoral qualifying examination is to determine if the student has adequate knowledge and understanding of the discipline to successfully perform dissertation research. It is the responsibility of every student to be thoroughly familiar with the procedures outlined below. The advancement to doctoral candidacy is a serious process that represents an important milestone in a student's academic career. The student should seek advice from his/her academic advisor to help prepare for the qualifying exam (QE). The QE is a three part examination testing the student's ability to demonstrate creativity, scholarship, writing skills and ability to orally answer questions in his/her professional discipline:

Part 1: This first phase of the examination tests the students' knowledge and scholarship in their discipline(s) by their ability to produce three original mini research proposals. The student must propose, in consultation with his/her advisor, a Qualifying Examination Committee that shall consist of no less than three voting members of the University Faculty, one of whom must be from outside the Department. The student's academic advisor may not serve on the Qualifying Exam Committee (QEC). The three proposals should cover different health outcomes/topic areas with varying study designs. The student's academic advisor may discuss possible topics with the student, may review the proposals for overall quality and provide general but limited suggestions. Neither the academic advisor, research or clinical mentor, nor any other faculty member or other person, however, should assist in the writing, correction or the preparation of the proposals; they should maintain an arm's length from the process. The academic advisor does not attend any of the QEC meetings except for the oral examination. Every examining committee must include at least one member who is recognized as a biostatistician and faculty member (full-time or affiliate) within the Division of Biostatistics & Bioinformatics, Department of Environmental Health and one member who is recognized as an epidemiologist and faculty member (full-time or affiliate) within the Division of Epidemiology, Department of Environmental Health.

The overall purpose of part 1 is to ensure the student has breadth of knowledge in more than the area of the intended dissertation and the ability to think for themselves with minimal input from the academic advisor or mentor. Therefore, the student's future dissertation topic should incorporate no more than one of the three mini-proposals. The student must ensure that all committee members have copies of the mini proposals. At the first QEC meeting, a chair is selected by the faculty committee members; students do not select their chair. In advance of the first meeting, the QEC will have reviewed all three proposals for quality of the idea, design, analysis plan, and writing ability. At this first meeting, the student should expect to be questioned on the scientific content of each proposal. The academic advisor may want to be available in their office at the time of the first QEC meeting in case the QEC has a question about the student. Students should not provide food or any other refreshments for faculty at any meeting of the QEC. After the first meeting, the student 1.) may be passed onto part 2, 2.) may be required to re-write one or more of the mini proposals, or 3.) may fail. If the student fails, the student may be given one more opportunity to retake this portion of the QE during the next academic semester. In the past, if a student failed or was not able to perform a satisfactory rewrite, some have been given the opportunity to complete an MS degree and leave the program.

Part 2: When the student proceeds to part 2, the QEC chooses one of the three proposals to be expanded into an NIH R01 proposal in approximately two months' time. The sections included in an NIH proposal of this kind

can be found at U.S. Department of Health and Human Services: Public Health Service Grant Application. The proposal should include sections for: personnel, budget and human subjects. The budget should indicate the percent effort for each of the personnel. The advisor should have no input at this stage 23 except for answering factual questions. The QEC may also answer factual questions. When the student has completed the expanded proposal, he/she submits it to all committee members who should be given no less than two weeks to review. The QEC should meet to discuss the quality of the proposal and to determine if the student is ready for the oral exam; the student must be available at this meeting if the QEC has additional questions or concerns. At this stage the student may be passed on to the oral exam, be asked to rewrite sections of the proposal or may fail. If the student fails, the student may be given one more opportunity to retake this portion of the QE during the next academic semester. In the past, if a student failed or was not able to perform a satisfactory rewrite, some have been given the opportunity to complete an MS degree and leave the program.

Part 3: The oral examination should be scheduled within approximately six weeks after the student has passed part 2. The QEC may grant extensions if appropriate. The date for the oral examination is set for 14 days after posting of the abstract through graduate studies and on the bulletin-board designated for such postings outside of the Graduate Studies Office. Any faculty member in the College of Medicine or any student who has already passed the QE may attend. The student's presentation should last about 25 but not exceed 30 minutes. The QEC asks several rounds of questions with the audience being given an opportunity to ask questions after the QEC. The questions should be rigorous and thoroughly test the student's knowledge. Questions can range outside the written proposal, testing general knowledge in epidemiology, biostatistics, pathophysiology, genetics, biomarkers, etc. that have been part of the student's curriculum. Only the student should answer the questions with no input or help from the committee members. After the questioning, all except the QEC members should leave the room while the QEC deliberates and votes. At the conclusion, the student may receive a pass, conditional pass, or fail. A conditional pass will require the student to address weaknesses in the expanded proposal that require revisions that will then be submitted to the QEC for further review. If the student fails, according to University guidelines, he/she must be given a second opportunity to retake the exam, but he/she must wait until the next academic semester.

Candidacy:

1. Registration Requirements

After the student has completed the required course work, the language requirements, and the Qualifying Examination, he/she is considered a candidate for the PhD degree. After admission into candidacy for the Doctoral degree, registration and fee payment for at least one semester credit hour in the fall semester of each year is required for each student if his/her candidacy is not to lapse. In addition, students are required to register for at least one (1) credit during each semester that they wish to use University resources, excluding summer.

2. Time Limitations

a. The Doctoral degree will be granted for no less than the equivalent of three (3) years of full-time graduate study.
b. All requirements for the doctoral degree must be completed within nine consecutive academic years of the date of matriculation into the program.
c. No more than 15 hours of applicable graduate course work may be completed prior to admission as a graduate student in this Department.
d. Normally, the Qualifying Examination is taken after two (2) years of full-time study. A period of at least seven (7) months must elapse between admission to Doctoral candidacy and receipt of the degree.
e. Students who have not been enrolled in courses for more than three years are not eligible for reinstatement and must reapply for admission to the University.

