Alabama Commission on Higher Education

Accessibility. Affordability. Coordination.

Proposal for a New Degree Program

I. Information and Rationale

A. Primary Contact Information

Institution: University of Alabama at Birmingham

Contact: James Cimino, MD

Title: Professor, Chair of the Department of Biomedical Informatics and Data Science

Email: jamescimino@uabmc.edu

Telephone: (205) 996-1958

B. Program Information

Date of Proposal Submission: 5/8/2024

Award Level: Doc Research (IPEDS 17)

Award Nomenclature (e.g., BS, MBA): PhD

Field of Study/Program Title: Biomedical and Health Informatics

CIP Code (6-digit): 51.2706 (Medical Informatics)

C. Administration of the Program

Name of Dean and College: Dr. Anupam Agarwal, School of Medicine

Name of Department/Division: Department of Biomedical Informatics and Data Science

Name of Chairperson: Dr. James Cimino

D. Implementation Information

Proposed Program Implementation Date: 8/1/2026

Anticipated Date of Approval from Institutional Governing Board: 9/1/2024

Anticipated Date of ACHE Meeting to Vote on Proposal: 12/14/2024

SACSCOC Sub Change Requirement (Notification, Approval, or NA): NA

Other Considerations for Timing and Approval (e.g., upcoming SACSCOC review): NA

E. Concise Program Description

Include general opportunities for work-based and/or experiential learning, if applicable.

The goal is to prepare individuals for the development and application of informatics theories and tools to solve problems across the life sciences and health ecosystem. This interdisciplinary field blends elements from computer science, statistics, clinical, and bioinformatics. It emphasizes analyzing and interpreting complex data and developing and

disseminating solutions, infrastructure, and algorithms to address human health and disease problems. It serves to distill, refine, and consolidate knowledge in life sciences and health.

The overall objective is to graduate students who can bridge the gap between advanced computational techniques, biomedical sciences, and health system science, developing interdisciplinary research to innovate and drive progress in improving human health. These graduates are expected to be capable of designing and implementing novel data- and science-driven solutions and capable, real-world information infrastructure, conducting rigorous research, and contributing significantly to the understanding of complex biological systems and health-related challenges with the goal of advancing healthcare and patient outcomes. Additionally, they should be capable of navigating the ethical, legal, and social implications of informatics and AI theories, methodologies, and technologies, ensuring responsible and beneficial use of technology across the life sciences and health ecosystem.

F. Specific Rationale (Strengths) for the Program

List 3 – 5 strengths of the proposed program as specific rationale for recommending approval of this proposal.

1. The move towards personalized medicine, powered by omics and precision health informatics, requires professionals skilled in managing and analyzing diverse data to tailor healthcare to individual patients.
2. The explosion of big biomedical data and artificial intelligence technologies offers unprecedented opportunities to improve healthcare delivery, patient outcomes, and medical research.
3. The increasing complexity of healthcare systems demands sophisticated informatics solutions to ensure efficiency, reduce errors, and manage the vast amounts of health-related data being generated.
4. There's a continuous need for informatics research to develop new methodologies, tools, and applications to improve health outcomes and healthcare delivery.
5. There's a recognized need to develop a workforce capable of innovating at the intersection of health and technology. BHI PhD programs aim to produce leaders in research, academia, and industry who can drive the future of healthcare innovation.

List external entities (more may be added) that may have supplied letters of support attesting to the program's strengths and attach letters with the proposal at the end of this document.

1. Elizabeth Worthey, PhD, Associate Professor, Genetics, Genomics, & Bioinformatics
2. David A. Schneider, PhD, Professor, Graduate Biomedical Sciences

3. Yuliang Zheng, PhD, Professor, Department of Computer Science
4. Palanaippan Sethu, PhD, Associate Professor, Department of Biomedical Engineering
5. Jane Banazak-Holl, Professor, Chair, Department of Health Services Administration

II. Background with Context

A. Student Learning Outcomes

List four (4) to seven (7) of the student learning outcomes of the program.

1. Informatics Research and Application: The program is dedicated to research in biomedical and health informatics, focusing on the management, analysis, and interpretation of biological and clinical data and the development and application of novel methodologies to create new knowledge. The program places a strong emphasis on the development of innovative computational algorithms specific to biomedical and healthcare challenges.

2. Real-world Applications and Practice: The program extends to the application of knowledge, AI algorithms, and informatics solutions to address tangible challenges in healthcare and biological research in diverse professional settings.

3. Harmonization, Mining, and Modeling of Interdisciplinary Data: The program is inherently interdisciplinary, integrating knowledge, methods, and tools from statistics, biology, medicine, AI, and health informatics. Interdisciplinary data harmonization, mining and modeling, and interpretation are crucial aspects for advancing research that helps to answer complex biomedical and healthcare questions.

4. Team Science and Social Implications: Students will be expected to engage in collaborative research projects that span multiple disciplines, promoting comprehensive problem-solving across the healthcare ecosystem.

B. Similar Programs at Other Alabama Public Institutions

List programs at other Alabama public institutions of the same degree level and the same (or similar) CIP codes. If no similar programs exist within Alabama, list similar programs offered within the 16 SREB states. If the proposed program duplicates, closely resembles, or is similar to any other offerings in the state, provide justification for any potential duplication.

CIP Code	Degree Title	Institution with Similar Program	Justification for Duplication

There is no similar program exists in Alabama.

We identified the following similar PhD programs offered within the 16 SREB states:

Vanderbilt University	Biomedical Informatics PhD program
Johns Hopkins University	Genomics & Bioinformatics PhD program
University of North Carolina Chapel Hill	Health Informatics
University of Florida	Medical Sciences | Biomedical Informatics
University of Texas Health Science Center at Houston	Biomedical Informatics

C. Relationship to Existing Programs within the Institution

1. Is the proposed program associated with any existing offerings within the institution, including options within current degree programs?   **Yes** ☒ **No** ☐

   (Note: Most new programs have some relationship to existing offerings, *e.g.*, through shared courses or resources). If yes, complete the following table. If this is a graduate program, list any existing undergraduate programs which are directly or indirectly related. If this is a doctoral program, also list related master's programs.

Related Degree Program Level	Related Degree Program Title	Explanation of the Relationship Between the Programs
Masters	Masters of Science in Health Informatics	Retention of Masters students as they matriculate to a PhD program, faculty sharing
Masters	Masters of Science in AI in Medicine	retention
PhD	PhD in Biomedical Engineering	Course sharing with department approval (see support letter)
PhD	Graduate Biomedical Science (GBS) Doctoral Program	BHI-PHD is designed to promote interdisciplinary collaboration. We embrace the opportunity for cross-disciplinary mentorship by extending invitations to faculty members from other departments within UAB to serve as advisors for students enrolled in the BHI-PHD program (see support letter).
PhD	PhD in Computer Science	Elective course sharing with department approval (see support letter)
PhD	PhD in Administration Health Services	Department support course and faculty sharing (see support letter)

BHI-PHD is designed to promote interdisciplinary collaboration. We embrace the opportunity for cross-disciplinary mentorship by extending invitations to faculty members from other departments within UAB to serve as advisors for students enrolled in the BHI-PhD program.

The mentor pool of BHI-PhD includes all faculty with primary and secondary appointments in HSA, MHIBI, and DBIDS. Faculty members with wet labs are not excluded from the mentor pool. Students can petition for mentors outside the current mentor pool by submitting a request form to the BHI-PhD program director. This request form should include a rationale for the choice of mentor and how his/her expertise aligns with the student's research goals in biomedical and health informatics. The program director will review the request and consult with relevant faculty to ensure the following criteria are satisfied:

- The mentor's expertise aligns with the student's research goals in biomedical and health informatics.
- The mentor is willing to collaborate and communicate effectively with the student and the program faculty.
- The mentor ensures that BHI-PhD students focus the majority of their efforts on research consistent with the student's trajectory toward a dissertation and graduation.