3. *Dissertation Advisor and Committee*

When the student is ready to begin the Dissertation research, the student, through the advisor, should submit to the Graduate Studies Office a list of faculty members considered appropriate for membership on the student's Dissertation Committee using the Dissertation Committee Request Form. Rules of the Graduate School require that at least the advisor or otherwise two other members of the committee be from the Graduate Faculty of the University. The Dissertation Committee, of at least three full-time faculty members of professional rank (including full tenured, research, field service or clinical track, assistant, and associate professors; not adjunct, visiting, retired, or emeriti), should be appointed as soon as possible after a student has been admitted to candidacy. At least one committee member must be from outside the Department. At this time, the student also submits a proposed Dissertation topic (Preliminary Statement of Intent) with sufficient detail to the Dissertation Committee for approval. The student should submit this Preliminary Statement of Intent through his/her advisor. The cover memorandum should also state the status of the student's progress (if any) relative to the time table in the Statement.

University of Cincinnati Institutional Review Board (IRB):

All human research projects must be submitted to and approved by the University of Cincinnati Institutional Review Board (IRB). Projects originating in and/or involving other institutions (e.g., Children's Hospital) must also have approval of that IRB. Other permissions may apply (e.g., animal care, radiation safety).

Where special expertise on, or familiarity with, the Dissertation topic is available in the person of a former faculty member or appropriate external professional, such a person should be included in the basic Dissertation Committee if he/she is nominated by the candidate and approved by the Graduate School by submitting an External Committee Member Form to the Graduate Studies Office. Such persons should be voting members of the Dissertation Committee and be appointed to the Committee along with the initial appointment of the other members. Such persons serve without compensation from either the University or the candidate.

The student must submit to the Dissertation Committee a final Statement of Intent within six months of the appointment of the Dissertation Committee. In some cases, more frequent progress reports and presentations to the Dissertation Committee can be very helpful for the candidate.

When the Dissertation is completed, a copy is submitted to each Committee member for critical evaluation. If it is considered to be satisfactory with respect to form and content by the Committee, a final, public Defense of

Dissertation should be scheduled through the University's and Department's Graduate Studies Office. Before the defense, a final draft of the Dissertation must be in the hands of each member of the Dissertation Committee in acceptable form and public announcements must be posted at least two weeks before the scheduled Defense.

Publication in a Peer-Reviewed Journal:
In addition to submitting the final approved dissertation a PhD student is required to conduct research leading to a distinct, quality publication to at least one peer-reviewed journal. All doctoral students will be required to have at least one article published or accepted for publication as the first author, prior to the dissertation defense date. The peer-reviewed journal must be approved by the dissertation advisor.

Dissertation Research:

a. Dissertation research should be part of the ongoing research affiliated with the department but must be separately identifiable. The Dissertation research should reflect advisor guidance, but mainly be the independent work of the student. The Dissertation research advisor who may or may not be their academic faculty advisor must have expertise in the field of research.
b. It is the responsibility of the student and the academic faculty advisor to see that a Dissertation Committee is formed and that the research plan is finalized within six months after passing the Qualifying Examination. The Dissertation Committee should assure itself that the student's work is not, to a large extent, carried out by technical assistants or other personnel.
c. After approval of the original topic by the Dissertation Committee any major change from one Dissertation topic to another is not permitted without the approval of the Dissertation Committee.
d. In agreement with the function of the Dissertation Committee, as specified by the rules of the University of Cincinnati Graduate School, any decisions about the quantity and quality of the work done are the responsibility of the Dissertation Committee. Dissertation research should be published with the student as first author.
e. After the departure of the student, the dissertation research results may be used as the basis for continuing investigations by the student or by the laboratory in which the research was done. The student and the laboratory are entitled to retain copies of the data and analyses for use.

Policy for External Dissertation Research:
Dissertation research outside the department requires careful coordination between the department and the collaborating institution. There are circumstances where it is in the interest of the student, the department, and an outside laboratory of academic stature, such as elsewhere in the University, or at a Federal Agency in Cincinnati, or other domestic or foreign institution to permit pursuit of graduate research outside the department. The policy outlined below represents a restatement and elaboration on the previous policy on external dissertation work, adopted by faculty on 10/1/79. The requirements of external Dissertation research are:

a. A departmental faculty advisor who has expertise in the field of research;
b. Appointment of the external supervisor to the Dissertation Committee;
c. An explicit understanding that, as in the case for research carried out within the department, every effort will be made to ensure that the research, when initiated, will be supported to its conclusion;
d. Adherence to the same rules and governance procedures used for Dissertation research within the department. These include the clear understanding that the results are available for publication as a Dissertation and in the open literature, and it is the responsibility of the Dissertation Committee to make final decisions about the direction and extent of work. Attention is also drawn to the requirement that the Dissertation Advisory Committee meet at least twice each year;

Final Defense of Dissertation:
The student's final Defense of Dissertation will be open to the public and all members of the academic community and posted on bulletin boards at least two weeks before the defense. The Office of the University Dean must have two weeks' notice in order to make notification of defense on University website. Under the

standard procedure, the candidate will answer pertinent questions put by members of the Dissertation Committee following an oral presentation of the Dissertation. After the Committee has completed its questioning, other persons present will have an opportunity to submit questions or comments. At the conclusion of the Defense, the Committee will withdraw, make a decision forthwith with regard to the acceptability of the Dissertation and its defense, and report to the candidate. If the decision is favorable, the approval form will be signed by the Committee members and transmitted to the Office of the Graduate Division. At least 80% of the voting members of the Dissertation Committee must approve the Dissertation.