- The mentor commits to providing at least one year of tuition and stipend support (consistent with the requirements of the graduate school) for the student's research as needed.

The School of Health Professions offers a Master's of Science in Health Informatics. Courses within this program are appropriate for the Clinical and Health Informatics track of this proposed BHI-PhD program and will be integrated. The proposed program also has some relation and overlap to the PhD in the Health Services Administration department (PhD-Administration-Health Services). In terms of the relation and overlap, some of the core knowledge and skills are similar, as they would be for many PhD level programs. More simply stated, there are a set of knowledge and skills that we expect PhDs to have when they graduate, such as research methods, for example. Every attempt will be made to share courses. While graduates from both programs will conduct data-intensive research, it is the application of those knowledge and skills that <u>sets the two programs apart</u>. For example, graduates in the PhD-Administration-Health Services historically conduct research focusing on questions and techniques relevant to the applied use of a broad variety of innovations within healthcare delivery organizations, including a broader understanding of how health systems work and responses to internal and external forces; whereas graduates in the BHI-PhD will be more focused on the application of knowledge and skills to answer questions around bioinformatics, AI, and clinical and health informatics, such as those centered around genomics, the use of AI in new knowledge discovery, and how those concepts impact clinical care. Another area where the two programs differ is in the types of students recruited. Students in the HSA-PhD program historically come from public health or health administration backgrounds, whereas we expect BHI-PhD students to come from computer science, bio/health informatics, and engineering backgrounds.

The School of Engineering offers a PhD degree in Biomedical Engineering (BME), and one of its tracks is bioinformatics. BME will continue to house the Bioinformatics track until the launch of the proposed doctoral program (projected 2026) to be housed in DBIDS. The courses would be essential to provide key concepts and advanced training in developing bioinformatics algorithms and tools. We will collaborate with the School of Engineering and the Department of Biomedical Engineering to offer these as curriculum electives.

The School of Medicine offers the Graduate Biomedical Science (GBS) Doctoral Program. In the program, the Genetics, Genomics & Bioinformatics (GGB) theme provides flexible, didactic, and integrated interdisciplinary training opportunities across the broad disciplines of genetics, genomics, and bioinformatics. We will work with the School of Medicine to include the GGB courses as electives for BHI-PHD students.

The College of Arts and Sciences Department of Computer Science offers PhD in Computer Science that prepares students for a professional career in the field of advanced computing, with areas of strength in advanced cyberinfrastructure, big data analytics, and cyber security. This program provides a full spectrum of training to equip students with AI fundamental knowledge and skill sets in machine learning, data mining, and data science, etc. This program is domain agnostic, while the proposed BHI-PHD focuses on the domain of biomedical informatics. We will work with the department to include their course offerings as electives in the proposed BHI-PHD.

Summary: There is a growing demand for graduate education that is focused on biomedical and health informatics research and application across the greater healthcare ecosystem. It is recognized that singularly focused programs lack inclusivity of diverse knowledge and skills applications within the broader healthcare ecosystem. We are specifically planning for

this degree to build upon and leverage the strengths of the current HSA, BME, GGB, and CS PhD programs and the strengths of diverse knowledge and skills across UAB, especially in the application of biomedical and health informatics to solve real-world problems in real-world settings.

2. Will this program replace any existing programs or specializations, options, or concentrations?   **Yes ☐ No ☒**

   If yes, please explain.

3. Will the program compete with any current internal offerings?   **Yes ☐ No ☒**

   If yes, please explain.

D. Collaboration

Have collaborations with other institutions or external entities been explored?   **Yes ☐ No ☒**

If yes, provide a brief explanation indicating those collaboration plan(s) for the proposed program.

Have any collaborations within your institution been explored?   **Yes ☒ No ☐**

If yes, provide a brief explanation indicating those collaboration plan(s) for the proposed program.

The BHI-PhD has been developed through extensive collaboration with relevant programs across UAB. We discuss each of the main areas of collaboration here:

The School of Health Professions offers a Master of Science in Health Informatics. Courses within these programs are appropriate for the Clinical Informatics track of this proposed BHI-PhD program and will be integrated. Every attempt will be made to share courses with the PhD in the Health Services Administration department (PhD-Administration-Health Services) as well.

The School of Engineering offers a PhD degree in Biomedical Engineering, and one of its tracks is bioinformatics. The courses would be essential to provide key concepts and advanced training in developing bioinformatics algorithms and tools. Courses within these programs are appropriate for the Translational Bioinformatics track of this proposed BHI-PhD program We will collaborate with the School of Engineering and the Department of Biomedical Engineering to offer these as curriculum electives.

The School of Medicine offers the Graduate Biomedical Science (GBS) Doctoral Program. In the program, the Genetics, Genomics & Bioinformatics (GGB) theme
provides flexible, didactic, and integrated interdisciplinary training opportunities across the broad disciplines of genetics, genomics, and bioinformatics. Courses within these programs are appropriate for the Translational Bioinformatics track of this proposed BHI-PhD program. We will include GGB courses as electives for BHI-PhD students.

The College of Arts and Sciences Department of Computer Science offers PhD in Computer Science that prepares students for a professional career in the field of advanced computing,

with areas of strength in advanced cyberinfrastructure, big data analytics, and cyber security. Courses within these programs are appropriate for all the tracks of this proposed BHI-PhD program. We will work with the Department of Computer Science to include relevant course offerings as electives in the proposed BHI-PhD.

E. Specialized Accreditation

1. Will this program have any external accreditation requirements in addition to the institution's SACSCOC program requirements?   **Yes ☐ No ☒**

   If yes, list the name(s) of the specialized accrediting organization(s) and the anticipated timeframe of the application process.

2. Does your institution intend to pursue any other non-required accrediting organizations for the program?*   **Yes ☐ No ☒**

   If yes, list the name(s) of the organization(s) and the purpose of the pursuit.

   If there are plans to pursue non-required external accreditation at a later date, list the name(s) and why the institution is not pursuing them at this time.

   Note: Check *No* to indicate that non-required external accreditation will not be pursued, which requires no explanation.

F. Professional Licensure/Certification

Please explain if professional licensure or industry certification is required for graduates of the proposed program to gain entry-level employment in the occupations selected. Be sure to note which organization(s) grants licensure or certification.

No. There is no specific professional licensure or industry certification required for entry-level employment in bioinformatics or health informatics.

G. Additional Education/Training

Please explain whether further education/training is required for graduates of the proposed program to gain entry-level employment in the occupations selected.

Additional education or training is not required for graduates of the BHI-PHD program to gain entry-level employment such as bioinformatician, data scientist in healthcare, and clinical informatics specialist. Students who complete the BHI-PhD will be able to demonstrate strength in the following areas:

Informatics Research and Application: The program is dedicated to research in biomedical and health informatics, focusing on the management, analysis, and interpretation of biological and clinical data and the development and application of novel methodologies to create new

knowledge. The program places a strong emphasis on the development of innovative computational algorithms specific to biomedical and healthcare challenges.

Real-world Applications and Practice: The program extends to the application of knowledge, AI algorithms, and informatics solutions to address tangible challenges in healthcare and biological research in diverse professional settings.

Harmonization, Mining, and Modeling of Interdisciplinary Data: The program is inherently interdisciplinary, integrating knowledge, methods, and tools from statistics, biology, medicine, AI, and health informatics. Interdisciplinary data harmonization, mining and modeling, and interpretation are crucial aspects for advancing research that helps to answer complex biomedical and healthcare questions.

Team Science and Social Implications: Students will be expected to engage in collaborative research projects that span multiple disciplines, promoting comprehensive problem-solving across the healthcare ecosystem.

The BHI-PhD program graduates will be well-positioned to attain diverse career paths, including academic research, industry roles in biotechnology and pharmaceutical companies, healthcare IT, and policy-making, where they can lead the way in using informatics to solve complex problems across the healthcare ecosystem.

H. Admissions

Will this program have any additional admissions requirements beyond the institution's standard admissions process/policies for this degree level?   **Yes ☒ No ☐**

If yes, describe any other special admissions or curricular requirements, including any prior education or work experience required for acceptance into the program.

US equivalent of BS/BE degree (4-year) in STEM fields
IELTS (higher or equal to 6.5) / TOEFL (higher or equal to 80) for international students

I. Mode of Delivery

Provide the planned delivery format(s) (*i.e.*, in-person, online, hybrid) of the program as defined in policy along with the planned location(s) at which the program will be delivered (*i.e.*, on-campus and/or at specific off-campus instructional site(s)). Please also note whether any program requirements can be completed through competency-based assessment.

Hybrid.

J. Projected Program Demand (Student Demand)

Briefly describe the primary method(s) used to determine the level of student demand for this program using evidence, such as enrollments in related coursework at the institution, or a survey of student interest conducted (indicate the survey instrument used), number and percentage of respondents, and summary of results.

Through bioinformatics and clinical informatics conferences nationally and internationally and anecdotally with our current bioinformatics and health informatics students, we are already aware of the demand for this program. For example, there are currently five graduates from our Master of Science in Health Informatics program in the School of Health Professions who

have gone on to PhD programs at other schools because UAB did not offer an appropriate Biomedical and Health Informatics PhD program. The Master's students in the AI in Medicine program led by MHIBI could be a potential candidate pool for this PhD by 2026. The Master's students in the Data Science program led by Department Computer Science could be a potential candidate pool for this PhD. Equally as relevant is the recent surge in the application of AI across the multitude of biomedical and health environments in the healthcare ecosystem. As an industry leader in education and the application of learning, UAB finds itself responsive to industry and carving a path as a leader in educational offerings.

K. Standard Occupational Code System

Using the federal Standard Occupational Code (SOC) System, indicate the top three occupational codes related to post-graduation employment from the program. A full list of SOCs can be found at https://www.onetcodeconnector.org/find/family/title#17.

A list of Alabama's In-Demand Occupations is available at https://www.ache.edu/index.php/policy-guidance/.

SOC 1 (**required**): 19-1029.01 Bioinformatics Scientists

SOC 2 (optional): 15-1211.01   Health Informatics Specialists

SOC 3 (optional): 15-2051.00   Data Scientists

Briefly describe how the program fulfills a specific industry or employment need for the

State of Alabama. As appropriate, discuss alignment with Alabama's Statewide or Regional Lists of In-Demand Occupations (https://www.ache.edu/index.php/policy-guidance/) or with emerging industries as identified by Innovate Alabama or the Economic Development Partnership of Alabama (EDPA).

Compared to many cities in the United States, Birmingham is experiencing significant socioeconomic growth that is fueling a burgeoning healthcare entrepreneurial ecosystem. As in other cities, a strong university innovation education program is invaluable to such an entrepreneurial environment. UAB is a critical part of such an ecosystem and functions as the epicenter of healthcare education, clinical, research, and outreach activities. In 2018, UAB enrolled 21,923 students, employed over 23,000 individuals, and counted over 120,000 alumni worldwide. Based on a 2017 study, UAB's annual statewide economic impact exceeds $7.15 billion and supports more than 64,000 jobs – an average of one out of every 31 jobs in Alabama.

According to comprehensive research conducted by Market Research Future (MRFR), Artificial Intelligence (AI) in the healthcare market size is expected to hit $12.22 billion from 2022-2030. The demand for improved patient outcomes is expected to be a significant factor towards the development of AI-assisted solutions enabling accurate patient diagnoses, treatment plans, and monitoring of disease trajectories. It has been cited that 'the high cost of implementing AI in healthcare, the lack of skilled professionals, and data privacy concerns are most anticipated restraints for the AI in healthcare market growth'. Proceedings of a 2023 Artificial Intelligence in Health Professions Education workshop from the National Academies of Sciences, Engineering, and Medicine (NASEM) suggests that we need better educational programs to produce a workforce adept at using AI applications for faster and more relevant processing of the increasing amounts of healthcare-related data, noting that the use of AI in healthcare has lagged behind other fields. Consequently, there is a need for a workforce that is knowledgeable and skilled at developing, applying, and translating responsible AI to decrease the cognitive load of human data processing

and interpretation, impact health outcomes, and further augment other critical decision points within the healthcare ecosystem.

The proposed BHI-PHD program addresses a specific industry need in the State of Alabama by providing trained professionals in biomedical and healthcare informatics, a field essential for advancing healthcare delivery, research, and innovation. The **mission** of the BHI-PHD is to produce a technical workforce that has attained graduate-level expertise in AI with specialized knowledge in healthcare applications. These graduates will serve as accelerators in the adoption and industrialization of healthcare AI technologies. The **goal** of the proposed program is to provide graduate-level professionals from various backgrounds (biomedical engineers, computer scientists, and future clinical practitioners) with AI application skills to adopt an integrated approach to improving human health and patient outcomes. This program of instruction would represent an investment in the economic development and commercial activity in the city of Birmingham and the state of Alabama. The program's focus on integrating technology and data analytics into healthcare practices aligns with the growing demand for skilled professionals who can optimize healthcare delivery systems, improve patient outcomes, and enhance population health management. Alabama's healthcare industry, including hospitals, research institutions, and healthcare technology companies, requires individuals with advanced knowledge in informatics to drive innovation and improve healthcare services. Furthermore, the program's emphasis on interdisciplinary collaboration prepares graduates to work effectively across healthcare, technology, and academic sectors, promoting partnerships and initiatives that benefit the state's healthcare ecosystem. The proposed BHI-PHD program serves specific healthcare industry needs for the State of Alabama and across the nation and world. The program will contribute to producing a workforce capable of designing, developing, and implementing AI to improve many aspects of the healthcare ecosystem. Graduates of the program will be prepared for success in at least 10 of the 2022-23 In-Demand Occupations identified by ACHE.

The proposed BHI-PHD degree meets the needs of the growing population of healthcare-related technological companies in Birmingham and the state of Alabama, as well as UAB students who will join the Birmingham and Alabama healthcare workforce, including but not limited to physicians and nurses. It will also help UAB students and faculty who plan to launch their own healthcare ventures and those in other health-related fields who desire specific knowledge and technical skills in advanced AI techniques.

The BHI-PHD degree complements existing university educational and entrepreneurial activities in AI education and AI-based technological innovation. There is a growing demand for professional education and technical expertise at the graduate level that is focused on biomedical and health informatics. The proposed degree program will address this demand by offering a comprehensive and integrative curriculum. We are specifically planning for this degree to build upon the strengths across UAB.

The EDPA Retain Alabama report discusses opportunities to increase retention of higher education graduates in the State. While the EDPA is working with stakeholders to address some of the largest gaps identified in the report, UAB can contribute by preparing graduates with highly marketable and applicable knowledge and skills in AI for health services. Thus, the proposed program squarely aligns with one of the EDPA's focus areas to add value through programming.