Publication of Dissertation:
All Dissertations must be submitted to the University in electronic form. All Dissertations approved for the doctorate will be published through Bell & Howell (formerly UMI University Microfilms International). Students submitting documents to Bell & Howell (required for Dissertations, optional for Theses) must download, print, complete, and submit the Bell & Howell Agreement Forms to the Graduate School. These documents must be submitted to the Office of the Graduate School along with the rest of the required graduation materials before the document submission deadline. Most current and complete instructions are available on-line on the Graduate School page. If you publish your Dissertation in a journal, you should acknowledge in any submitted manuscripts based upon your graduate research that the work was completed in partial fulfillment of the requirements for the PhD in biostatistics. The University of Cincinnati Electronic Thesis or Dissertation (ETD website) has all the details you need to submit your final dissertation. In short, you will need to submit your full dissertation in PDF form to OhioLINK following the directions on the ETD website, along with a scanned PDF of your fully signed Committee Approval form. If you publish part or all of your dissertation, you should add the following acknowledgement to your publication: "This work was completed in partial fulfillment of the Doctor of Philosophy degree in Biostatistics in the Department of Environmental Health, Division of Biostatistics & Bioinformatics, University of Cincinnati College of Medicine. The advisor must approve a dissertation after it is uploaded to ETD, so the student should submit early to allow the advisor time to submit approval. If you publish part or all of your Dissertation, you should add the following acknowledgement to your publication: "This work was completed in partial fulfillment of the Doctor of Philosophy degree in in the Department of Environmental Health, Division of Biostatistics & Bioinformatics, University of Cincinnati College of Medicine." Also acknowledge any grant support you received as you completed your project.

Embargo of Dissertation:
If you plan to submit your Dissertation in part or whole for publication it is vital that you embargo your work for a period of time after electronic submission to the Office of Graduate Studies and ETD website. Some journals consider a Dissertation that is published electronically a "publication." In order to avoid the fact or appearance of a "duplicate" publication it is important to embargo your document. You can embargo your work for a period of up to three years. You request an embargo electronically when you upload your Dissertation for final approval by your Dissertation Committee chairperson. You must also provide a reason for the embargo such as patent pending or publisher restrictions. See your advisor of you have any questions regarding the embargo of your work.

Doctor of Philosophy Biostatistics Traditional Track Curriculum (Course descriptions available on the Course Catalog)

Course Number	Course Title	Credits	Required or Elective	Semester Offered
PhD Biostatistics Core Courses: 31 credit hours				***ALL semester course offerings are subject to change***
BE 7024	Computational Statistics	3	Required	Spring
BE 7088	Regression Analysis	3	Required	Spring
BE 7089	Experimental Design	3	Required	Fall
BE 8029	Biostatistics Seminar **(4 semesters)**	4	Required	Fall/Spring
ENV 7001	Environmental Health Seminar **(4 semesters)**	4	Required	Fall/Spring
GNTD 7003	Ethics in Research	1	Required	Spring
STAT 6021	Mathematical Statistics I	3	Required	Fall
STAT 6022	Mathematical Statistics II	3	Required	Spring
ENV 9091	Dissertation Research *(After Statement of Intent Approved)*	7	Required	Fall/Spring/Summer
Biomedical Credits: 4 credit hours			Required	
BE 7076	Introduction to Epidemiology	2		Fall/Spring
CB 8080	Cancer Biology & Therapeutics	4		Spring
GNTD 7001	Molecular and Cellular Biology	1-4		Fall
MCP 6031C	Computational Systems Biology	2		Spring
TOX 7082	Survey of Toxicology	2		Spring
Traditional Track Specific: 6 credits			Required	
BE 7026	General Linear Models	3		Spring (varies)
BE 7090C	Applied Survival Analysis	3		Fall 2019
BE 7091	Applied Multivariate Analysis	3		Fall 2020
Free Electives: Select remaining credits from Course Catalog List (fill-in with advisor)				
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
Total Credits Post-Masters (≥ 19 credit hours Free Electives)		**60**		
Total Credits Post-Bacc (≥ 49 credit hours Free Electives)		**90**		

- 3.0 GPA (B average) or higher required for graduation.
- All required courses must be completed with a B- or higher.
- "I" (Incomplete) or "NG" (Not Graded) grades must be removed from academic record prior to applying for graduation.
- The doctoral degree will be granted for no less than the equivalent of three years of full-time graduate study.
- All requirements for the doctoral degree must be completed within nine consecutive academic years of the date of matriculation into the program.
- Students must take a minimum of one graduate credit that contributes to degree requirements per academic year (fall-summer) to maintain active status.
- A doctoral student must be enrolled for at least 10 graduate credits in his/her program in each of two semesters (including summer semester) during a span of three consecutive semesters.
- Students are expected to meet with their advisor at least once a semester to discuss their academic progress.
- Electives must be determined with a consultation from your advisor.

Doctor of Philosophy Biostatistics Big Data Track Curriculum (Course descriptions available on the Course Catalog)

Course Number	Course Title	Credits	Required or Elective	Semester
PhD Biostatistics Core Courses: 31 credit hours			***ALL semester course offerings are subject to change***	
BE 7024	Computational Statistics	3	Required	Spring
BE 7088	Regression Analysis	3	Required	Spring
BE 7089	Experimental Design	3	Required	Fall
BE 8029	Biostatistics Seminar **(4 semesters)**	4	Required	Fall/Spring
ENV 7001	Environmental Health Seminar **(4 semesters)**	4	Required	Fall/Spring
GNTD 7003	Ethics in Research	1	Required	Spring
STAT 6021	Mathematical Statistics I	3	Required	Fall
STAT 6022	Mathematical Statistics II	3	Required	Spring
ENV 9091	Dissertation Research *(After Statement of Intent*	7	Required	Fall/Spring/Summer
Biomedical Credits: 4 credit hours			Required	
BE 7076	Introduction to Epidemiology	2		Fall/Spring
CB 8080	Cancer Biology & Therapeutics	4		Spring
GNTD 7001	Molecular and Cellular Biology	1-4		Fall
MCP 6031C	Computational Systems Biology	2		Spring
TOX 7082	Survey of Toxicology	2		Spring
PhD Biostatistics Big Data Track Courses: 12 credit hours			Required	
BE 8093	Data Base Management	3	Required	Spring
BMIN 7099	Introduction to Bioinformatics	3	Required	Spring
GNTD 8001C	Introduction to Functional Genomics	3	Required	Fall
Select one course from the list below.				
BE 7082	Intro to Data Science	3		Fall (even years)
CS 6037	Machine Learning	3		Fall
Free Electives: Select remaining credits from Course Catalog List (fill-in with advisor)				
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
			Elective	
Total Credits Post-Masters (≥ 13 credit hours Free Electives)		**60**		
Total Credits Post-Bacc (≥ 43 credit hours Free Electives)		**90**		