Overall, the BHI-PHD program fulfills a critical industry need in Alabama by producing skilled professionals who can advance healthcare delivery, research, and technology innovation to benefit the state's population and economy. This is an opportune time to launch a program that prepares graduates to develop, apply, and translate AI across the healthcare ecosystem so that health data become actionable knowledge with the potential to reduce the cognitive load of the consumers of those data, ultimately improving the quality of health care. Leveraging UAB's innovative history, this is the right time, in the right place, with the right attention, for the proposed program.

III. Curriculum Information for Proposed Degree Program

A. Program Completion Requirements: Enter the credit hour value for all applicable components (enter N/A if not applicable).

Curriculum Overview of Proposed Program	
Credit hours required in **general education**	0
Credit hours required in **program courses**	20
Credit hours in **program electives/concentrations/tracks**	18
Credit hours in **free electives**	12
Credit hours in **required research/thesis**	24
Total Credit Hours Required for Completion	**74**

Note: The above credit hours **MUST** match the credit hours in the *Curriculum Components of Proposed Program* table in Section V.G.

B. Maximum number of credits that can be transferred in from another institution and applied to the program:

In the proposed BHI-PhD program, we understand the value of prior academic accomplishments and aim to facilitate a seamless transition for students transferring from other institutions. Previously earned graduate credit with a grade of B or above while enrolled at another regionally accredited graduate school may be eligible for transfer into the BHI-PhD program if it has not been applied toward another degree (either at UAB or elsewhere). In addition, credit may be awarded for non-collegiate courses in accordance with American Council on Education recommendations and approval of the appropriate department chair and dean. All transfer credit requests must be initiated by the student and require the approval of the graduate program director and the Graduate School. Transfer of Credit forms are available online at http://www.uab.edu/graduate/online-forms. Completion of this form does <u>not</u> guarantee that the transfer credit will be granted. No more than <u>12 semester hours</u> of graduate credit can be transferred to UAB. Students wishing to request an exception to the transfer credit hour limit must receive the approval of the program director, department chair, and Graduate School Dean. Once transfer credit has been approved, it will be included in the calculation of the grade point average in the student's BHI-PhD program.

C. Intended program duration in semesters for full-time students:

In total, 14 semesters are required for graduation. This includes non-dissertation research during the summer semesters.

D. Intended program duration in semesters for part-time students:

20 semesters are required for graduation, assuming a normal part-time student will take 6 credits (2 courses) per Spring or Fall semester. This includes non-dissertation research during the summer semesters.

E. Does the program require students to demonstrate industry-validated skills, specifically through an embedded industry-recognized certification, structured <u>work-based learning</u> with an employer partner, or alignment with nationally recognized industry standards?   **Yes** ☐ **No** ☒

If yes, explain how these components fit with the required coursework.

F. Does the program include any concentrations? **Yes** ☒ **No** ☐

If yes, provide an overview and identify these courses in the *Electives/Concentrations/Tracks* section in the Curriculum Components of Proposed Program Table in Section V.G.

BHI-PhD is deeply rooted in both the application and development of artificial intelligence and informatics theories, methods, and tools, striving to contribute to the theoretical and practical advancements at the intersection of these fields. BHI-PhD will build upon existing programs and courses in the Department of Biomedical Informatics and Data Science, Department of Health Services Administration, and Marnix E. Heersink Institute for Biomedical Innovation, Department of Medicine. It also requires additional courses to be developed. Most of the new courses will be developed from existing content already being taught and will be repackaged for this audience to achieve content that is more specific and relevant for BHI-PhD.

BHI-PhD is designed as a core-track model where all students will take the same set of core courses, providing a solid and broad foundation of PhD level analytics knowledge and skills as well as information, biological, and health system knowledge. The common core courses include four informatics research/methodology courses ranging from research integrity to machine learning and one course that is structured to provide a broad foundation of biomedical informatics and data science, preparing students for specialized PhD tracks. The Dissertation Research course is required for all PhD students.

The BHI-PHD program has three tracks: Translational Bioinformatics, Clinical Informatics, and AI in Medicine. Each track has five track courses (required). Seminar & Journal club is listed as a track course, but all students will attend the same class. To ensure the transdisciplinarity of the degree, students will select a track within which they will deepen their knowledge and skills.

Additionally, students will be encouraged to take a variety of elective courses that are offered by other programs at UAB, where the knowledge and skills from such electives will support and extend the knowledge and skills acquired from the core and track courses in BHI-PhD. Such programs may exist in engineering, computer science, health services administration, public health, etc.

The Translational Bioinformatics track is designed for students to gain comprehensive knowledge and practical skills in leveraging computational methods and infrastructure to analyze biological data and bridge the gap between bench research and clinical applications. It includes the following courses: Introduction to Bioinformatics, Biological Data Management, Next-generation Sequencing Data Analysis, and Algorithm in Bioinformatics.

The Clinical Informatics track is designed for students to develop advanced competencies in translating and applying health informatics concepts to enhance patient care, clinical decision-making, and healthcare delivery systems science. It includes the following courses: Clinical Operations and Decision-Making, Learning/Knowledge Health Systems, Technology and Society, and Health Information Systems.

The AI in medicine track is designed to empower students with expertise in harnessing informatics and artificial intelligence for transformative applications in healthcare. It includes the following courses: AI in Medical Imaging, AI for Biomedical Signals and Critical Systems, Large Language Model Development for Medicine, and Integration of AI Systems in Healthcare.

G. Please provide all course information as indicated in the following table. Indicate new courses with "Y" in the associated column. If the course includes a required work-based

learning component, such as an internship or practicum course, please indicate with a "Y" in the WBL column.

Program Name:	PhD in Biomedical and Health Informatics			
Program Level:	PhD			
Curriculum Components of Proposed Program				
Course Number	Course Title	Credit Hours	New? (Y)	WBL? (Y)
General Education Courses *(Undergraduate Only)*				
	NA			
Program Courses				
TBD	Foundations in Informatics (core course)	3	Y	N
TBD	Statistical Learning Models (core course)	3	Y	N
TBD	Artificial Intelligence Models (core course)	3	Y	N
AH 707	Research Methods and Design (core course) – existing course	3	Y	N
HI 620	Privacy, Security, and Ethics (core course) – existing course!	3	Y	N
TBD	Biomedical and Health Informatics Seminar (all track)	1x2	N	N
INFO 793	Bioinformatics Journal Club (Translational Bioinformatics track); 2nd year to graduation	2	N	N
INFO 773	Clinical Informatics Journal Club (Clinical Informatics Track); 2nd year to graduation	2	N	N
TBD	AI in Medicine Journal Club (AI in Medicine Track); 2nd year to graduation	2	Y	N
INFO 701	Introduction to Bioinformatics (Translational Bioinformatics track)	3	N	N
INFO 703	Biological Data Management (Translational Bioinformatics track)	3	N	N
INFO 704	Next-generation Sequencing Data Analysis (Translational Bioinformatics track)	3	N	N
INFO 702	Algorithm in Bioinformatics (Translational Bioinformatics track)	3	N	N
TBD	Clinical Operations and Decision-Making (Clinical and Health Informatics Track)	3	Y	N
TBD	Learning/Knowledge Health Systems (Clinical and Health Informatics Track)	3	Y	N
TBD	Technology and Society (Clinical and Health Informatics Track)	3	Y	N
TBD	Health Information Systems (Clinical and Health Informatics Track)	3	Y	N
AIM 742	AI in Medical Imaging (AI in Medicine Track)	3	N	N
AIM 743	AI for Biomedical Signals and Critical Systems (AI in Medicine Track)	3	N	N
AIM 745	Large Language Model Development for Medicine (AI in Medicine Track)	3	N	N

HCI 714	Integration of AI Systems in Healthcare (AI in Medicine Track)	3	N	N
GRD 717	Principles of Scientific Integrity (all Tracks)	3	N	N
Program Electives/Concentrations/Tracks				
AIM 747	Explainable AI in Medicine	3	N	N
INFO 712	Visual Analytics for Biomedical Research	3	N	N
INFO 751	Systems Biomedicine of Human Microbiota	3	N	N
INFO 762/ CS 762	Biomedical Applications of Natural Language Processing	3	N	N
CS 716	Big Data Programming	3	N	N
CS 760	Artificial Intelligence	3	N	N
CS 763	Data Mining	3	N	N
CS 765	Deep Learning	3	N	N
CS 767	Machine Learning	3	N	N
CS 773	Computer Vision and Convolutional Neural Networks	3	N	N
BY 633	Advanced Molecular Genetics and Medicine	3	N	N
GBS 707	Basic Biochemistry and Metabolism	2	N	N
GBS 708	Basic Genetics and Molecular Biology	2	N	N
GBS 709	Basic Biological Organization	2	N	N
GBS 701	Core Concepts in Research: Critical Thinking/Error Analysis	1	N	N
BME 617	Engineering Analysis	3	N	N
BST 622	Statistical Methods II	3	N	N
BST 621	Statistical Methods I	3	N	N
INFO 710	Programming with Biological Data	3	N	N
GBS 716, GBS 725, GBSC 726, or GRD 709	Grant writing / scientific writing (core course)	2	N	N
Research/Thesis				
GRD 799	Dissertation Research	24	N	N
*Total Credit Hours Required for Completion		**74**		

*Note: The total credit hours should equal the total credit hours in the Curriculum Overview table (V.B, p. 9).

Requirement for seminar and journal club courses

- Students are required to take the seminar course (1 hour) in two semesters.

- Students are required to take journal club courses (2 hours) every school year from year 2 to graduation, choosing from INFO 793 Bioinformatics Journal Club, INFO 773 Clinical Informatics Journal Club, and TBD AI in Medicine Journal Club.

- Students are recommended to select one grant writing/scientific writing class (2 hours) from GBS 716, GBS 725, GBSC 726, and GRD 709.

Requirement for Qualifying Exam and Dissertation Defense

There is a natural occurrence that happens when students take courses, learn new knowledge, and then are in environments to apply that knowledge. We expect that new knowledge learned from coursework will be organically integrated into the research that the student is doing.

Qualifying Exam (QE)

All BPH-PhD students are required to pass a QE prior to being admitted to candidacy. Before scheduling the QE, students must have gotten approval from their advisors for the planned topic of the students' thesis research. The QE committee should include 3 faculty members, with at least one faculty member being the dissertation committee chair. The other faculty members may be from other departments or a subject matter expert, as recommended by the dissertation committee chair or the program/track director.

The QE has both a written and oral component. Students will submit an abstract, and from this abstract, a QE question will be written. The student will then have two weeks to write the QE, in the form of a research proposal, and submit the response. During this time, students are not communicating with any faculty. Students will present a written research proposal and orally defend it. Students are responsible for checking with program/track director(s) regarding additional track-specific requirements, including the attendance of program/track directors or individuals who are not the student's committee members.

The aims of the qualifying exam proposal do not constitute a binding contract for the successful completion of the dissertation project.

When a student arranges the schedule of the qualifying exam, the student will fill out the Pre-Qualifying Exam Form that will include the QE committee membership and email addresses. In addition, the agreed-upon dates for completion of the written portion and the oral portion will be entered. Submission of this form will trigger an email to all QE committee members (including the mentor) and program/track director(s) indicating the dates of the written evaluation and the oral presentation. Importantly, the message will also detail the expectations of the meeting and all faculty participants.

Students will have 2 weeks to write and submit the QE. Faculty will have 30 days to review the QE. The QE oral defense will occur within 45 days of the QE submission or by mutual agreement of the QE committee and program/track director. QE outcome will be provided to the student at the end of the oral defense.

Committee members will be encouraged to reach out to the program/track director with questions or concerns. It is preferred that at least one program/track director attend all qualifying examinations for track students. The program/track director may ask questions of the student, but does not have a vote on the student's performance (unless the program/track director is also an official member of the committee).

Dissertation

We will follow the graduate school guidance at https://www.uab.edu/graduate/students/current-students/theses-dissertations/your-thesis-and-dissertation to guide BHI-PhD students to prepare their dissertation defense.

IV. Program Resource Requirements

A. Proposed Program Faculty*

Current Faculty and Faculty to Be Hired

Complete the following **New Academic Degree Proposal Faculty Roster** to provide a brief summary and qualifications of current faculty and potential new hires specific to the program.

***Note**: Institutions must maintain and have current as well as additional faculty curriculum vitae available upon ACHE request for as long as the program is active, but CVs are **not** to be submitted with this proposal.

Current Faculty			
1	2	3	4
CURRENT FACULTY NAME (FT, PT)	**COURSES TAUGHT including Term, Course Number, Course Title, & Credit Hours (D, UN, UT, G, DU)**	**ACADEMIC DEGREES and COURSEWORK Relevant to Courses Taught, including Institution and Major; List Specific Graduate Coursework, if needed**	**OTHER QUALIFICATIONS and COMMENTS Related to Courses Taught and Modality(ies) (IP, OL, HY, OCIS)**
Pietro Bonizzi (FT)	AIM647 Explainable AI in Medicine, 3 credits G	PhD	Engineering background, expert on biomedical signal processing
Ria Hearld (FT)	AHD 632 Research Methods and Design, 3 credits, Spring, G	PhD	Currently teaching this course across different degree programs
Shannon Houser/Thad Phillips	HI 620 Security and privacy in healthcare, 3 credits, Spring G	PhD	Currently teaching this course across different degree programs
Amy Wang (FT)	INFO791 - Bioinformatics Seminar I, 1 credit, Spring, G INFO796 - Intro to Biomed Info Research, 3 credits, Fall, G	MD	Currently teaching these courses combined, MD background
Zechen Chong (FT)	INFO 701 Introduction to Bioinformatics, 3 credits, Fall, G	PhD	Bioinformatics expert
Jake Chen (FT)	INFO 703 - Biological Data Management, 3 credits, Spring, G INFO 793 - Bioinformatics Journal Club, 2 credits, Fall, G	PhD	Bioinformatics expert
Jin Chen (FT)	INFO 704 Next-generation Sequencing Data Analysis, 3 credits, Spring, G	PhD	Bio/clinical informatics background
Akanksha Singh (FT)	HI 611 – Introduction to Health Informatics and health care Delivery (3G) HI 658 – Development of User Centered Health Information Systems (3G)	PhD	Engineering background Sociotechnical expert
Ben Ozaydin, FT	HI 642 - Advanced Data Management and Analytics for Healthcare, 3 credits, G HI 613 - Analysis and Design of Health Information Systems, 3 credits, G	PhD	Engineering background Conducts extensive research in this area

Alabama Commission on Higher Education

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Current Faculty

1	2	3	4
CURRENT FACULTY NAME (FT, PT)	**COURSES TAUGHT including Term, Course Number, Course Title, & Credit Hours (D, UN, UT, G, DU)**	**ACADEMIC DEGREES and COURSEWORK Relevant to Courses Taught, including Institution and Major; List Specific Graduate Coursework, if needed**	**OTHER QUALIFICATIONS and COMMENTS Related to Courses Taught and Modality(ies) (IP, OL, HY, OCIS)**
Abdulaziz Ahmed, FT	Fall HI 641 - Healthcare Data Analytics Challenges, Methods, and Tools, 3 credits, G Spring HI 646-Advanced Quantitative Methods for Health Informatics, 3 credits, G	PhD	Currently teaching similar content courses in the MSHI program
Alexander Rosenberg, FT	INFO 710 - Programming with Biological Data, 3 credits, G	PhD	Currently teaching this course
John Osborne, FT	INFO 762 - Biomedical Applications of Natural Language Processing, 3 credits, G	PhD	Currently teaching this course
James Cimino	INFO 773 Clinical Informatics Journal Club, 2 credits, Spring & Fall, G	MD	Currently teaching this course
Tiago Colicchio	INFO797 - Biomed Informatics Methods, 3 credits, Spring, G	PhD	Currently teaching this course