- 3.0 GPA (B average) or higher required for graduation.
- All required courses must be completed with a B- or higher.
- "I" (Incomplete) or "NG" (Not Graded) grades must be removed from academic record prior to applying for graduation.
- The doctoral degree will be granted for no less than the equivalent of three years of full-time graduate study.
- All requirements for the doctoral degree must be completed within nine consecutive academic years of the date of matriculation into the program.
- Students must take a minimum of one graduate credit that contributes to degree requirements per academic year (fall-summer) to maintain active status.
- A doctoral student must be enrolled for at least 10 graduate credits in his/her program in each of two semesters (including summer semester) during a span of three consecutive semesters.
- Students are expected to meet with their advisor at least once a semester to discuss their academic progress.
- Electives must be determined with a consultation from your advisor.

Doctor of Philosophy Degree Checklist

- ☐ Admission to a PhD program **(step 7 should be completed in two years by full time students).**
- ☐ Course work required for PhD Degree completed satisfactorily.
- ☐ Oral English Proficiency Test (OEPT) requirement met for international students (OEPT must be taken by the end of your first academic year). Letter attesting to satisfactorily completed OEPT submitted by examiner to program director, and Graduate Studies Office (GSO).
- ☐ Qualifying Examination Committee and three preliminary proposals approved by Dissertation Committee.
- ☐ Qualifying Examination passed.
- ☐ Form (obtain from GSO) attesting that Qualifying Exam was passed submitted by Examining Committee Chair to GSO.
- ☐ Statement of Intent approved by Dissertation Committee. Interim: committee meetings with candidate.
- ☐ Dissertation written.
- ☐ Publication to a peer-reviewed journal
- ☐ Successful defense of Dissertation and signed by Dissertation Committee members (and Residency requirement completed).
- ☐ Complete "On-Line Graduation Application" on the Graduate School page at Main Menu side bar select "Graduation." Graduation paperwork filed with GSO and University Officials. (See official dates on the Graduate School website.)
- ☐ Electronic Dissertation. Current information regarding dissertation and electronic submission can be obtained on the Graduate School page.

Graduation:

One semester prior to anticipated graduation, the student should:

1. Run a degree audit using the Get My Degree Audit page to receive your grade report and an estimation of your degree progress.
2. Schedule a meeting with your academic advisor to verify all course work is complete.
3. Consult the Graduate School's website for the Graduation Deadlines dates; including the last day to register for graduation and the last day to electronically submit the thesis or dissertation.
4. Apply for graduation after you have verified all of your coursework and degree requirements; please note the importance of verifying your coursework before you apply to graduate as there will be a fee for the graduation application and this will need to be resubmitted each time you apply to graduate. Information on how to apply can be found on the Graduation Application Information page.

Student Graduation Checklist:

- Cap and Gown - may be purchased or rented at the University Bookstore.
- Removal of I and NG Grades - Notification of removal of all I and NG grades must be submitted prior to the student's graduation.
- Credit Hours - Completion of the required semester credit hours for the degree.
- Departmental Requirements – Students must complete all departmental requirements for the degree. Any graduate student who expects to receive a degree at any of the three (3) University commencements must make a formal application for the degree. As a general rule, the On-Line Graduation Application is accessible only for approximately four (4) weeks prior to the end of each semester and steps on the application itself may be read and completed only incrementally upon completion of each preceding step. The GSO will complete and submit a Certification form electronically to the Graduate School Office.

Application to Graduate:

Students must: 1) complete academic requirements, 2) complete the official online Application to Graduate by the deadline for the semester in which they expect to graduate. Deadlines are firm and failure to meet them will delay students' graduation until the following semester, when they must then submit a new application for their revised graduation date.

All students applying to graduate will be assessed a non-refundable graduation application fee of $50. The fee will be assessed each semester a student applies for graduation.

Student Resources

International Students:

All of the necessary information required by international students can be located on the UC international Services webpage.

OneStop:

One Stop Student Service is the UC Web site where you are able to accept your aid award, pay your bill, check your grades, request a transcript, and more. The One Stop Student Service Center is located on the second floor of the University Pavilion.
Phone: 513-556-1000
Office hours: Monday - Thursday, 8-5 and Friday 9-5

Catalyst:

Catalyst is the University of Cincinnati's new student portal, Catalyst will change how you take care of your student-related services, from class registration to paying your bill. WHAT IS A STUDENT PORTAL? Picture the Catalyst portal like a house. Unlock the front door with your 6+2 and password, and inside you'll find rooms filled with many of the student functions found on the One Stop website, including: View Class Offerings, Add/Drop Classes, Run Degree Audit, View Grade Report, View/Pay Bills, Apply for Financial Aid, Check Aid Status.

Blackboard:

Blackboard or Canopy is extremely versatile software that not only allows instructors to easily place course materials online, but also contains multiple communication tools that allow instructors and students to collaborate in new and exciting ways, and acts as a portal to other web services at the University of Cincinnati. As a first time user of Blackboard, one must first activate his or her account, then click the Create Account button and fill out the requested information. The username and password that appears on the next screen will be required to log in to Blackboard the next time.

Fellowships and Scholarships

Graduate Assistantships, NIEHS Fellowships, NIOSH Fellowships, and Assistantships at the Center for Biostatistical Services (CBS)

Graduate assistantships are available for full-time PhD students along with tuition remission. These assistantships provide the opportunity to apply classroom learning to ongoing research projects and to learn state-of-the-art biostatistical & bioinformatical methods, which are extremely beneficial for completion of the academic program. These assistantships are provided by the Department, individual faculty grants or contracts or external sources. Expectations are that students will, over the period of the assistantship, provide approximately 20 hours of service weekly, often with their advisor, which is also an integral part of their learning experience.

U.S. EPA STAR Program:

The U.S. Environmental Protection Agency (EPA), as part of its Science to Achieve Results (STAR) program, is offering Graduate Fellowships for Master's and Doctoral level students in environmentally related fields of study. Master's-level students may receive support for a maximum of two years.
Doctoral students may be supported for a maximum of three years with funding available or, under certain circumstances, over a period of four years. The fellowship program provides up to $37,000 per year of support.

Center for Biostatistical Services (CBS)

The Center for Biostatistical Services (CBBS) is a University-wide Service unit at the University of Cincinnati. This core facility is available for biostatistical/statistical consulting and service to all full-time faculty in the medical center as well as to faculty in other colleges located on West Campus. A major component of the statistical

services provided by the center is "participation and collaboration in grant preparation for extramural funding." Graduate students working for the Center acquire "real world" experience of statistical consultations by participating in Center activities.

Study Space:
Students in the Division of Biostatistics & Bioinformatics share a student room with Master of Public Health (MPH) students. This study space is located in rm. G25 of the Kettering building. This student room is equipped with comfortable seating, three computers, and plenty of desk space for student work. This student room is available to all Biostatistics and MPH students. Additional study space is located in the Health Sciences Library, located in the Medical Sciences Building/CARE building as well as in the multiple libraries of UC's West Campus.

Libraries:
University of Cincinnati Libraries offer access to an outstanding research library collection of 2.8 million volumes and a wide range of services to help students with their research needs. Students have access to the University of Cincinnati Libraries' online library catalog and information about resources and services. Students also have access to the Health Sciences Library. The libraries' web sites serve as local gateways to OhioLINK, which includes a statewide library catalog of over 38 million items from 83 other academic libraries across Ohio as well as over 4700 electronic journals.

Each University of Cincinnati library is home to a knowledgeable staff eager to assist students, faculty, and staff with their research and service needs. Among the most important services provided by our staff are instruction in library research, assistance with the appropriate use of electronic resources, and help creating electronic Dissertations and Theses.

The Health Sciences Library is located on the E level of the Medical Sciences Building/CARE building.
Contact information and directions:

Circulation Desk: 558-0127 Technology Support: 558-4173
Reference: 558-5628

The entrance to the library is in the Medical Sciences Building on the E level across from MSB E351 and between Kresge Auditorium and the bank of passenger elevators.

Professional Societies and Organizations:
The following is a non-comprehensive list of scientific societies and Organizations in Biostatistics and Bioinformatics

- American Statistical Association (ASA)
- Biometrics Society (ENAR)
- Institute of Mathematical Statistics
- International Biometric Society
- International Society for Clinical Biostatistics (ISCB)
- Society for Clinical Trials (SCT)

Student Organizations:
- Health Sciences Graduate Association (HSGA)
- UC Student Organizations

GSGA Travel Awards:
Travel awards may be given to full-time graduate students who are attending or presenting papers at conferences. Non-presenters will be eligible for an award if they can demonstrate that they must attend a conference, which is vital for their professional development. These students will be eligible for such an award once during their academic period at UC. Presenters will be eligible for an award once each academic year. Presenters at conferences will be given preference. Many conferences also offer competitive student travel awards.

Student presenters who travel less than a 400-mile radius of Cincinnati may be eligible for a maximum of $125. Students who travel outside of a 400-mile radius of Cincinnati may be eligible for a maximum of $400. For travel over 2,500 miles, students may be eligible for $500. For more information and to receive a copy of the Travel Award Guidelines for Individual Travelers, contact the Graduate Student Governance Association (GSGA), Room 683 Steger Student Life Center (West Campus) at 556-610. (All awards are subject to availability of funds.

Graduate Student Research Forum:
The Annual College of Medicine Graduate Student Research Forum is another opportunity for students to gain experience in presenting research findings. The purpose of this annual event is to promote scientific communication among students and their research advisors in our various graduate divisions, as well as to inform the scientific community about current graduate student research activities at the College of Medicine. Every graduate student should consider presenting their research poster at this forum. Monetary awards are given to the students with the most outstanding poster presentations.

Career Opportunities:
As stated on the American Statistical Association's webpage; biostatisticians play essential roles in designing studies and analyzing data from research problems. They help formulate the scientific questions to be answered, determine the appropriate sampling techniques, coordinate data collection procedures, and carry out statistical analyses to answer those scientific questions. Research problems are as diverse as the study of factors affecting heart and lung disease, testing new drugs to combat AIDS, assessing indoor air quality in schools, working with various cancer studies, evaluating dental health and dental procedures, evaluating psychiatric symptoms and drug and alcohol use, transplanting organs and bone marrow, and studying inner ear infection. Biostatisticians also help develop statistical techniques. Active areas of research include Bayesian methods, high-speed computing and simulation, survival analysis, analysis of geographical patterns of disease, longitudinal data analysis, and methods for analyzing data from epidemiologic studies and clinical trials.

Computer Account and Printing Services:
The University provides all students computer accounts free of charge. The Bearcat Online system is a client-server system that allows you to exchange electronic mail (e-mail) with other computer users on campus and around the World, and access the diverse resources of the Internet. You may access your Bearcat Online account from your home, office or a campus computer lab.