Additional Faculty (To Be Hired)

1	2	3	4
FACULTY POSITION (FT, PT)	**COURSES TO BE TAUGHT including Term, Course Number, Course Title, & Credit Hours (D, UN, UT, G, DU)**	**ACADEMIC DEGREES and COURSEWORK Relevant to Courses Taught, including Institution and Major; List Specific Graduate Coursework, if needed**	**OTHER QUALIFICATIONS and COMMENTS Related to Courses Taught and Modality(ies) (IP, OL, HY, OCIS)**
New faculty	Clinical Operations and Decision-Making, 3 credits	PhD	We are currently in negotiations with a new faculty member
New Faculty	Learning/Knowledge Health Systems, 3 credits	PhD	We are currently in negotiations with a new faculty member
New Faculty	Statistical Learning Models, 3 credits	PhD	We are currently in negotiations with a new faculty member

Abbreviations: (FT, PT): Full-Time, Part-Time; (D, UN, UT, G, DU): Developmental, Undergraduate Nontransferable, Undergraduate Transferable, Graduate, Dual: High School Dual Enrollment
Course Modality: (IP, OL, HY, OCIS): In-Person, Online, Hybrid, Off-Campus Instructional Site
Courses Taught/To be Taught – For a substantive change prospectus/application, list the courses *to be taught*, not historical teaching assignments.

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B. All Proposed Program Personnel

Provide all personnel counts for the proposed program.

Employment Status of Program Personnel		Personnel Information		
		Count from Proposed Program Department	Count from Other Departments	Subtotal of Personnel
Current	Full-Time Faculty			
	Part-Time Faculty			
	Administration	0.5		
	Support Staff	0.5		
**New To Be Hired	Full-Time Faculty	3		
	Part-Time Faculty			
	Administration			
	Support Staff			
		Personnel Total		4

Note: **Any new funds designated for compensation costs (Faculty (FT/PT), Administration, and/or Support Staff to be Hired) **should be included** in the **New Academic Degree Program Business Plan Excel file**. Current personnel salary/benefits (Faculty (FT/PT), Administration, and/or Support Staff) **should not be included** in the **Business Plan**.

Provide justification that the institution has proposed a sufficient number of faculty (full-time and part-time) for the proposed program to ensure curriculum and program quality, integrity, and review.

C. Equipment

Will any special equipment be needed specifically for this program? **Yes ☐ No ☒**
If *yes*, list the special equipment. Special equipment cost should be included in the **New Academic Degree Program Business Plan Excel file.**

D. Facilities

Will any new facilities be required specifically for the program? **Yes ☐ No ☒**

If *yes*, list only **new** facilities. New facilities cost should be included in the **New Academic Degree Program Business Plan Excel file.**

Will any renovations to any existing infrastructure be required specifically for the program? **Yes ☐ No ☒**

If *yes*, list the renovations. Renovation costs should be included in the **New Academic Degree Program Business Plan Excel file.**

E. Assistantships/Fellowships

Will the institution offer any assistantships specifically for this program? **Yes** ☐ **No** ☒

If *yes*, how many assistantships will be offered?

The expenses associated with any *new* assistantships should be included in the **New Academic Degree Program Business Plan Excel file.**

F. Library

Provide a brief summarization (one to two paragraphs) describing the current status of the library collections supporting the proposed program.

The UAB Libraries offer sufficient resources, staffing, and services to support the grant writing and submission process. Notable among these are:

(i) The Lister Hill Library of the Health Sciences: Established in 1945 to support the University of Alabama School of Medicine, the Lister Hill Library is the largest biomedical library in Alabama and served as a Resource Library for the Southeast/Atlantic Region in the Network of the National Library of Medicine (NNLM). It is the main health sciences library on the UAB campus, supporting graduate and professional programs in the health sciences. The UAB Libraries have an active library liaison program supporting all academic and health science units on campus. The program plays a pivotal role in fostering effective communication between the UAB Libraries and their user communities. Liaison librarians in the Lister Hill Library Department of Clinical, Academic, & Research Engagement are assigned liaison responsibilities for the UAB Schools of Dentistry, Health Professions, Nursing, Medicine, Optometry, and Public Health. Liaison librarians can assist with systematic reviews and in-depth expert searches. Additionally, the Lister Hill Library has a Systematic Review Coordinator to coordinate all systematic review requests.

(ii) The Mervyn H. Sterne Library: The Sterne Library was officially opened in 1973, four years after UAB was established, and its collections support teaching and research in the arts and humanities, business, education, engineering, natural sciences, mathematics, and the social sciences. Librarians in the Sterne Library Department of Research & Learning are assigned liaison responsibilities for the UAB Schools of Business, Education, and Engineering, and the College of Arts & Sciences.

(iii) Office of Scholarly Communication. The UAB Libraries' Office of Scholarly Communication (OSC) was established in 2021 to support the UAB community in navigating and understanding scholarly communication principles including copyright and fair use, author agreements, research data management, scholarly impact, and public access to scholarly works. Services provided by the OSC include on-demand consultations and workshops on scholarly communication topics and assistance selecting journals and identifying open access funding sources. The OSC also provides extensive Research Data Management support such as data interviews, Data Management Plan review, and data repository selection.

(iv) Resources: The UAB Libraries provide access to 645 databases through its web site. These databases support all areas of UAB teaching, research, and scholarship, on both the academic and medical sides of campus. All databases are available 24/7 and are available from both on and off-campus. They include databases such as Embase, PubMed, SCOPUS, and Web of Science from hundreds of library vendors including Elsevier, Wiley, Proquest, Springer, Wolters Kluwer, and EBSCO. Specialized databases from smaller vendors such as

VisualDX, Clarivate, Thieme, and JoVe are also available. The UAB Libraries' collection includes more than 2 million titles, including more than 900,000 physical books and nearly 850,000 electronic books. The number of print journals totals more than 25,000, while the number of electronic journals totals more than 105,000. The UAB Libraries also hold nearly 125,000 microform titles.

Will additional library resources be required to support the program?   **Yes ☐ No ☒**

If *yes*, briefly describe how any deficiencies will be remedied, and include the cost in the **New Academic Degree Program Business Plan Excel file.**

G. Accreditation Expenses

Will the proposed program require accreditation expenses?   **Yes ☐ No ☒**

If *yes*, briefly describe the estimated cost and funding source(s) and include cost in the **New Academic Degree Program Business Plan Excel file.**

H. Other Costs

Please explain any other costs to be incurred with program implementation, such as marketing or recruitment costs. Be sure to note these in the **New Academic Degree Program Business Plan Excel file.**

I.   Revenues for Program Support

Will the proposed program require budget reallocation?   **Yes ☒ No ☐**

If *yes*, briefly describe how any deficiencies will be remedied and include the revenue in the **New Academic Degree Program Business Plan Excel file.**

Administration (0.5 FTE) and support staff (0.5 FTE) are required to support this new program. Regarding full-time students, we expect to admit 3 students in Year 2, 4 students in Year 3, and 5 students each year in Year 5-7. Regarding part-time students, we expect to admit 3 students each year in Year 5-7. The tuition will be used to cover administration (0.5 FTE) and support staff (0.5 FTE). We anticipate 1 student will graduate in Year 5 and 3 students in Year 6 and Year 7.