Computer Printing Procedures and Charges: The College of Medicine generously subsidizes printing for its medical and graduate students. Each student printing account is given a $100 value (i.e., > 1400 B&W pages free) on July 1 of each year. Students may purchase additional printing by activating their UC ID badge as a Bearcat Campus Card and adding value to it using a personal credit card via the Bearcat Campus Card web site, or by visiting the East Campus Bookstore and adding value to card with cash, credit card, or check, or by using a Value Transfer Station on the West Campus, or calling the Bearcat Campus Card office at 556-2000.

Wireless LANS at UC: Wireless connectivity is free to UC students. You will need to enter your password in the field to connect to Securewireless. For off campus access to software on your personal computer contact the Environmental Health Helpdesk 558-1040

University Bookstores:
The University of Cincinnati Bookstore is your source for all of your textbook, apparel, and supply needs. They have the largest selection of used textbooks in the community. Students need to shop early as the used books, which retail at 25% less than the new retail price, sell quickly. If you have any questions, contact them at (513) 556-1400. You are also able to order Textbooks online through the bookstores.

University Health Services:
The mission of University Health Services is to provide superb health care and health education in a compassionate and caring environment, to assist the University in providing a safe environment for students and

employees, and to provide wellness in a Just Community.

All students are required to be covered by health insurance, either the Student Insurance Program or another policy, which must be at least as comprehensive as the University policy. Full-time, co-op, and part-time students taking six or more credit hours are all eligible for coverage and will be automatically charged unless they have previously waived coverage during the current academic year. Graduate students enrolled in less than six (6) credit hours may purchase coverage with: 1) an Insurance Action Form; 2) written certification of matriculation from your academic department; and 3) payment.

Mental Health Services:
The UHS Mental Health Clinic provides professional, confidential mental health services for UC students with Student Health Insurance.

Services include counseling for situational stress, anxiety, depression, relationship issues, grief and loss, sexual abuse, bipolar disorders, and personality disorders. They also perform psychological assessments.

For UC students with Student Health Insurance, the cost is $17 per visit for counseling, but students should obtain an appointment referral from University Health Services first (East Campus phone number: 516-584-4457).

Mail boxes / ID Badges / Keys / Parking Passes:

Students are required to wear/show photo ID badges. Access Control is responsible for the physical security of the University, as well as providing photo identification for all employees and students. Access Control provides the following services:

- Control and service for the over 50,000+ locks in use at the University.
- Issuance of keys to students, faculty, and staff.
- Production of photo ID badges for all University employees and students.
- Control access to areas using a card access system. This system allows access via the University photo ID card.

General Information: Badge/Key/Parking Passes Office: 4 Edwards Center

- To order your keys complete the Key and Card Access Request Form located here; Environmental Health Student Resources page & return this form to Kathy McCann; mccannks@ucmail.uc.edu
- Take the *CCM Plaza-Eden Ave*. shuttle or park your car for free for 30 minutes in the Cory Garage to pick your keys, parking passes, and ID badges.

General Information: Mailboxes

- Mail boxes for all students are located on the First Floor of the Kettering Laboratory (Room 125).

Parking:
All students are eligible to purchase a parking decal. To park on campus, one must display a Parking Services issued decal or use a parking garage and pay the hourly rate. Decals are issued on a semesterly or academic year basis and are most easily purchased through the Parking Services' web site during priority registration prior to the start of each semester. The priority registration dates coincide with those for priority class registration. Internet access for priority registration is available in the parking Offices and in some computer labs on campus. Contact the Parking Office at 556-2283.

Shuttle Bus:
The University of Cincinnati offers a shuttle bus service that transports students, staff, and faculty across campus. Buses run every 7-10 minutes Monday through Friday year round (except holidays). Their website has up-to-date route information.

- For Shuttle GPS tracking view visit UC's DoubleMAP website.

Housing:

As a student of the University of Cincinnati you may need to locate housing in the surrounding university or Cincinnati areas. It is important to remember that the Graduate Studies Office does not directly handle any housing request or student placement in housing and that locating, as well as any and all associated costs with student housing are the primary responsibility of the student once they arrive in Cincinnati. Below is a list of helpful links where you can find more information regarding housing:

Off Campus Graduate and Family Housing

International Students Temporary Housing

More housing options can be found using Uptown Rental Properties, LLC

Sports and Exercise:

The Fitness Center (FC) at CARE/Crawley on Eden Avenue at the Uptown East Campus offers 12,000 square feet of fitness and wellness space. The Fitness Center at CARE/Crawley offers membership options for everyone including UC students and employees, university affiliates (e.g., Children's Hospital), and community members. Membership also provides access to the Campus Recreation Center. Additional options include supplemental memberships for spouses/domestic partners or legal dependents. The University of Cincinnati Campus Recreation Center (CRC) is a state-of-the-art fitness and recreation facility on the Main (West) Campus. With over 200,000 square feet of recreation space, the CRC offers university students, employees, and friends of the university a wide range of exercise and fitness opportunities.

For more information and facility hours call:
Campus Recreation Center: 513-556-0604
Fitness Center at CARE/Crawley: 513-558-0604

BearCat Fitness Trail - A Cross Campus Challenge
The Bearcat Fitness Trail combines 15 exercise routines and 1.4 miles of trail for walking or jogging to provide a well-balanced fitness program for the entire body. The fitness trail spans across the East and West campuses to provide a total campus connection. Take a casual walk along the Bearcat Fitness Trail and enjoy your campus community or get in full exercise mode and work out on the Cross Campus Challenge.

Dining near the Medical Center:

Cincinnati offers many fine dining adventures, but few are within walking distance from the Kettering Building. If you're seeking to dine between classes, the nearest facilities are the Medical Sciences Building cafeteria, Children's Hospital Medical Center cafeteria, University Hospital's cafeteria, or the Veteran's Hospital cafeteria. Chipotle and Zoup are just up the street on the corner of MLK Drive and Highland. The Kingsgate Marriott Conference Hotel also offers a buffet lunch for around $12 per person. Another venue is the University Hall cafeteria, which offers an inexpensive dining experience.