Will the proposed program require external funding (*e.g.*, Perkins, Foundation, Federal Grants, Sponsored Research, etc.)?   **Yes ☐ No ☒**

If *yes*, list the sources of external funding and include the revenue in the **New Academic Degree Program Business Plan Excel file.**

Please describe how you calculated the tuition revenue that appears in the **New Academic Degree Program Business Plan Excel file.** Specifically, did you calculate using cost per credit hour or per term? Did you factor in differences between resident and non-resident tuition rates?

According to https://www.uab.edu/cost-aid/cost/detailed-tuition-fees, for an in-state PhD student at Graduate School, the yearly tuition is $8,464, and for an out-of-state student, the yearly

tuition is $20,556. We use the average yearly tuition fee of in-state and out-of-state ($10,282) to calculate the tuition revenue.

New Academic Degree Program Summary/Business Plan

Use the Excel form from ACHE's Academic Program webpage located at https://www.ache.edu/index.php/forms/, named **New Academic Degree Program Business Plan**, to complete the New Academic Program Degree Proposal.

Instructions and definitions are provided in the Excel file. **The New Academic Degree Program Business Plan should be uploaded as an Excel file (.xlsx) in the Academic Program Review (APR) Portal.**

Steps for Submitting the New Academic Degree Proposal

1. Complete the **New Academic Degree Proposal** document.

2. Attach the letters of support from external entities listed in *Section I.D.* at the end of the **New Academic Degree Proposal** document.

3. Save the **New Academic Degree Proposal** document as a **.pdf file**.

4. Complete the **New Academic Degree Program Business Plan** and save as an **.xlsx file.**

5. Login to the Academic Program Review (APR) Portal at apr.ache.edu using your ACHE-provided login information. If you are not a designated user for your institution, contact your designated user.

6. Provide responses to questions in the APR Portal.

7. Upload the **New Academic Degree Proposal .pdf file** in the APR Portal.

8. Upload the **New Academic Degree Program Business Plan .xlsx file** in the APR Portal.

9. Click to "Validate" the proposal and then address any issues with your submission.

10. Once validation is clear, click "Review" to check your responses before submitting. If all looks good, click "Submit" at the bottom of the review screen.

11. The system will then prompt you to "Lock" the submission. Your proposal is considered submitted only once it has been locked within the APR Portal.

NOTE: Proposals that have not been locked by the deadline will not be reviewed for consideration of inclusion on the next Commission agenda.

ACADEMIC DEGREE PROGRAM PROPOSAL SUMMARY

INSTITUTION:	University of Alabama at Birmingham		
PROGRAM NAME:	PhD in Biomedical and health Informatics	CIP CODE:	51.2706
SELECT LEVEL:	GRADUATE (DOCTORATE)		

ESTIMATED *NEW* EXPENSES TO IMPLEMENT PROPOSED PROGRAM

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	TOTAL	
FACULTY								$0	
ADMINISTRATION/STAFF	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$700,000	
EQUIPMENT								$0	
FACILITIES								$0	
ASSISTANTSHIPS/FELLOWSHIPS								$0	
LIBRARY								$0	
ACCREDITATION AND OTHER COSTS	$0	$0	$0	$0	$0	$0	$0	$0	
TOTAL EXPENSES	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$700,000	V1

Note: Total expenses for each category (Cells I7:I13) should correspond to the narrative description given under *Program Resource Requirements* in the New Program Proposal.

NEW REVENUES AVAILABLE FOR PROGRAM SUPPORT

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	TOTAL	
REALLOCATIONS	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$350,000	
EXTERNAL FUNDING	$0	$0	$0	$0	$0	$0	$0	$0	
TUITION + FEES	$0	$20,564	$41,128	$61,692	$92,538	$102,820	$102,820	$421,562	
TOTAL REVENUES	$50,000	$70,564	$91,128	$111,692	$142,538	$152,820	$152,820	$771,562	V1

Note: Tuition + Fees (Cells B19:H19) should equal estimated tuition and fees per student multiplied by Total Enrollment Headcount (Cells C26:H26).

Validation 1: Total Revenues (Cell I20) exceed or match Total Expenses (Cell I14). — **YES**

ENROLLMENT PROJECTIONS
Note: "New Enrollment Headcount" is defined as unduplicated counts across years.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	AVERAGE	
FULL-TIME ENROLLMENT HEADCOUNT		2	4	6	8	8	8	6.00	
PART-TIME ENROLLMENT HEADCOUNT	No data reporting	0	0	0	1	2	2	0.83	
TOTAL ENROLLMENT HEADCOUNT		2	4	6	9	10	10	6.83	
NEW ENROLLMENT HEADCOUNT		2	2	3	3	4	4	3.00	V2
Validation of Enrollment			YES	YES	YES	YES	YES		V3

Validation 2: New Enrollment Headcount average (Cell I27) must be greater than or equal to the Minimum Viability Requirement (see chart below). — **MET**

Validation 3: Total Enrollment Headcount for Years 3 thru 7 (Cells D26:H26) must be less than or equal to (<=) previous year **Total Enrollment Headcount** minus (-) previous year **Degree Completion Projection** plus (+) current year **New Enrollment Headcount**. To be **validated**, Years 3 thru 7 (Cells D28:H28) must all be "YES".

DEGREE COMPLETION PROJECTIONS
Note: Do not count Lead "0"s and Lead 0 years in computing the average annual degree completions.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	AVERAGE	
DEGREE COMPLETION PROJECTIONS	No data reporting	0	0	0	1	3	3	2.33	V4

Validation 4: Degree Completion Projections average (Cell I32) must meet viability standard for this degree level. — **MET**

*New entails additional expenses or revenues associated with program implementation. Please include any planning or start-up expenses within Year 1 (even if these were incurred in Year 0 or prior). Do not include expenses or revenues already budgeted for a department or instructional unit prior to the development of this specific program. For instance, if new faculty will be hired to teach in this program, salary/benefits should be included for each year following hire, but salary/benefits for existing faculty would not be included.

Minimum Viability Requirements
established in ACHE Administrative Code §300-2-1-.04,
based on §16-5-8(2), Code of Alabama, 1975

Degree Level	New Enrollment	Degree Completions
Certificate	9.4	7.5
Associate	9.4	7.5
Bachelor's	9.4	7.5
Master's	4.7	3.75
Specialist	3.75	3
Doctorate	2.8	2.25

Board Rule 502
New Program Proposal Supplement

In addition to the items ACHE has requested for program proposals, please include the following additional items when developing and submitting academic program proposals to the System Office and the Board of Trustees for approval.

1. Institution:

- UAB

2. Program Identification

Program Name:	Biomedical and Health Informatics
Degree Nomenclature:	Ph.D.
Date of NPP Submission:	6/17/24

CIPC. 3. CIP Code

2-digit CIP Code:	51 HEALTH PROFESSIONS AND RELATED PROGRAMS
4-digit CIP Code:	51 HEALTH PROFESSIONS AND RELATED PROGRAMS ~ 51.27 Medical Illustration and Informatics
6-digit CIP Code:	51 HEALTH PROFESSIONS AND RELATED PROGRAMS ~ 51.27 Medical Illustration and Informatics ~ 51.2706 Medical Informatics

4. Executive Summary (not to exceed two pages)

The PhD in Biomedical and Health Informatics (BHI-PhD) is a new PhD program led by the Department of Biomedical Informatics and Data Science in the School of Medicine at the University of Alabama at Birmingham (UAB). BHI-PhD will be the first and only Biomedical and Health Informatics PhD program in the state of Alabama. This program will leverage existing strengths and

coursework from the Department of Biomedical Informatics and Data Science, the Department of Health Services Administration, and the Marnix E. Heersink Institute for Biomedical Innovation.