Public Safety:

The Department of Public Safety is comprised of four distinct, but interrelated units – University Police, Emergency Preparedness, Parking Services, and Support Services.

How to Contact the Police:

- Police Headquarters: 3 Edwards Center 51 West Corry Street Cincinnati, Ohio 45221-0215
- Primary phone numbers are: Emergencies 911
- To contact UC Police 911 from a non-university phone or cell phone dial 556- 3911
- Non-Emergencies 556-1111, 558-1111
- Office 556-4900 (If long distance, the area code is 513)
- Help Phones
- Email: ucpd@uc.edu

Nightride:

NightRide, operated by students, is a free nighttime transportation service. It provides students, faculty and staff safe and reliable transportation to and from locations within a one mile radius of the UC campus. A UC ID is required and users may take one non-UC person as a guest.

NightRide's number is 513-556-RIDE (7433)

Operating Hours:

Sunday -Wednesday: 8 p.m. to midnight

Thursday- Saturday: 8 p.m. - 2 a.m.

Limited service is available:

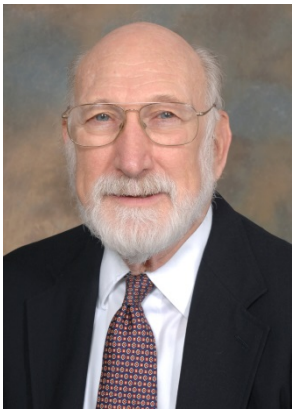
Sunday - Wednesday: midnight to 5 a.m.

Saturday - Sunday: 2 - 5 a.m.

Faculty Profiles:

Mario Medvedovic, PhD
Professor
Division Director
Dr. Medvedovic is developing and applying new statistical and computational methods for the analysis of "big data" in the context of biomedical research. His recent work is focused on the reconstruction of regulatory networks using libraries of genome-scale signatures of cellular perturbations. He is also developing protocols for analyzing next-generation sequencing data, and working on development and application of unsupervised statistical learning approaches based on the non-parametric Bayesian models.

Marepalli Rao, PhD
Professor
Academic Director
Dr. Rao's research interests include applications of statistical methodologies in bioinformatics; calibrating an electronic nose in testing food safety; classification and clustering techniques in medical diagnostics; sample size determination in biomedical research; analysis of familial data and longitudinal data analysis; false discovery rates; data mining techniques; deep learning methodologies; developing diagnostic tests; disease progression models.



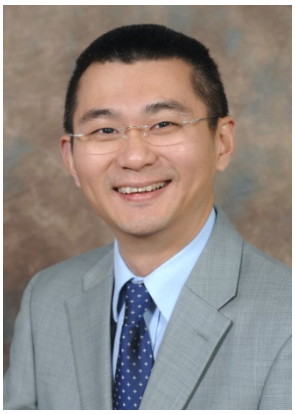
C. Ralph Buncher, ScD
Professor Emeritus
Dr. Buncher's research covers many aspects of biostatistics and epidemiology. This includes the subareas of these fields related to environmental and occupational studies such as the effects of exposure to lead, clinical trials especially of pharmaceutical products, evaluating imaging systems, cancer studies especially with relation to Cincinnati and Ohio, and studies of the effects of ionizing radiation. He is now studying the later effects of bariatric surgery in teenagers.

Roman Jandarov, PhD
Assistant Professor
Dr. Jandarov's current research interests include space-time processes, approaches to dimension reduction, air pollution epidemiology, modeling the dynamics of infectious diseases, complex computer experiments, statistical computing, and Bayesian inference, with applications to biomedical research. Prior to joining the University of Cincinnati, Dr. Jandarov was a postdoctoral senior research fellow in the Department of Biostatistics at the University of Washington. At the University of Washington, his postdoctoral research focused on statistical problems arising in air pollution epidemiology. Dr. Jandarov obtained his Ph.D. from the Department of Statistics at Penn State University in 2012. In his doctoral dissertation, Dr. Jandarov developed inferential methods and statistical tools for infectious disease and population dynamics models and collaborated with leading experts in the field of infectious diseases. Dr. Jandarov also holds a Specialist degree in Mathematics from Lomonosov Moscow State University.

Jane Khoury
Research Assistant Professor
Dr. Khoury is an assistant professor in the Division of Biostatistics and Epidemiology at Cincinnati Children's Hospital Medical Center (CCHMC), and holds a secondary appointment in the Division of Epidemiology and Biostatistics in the Department of Environmental Health. Dr. Khoury has worked with the Greater Cincinnati and Northern Kentucky Stroke team for the last 20 years. She is the lead biostatistician for the epidemiological studies of stroke and is director of the biostatistical core for the Cincinnati SPOTRIAS (Specialized Program of Translational Research in Acute Stroke), which includes two clinical trials. Dr. Khoury has also been involved in research with the Division of General and Community Pediatrics at CCHMC for the last ten years. The latter currently involves study of childhood neurobehavior and environmental exposure to insecticides and phthalates. Dr Khoury's personal research interests involve the effect of inter-uterine exposure to type 1 diabetes on childhood growth, metabolism and cardiac function. She currently has an internally-funded CCTST award for examining modeling of maternal glycemic control during pregnancy.

Linda S. Levin, PhD
Professor Emeritus
As a biostatistician, my focus has been the study of methodologies for analyzing longitudinal discrete and continuous data, and investigation of the effect of measurement error and misclassification on estimates of association between environmental exposure and respiratory health. Specifically, an area of interest in longitudinal analysis is the assessment of pulmonary function change over time. As chief statistician in a large industry-wide study of the effect of an occupational exposure, I have computerized spirometric trend reports which are being used to measure pulmonary function change for large numbers of workers. I have co-authored many publications in which longitudinal data analysis was used, including Generalized Estimating Equations and mixture modeling approaches.

Jaroslaw Meller, PhD
Associate Professor
Building upon broad interdisciplinary training in molecular modeling, computational chemistry, and bioinformatics, Dr. Meller has been pursuing research at the intersection of computational genomics and biomedicine. Dr. Meller has a primary appointment in the Department of Environmental Health, University of Cincinnati College of Medicine, and joint/secondary appointments in the Division of Biomedical Informatics, Cincinnati Children's Hospital Medical Center, and the School of Electrical Engineering and Computing Systems, University of Cincinnati College of Engineering and Applied Sciences. Dr. Meller has published over 70 original research articles with over 2,500 citations and ISI Web of Science H-index of 30.



Liang Niu, PhD
Assistant Professor
Dr. Niu's research interests focus on statistical applications in the Next Generation Sequencing (NGS) data analysis. His recent work includes statistical modeling of Chromatin Interaction Analysis by Paired-End Tag Sequencing (ChIA-PET) data and statistical modeling for RNA-Seq data. He is also interested in the pathway analysis and statistical applications in the preprocessing of methylation array data.

Rakesh Shukla, PhD
Professor Emeritus
Dr. Shukla now retired, is a Professor Emeritus of the Division of Biostatistics and Bioinformatics. His research portfolio has previously been supported by both intra as well as extra-mural research initiatives. In the past he has been involved as a Chief Biostatistician for various projects which included on-going clinical trials. These clinical trials included both Phase II and Phase III elements for the control of ventilation and control of oxygenation in trauma patients. Some of Dr. Shukla's past projects have been concerned with the development of a novel screening tool using bio-mechanical properties of bone as biomarkers of preclinical osteoporosis and risk of fracture among post-menopausal women. Other past projects have been concerned with the impact of the type of respirators and sizes of particles in respiratory protections against bioaerosols in agriculture. Some of Dr. Shukla's research areas of interest in statistical methodology have included the development of statistical models for count data with excess zeros, as others have been concerned with the application of quantile regression to medical and health data particularly in identifying prognostic factors for survival as well as delay in diagnosing various cancers.

Rhonda D. Szczesniak, PhD
Associate Professor
UC Department of Pediatrics
Dr. Szczesniak's research interests include; Self-modeling regressions; bayesian adaptive regression splines; time series analysis; spectral analysis.

Jeff Welge, PhD
Research Associate Professor
Dr. Welge provides biostatistician services for the department and insures the adequacy of statistical analyses in submissions for publication and funding. Dr. Welge has expertise in clinical biostatistics, clinical trial design, and hierarchical regression models for longitudinal and multi-center data, meta-analysis, and placebo responsiveness in clinical trials. Dr. Welge also teaches residents and graduate students. He serves on the editorial board of Schizophrenia Research, Bipolar Disorders and Current Drug Therapy.

Changchun Xie, PhD
Associate Professor
Dr. Xie has more than 10 years of experience in large international clinical trials and epidemiology studies – design, data management, analysis and publication and experience in genetic studies. His many referred professional publications, including those published in top Journals (such as NEJM, JAMA, Nature) have been generated from these researches. Recently, He has developed a new method on weighted multiple testing correction in clinical trials with correlated multiple endpoints, published in Statistics in Medicine. He has been a reviewer for 21 statistical/medical/genetic Journals. He is a member of University of Cincinnati (UC) IRB Committee and a member of Protocol Review and Monitoring Committee (PRMC) in UC Cancer Institute and UC Health. Interest areas include multiple testing, statistical genetics (Next Generation sequencing, methylation, SNP and their integration), hierarchical models, frailty models (in survival analysis), meta-analysis, nonparametric, longitudinal data, cluster analysis and multivariate statistical analysis.

Jun Ying, PhD
Associate Professor
Dr. Ying is the Director of the MPH Program. He also serves as the Director of Center for Biostatistical Services of the Department of Environmental Health, the Co-Director of BERD Statistical Service Unit of the CCTST (Center for Clinical and Translational Science and Training). Dr. Ying's research interests involve predictive models using supervised and unsupervised machine learning methods; classification and discrimination of patients using single or panel biomarkers; longitudinal statistical models, and hierarchical Bayesian models. His medical and health research involve various areas including children's systemic lupus erythematosus, cancer, HIV, occupational asthma, imaging and radiology diagnose, bone density under lead exposure, and etc. He has published 90 peer reviewed papers in the professional journals, and is serving co-PI, co-investigators in 4 NIH funded grants. He has been serving a reviewer for VA HSR&D, NIH, and Susan Komen.

Rong Zhou, PhD
Volunteer – Associate Professor
Director, Medpace
Dr. Zhou is the director of biostatistics at Medpace, Inc Cincinnati.

Sample Letter - MS Statement of Intent
ATTACH TO PROPOSAL

MEMORANDUM

DATE:

FROM: “Your Name”

THROUGH: “Your Advisor”

Attached is the statement of intent for my MS thesis entitled “Your Title”

Thank you for your reviews and comments

Attachments

Sample Letter - PhD Statement OF Intent
ATTACH TO PROPOSAL

MEMORANDUM

DATE:

FROM: “Your Name”

THROUGH: “Your Advisor”

Attached is the statement of intent for my PhD dissertation entitled “Your Title”

Thank you for your reviews and comments

Attachments

Sample Letter Qualifying Examination
ATTACH TO PROPOSALS

MEMORANDUM

DATE:

FROM: “Your Name”

THROUGH: “Your Advisor”

"Your name" has completed all the coursework required in the Division of "Your division" maintaining a grade point average of 3.0 or better and would like to begin the PhD qualifying process. (If applicable: Also please see attached documentation of successful completion of OEPT examination).

Attached are _# _ short research proposal(s), we would like to request the following Qualifying Examination Committee:

1. Dr. _____
2. Dr. _____
3. Dr. _____
4. Dr. _____
5. Dr. _____

Sincerely,

Your name

Division director

Advisor

*PLEASE INCLUDE TITLES