The overall objective of PHI-PhD is to graduate students who can bridge the gap between advanced computational techniques, biomedical sciences, and health system science, developing interdisciplinary research to innovate and drive progress in improving human health. These graduates are expected to be capable of designing and implementing novel data- and science driven solutions and capable, real-world information infrastructure, conducting rigorous research, and contributing significantly to the understanding of complex biological systems and health-related challenges with the goal of advancing healthcare and patient outcomes. Additionally, they should be capable of navigating the ethical, legal, and social implications of informatics and AI theories, methodologies, and technologies, ensuring responsible and beneficial use of technology across the life sciences and health ecosystem.

Biomedical and Health Informatics is an interdisciplinary field that blends elements from computer science, statistics, clinical, and bioinformatics. The goal of the program is to prepare individuals for the development and application of informatics theories and tools to solve problems across the life sciences and health ecosystem. It emphasizes analyzing and interpreting complex data and developing and disseminating solutions, infrastructure, and algorithms to address human health and disease problems. It serves to distill, refine, and consolidate knowledge in life sciences and health.

BHI-PhD is designed as a core-track model where all students will take the same set of core courses, providing a solid and broad foundation of PhD level analytics knowledge and skills as well as information, biological, and health system knowledge. Students will then select a track within which they will deepen their knowledge and skills. BHI-PhD will include three tracks: translational bioinformatics, clinical and health informatics, and AI in medicine. To ensure the transdisciplinarity of the degree, students will choose one of the tracks as their academic paths. Additionally, students will be encouraged to take a variety of elective courses that are offered by other programs at UAB, where the knowledge and skills from such electives will support and extend the knowledge and skills acquired from the core and track courses in BHI-PhD.

5. Steps taken to determine if other UA System institutions might be interested in collaborating in the program.

We have established long-standing internal collaborations. Opportunities for partnership with other University of Alabama System Institutions will be considered. The following steps will be taken.

1. Explore the strengths and focus areas of other UA System institutions that align with the BHI PhD program's goals.

2. Initiate informal discussions with potential contacts at other institutions. Discuss with the potential partners to assess their interest in various types of collaboration.

3. Based on the discussions, develop a detailed proposal outlining potential collaboration areas, objectives, expected outcomes, and benefits for all parties involved.

4. Organize meetings with key stakeholders from both UAB and the potential partner institutions to discuss the proposal.

5. Plan specific collaborative activities such as joint research initiatives, guest lectures, shared seminars, and co-authored publications. Publicize the collaboration through various channels to enhance visibility.

6. Summary of other campus comments, internal to the UA System or external (if any), regarding your plans for developing this program. Please include substantive feedback from the pre-proposal process.

During the NPP review, we were advised to engage with librarians and related program leaders to seek their support. Following this advice, we obtained support letters from librarians, Genetics, Genomics, & Bioinformatics (GGB), Graduate Biomedical Sciences (GBS), Biomedical Engineering (BME), Computer Science (CS), and Health Informatics (HI).

7. Describe the process that will be used by your institution for routine internal and/or external program review.

The Ph.D. in Biomedical and Health Care Informatics will submit UAB Institutional Assessment Reports annually beginning in 2028. These reports measure success in student learning outcomes. A Post Implementation Report will be submitted to ACHE upon completion of the sixth year of the program implementation. This report is shared with the UAB Provost and the UAS Board of Trustees.

8. Describe the process that will be used in assessing program outcomes (to include student learning outcomes).

UAB Institutional Assessment systems requires all academic programs to submit at data, data analysis, and actions plans for at least two student learning outcomes annually in October. These plans are reviewed by the Institutional Assessment Committee and revised to ensure continuous quality improvement.

9. Other pertinent information, if any.

N/A

10. Please provide your contact information.

Contact person:	Dr. Katrina Mintz
Telephone:	205-934-2753
Email:	kmintz@uab.edu

Board Rule 502
Notice of Pending Proposal (NPP) for a New Program of Instruction
(To be completed by the Provost's Office)

1. Institution
(Please select more than one institution for cooperative, joint, and shared degree programs.)

- UAB

2. Date of NPP Submission (mm/dd/yyyy):
06/17/2024

Contact. 3. Contact Information

Institutional Contact Person:	Katrina Mintz
Telephone:	256-557-0568
Email:	kmintz@uab.edu

program. 4. Program Identification

Program Name:	Biomedical and Health Informatics
Degree Nomenclature:	Ph.D.

5. CIP Code

2-digit CIP Code:	51 HEALTH PROFESSIONS AND RELATED PROGRAMS
4-digit CIP Code:	51 HEALTH PROFESSIONS AND RELATED PROGRAMS ~ 51.27 Medical Illustration and Informatics
6-digit CIP Code:	51 HEALTH PROFESSIONS AND RELATED PROGRAMS ~ 51.27 Medical Illustration and Informatics ~ 51.2706 Medical Informatics

6. Program Mode of Delivery
Provide the planned delivery format(s) (i.e., in-person, online, hybrid) of the

program along with the planned location(s) at which the program will be delivered (i.e., on-campus and/or at specific off-campus instructional site(s)). Please also note whether any program requirements can be completed through competency-based assessment.

- In-person
- Online

7. Select a meeting for Board consideration:

- November 7-8, 2024

8. Is the proposed academic degree program currently listed on your campus Three-Year Academic Program Planning Report that is annually submitted to the Board of Trustees?

- Yes

9. Provide a brief description of the program.

The goal is to prepare individuals for the development and application of informatics theories and tools to solve problems across the life sciences and health ecosystem. This interdisciplinary field blends elements from computer science, statistics, clinical, and bioinformatics. It emphasizes analyzing and interpreting complex data and developing and disseminating solutions, infrastructure, and algorithms to address human health and disease problems. It serves to distill, refine, and consolidate knowledge in life sciences and health.

The overall objective is to graduate students who can bridge the gap between advanced computational techniques, biomedical sciences, and health system science, developing interdisciplinary research to innovate and drive progress in improving human health. These graduates are expected to be capable of designing and implementing novel data- and science-driven solutions and capable, real-world information infrastructure, conducting rigorous research, and contributing significantly to the understanding of complex biological systems and health-related challenges with the goal of advancing healthcare and patient outcomes. Additionally, they should be capable of navigating the ethical, legal, and social implications of informatics and AI theories, methodologies, and technologies, ensuring responsible and beneficial use of technology across the life sciences and health ecosystem.

Students who complete the BHI-PhD will be able to demonstrate strength in the following areas:

- Informatics Research and Application: The program is dedicated to research in biomedical and health informatics, focusing on the management, analysis, and interpretation of biological and clinical data and the development and application of novel methodologies to create new knowledge. The program places a strong emphasis on the development of innovative computational algorithms specific to biomedical and healthcare challenges.
- Real-world Applications and Practice: The program extends to the application of knowledge, AI algorithms, and informatics solutions to address tangible challenges in healthcare and biological research in diverse professional settings.
- Harmonization, Mining, and Modeling of Interdisciplinary Data: The program is inherently interdisciplinary, integrating knowledge, methods, and tools from statistics, biology, medicine, AI, and health informatics. Interdisciplinary data harmonization, mining and modeling, and interpretation are crucial aspects for advancing research that helps to answer complex biomedical and healthcare questions.
- Team Science and Social Implications: Students will be expected to engage in collaborative research projects that span multiple disciplines, promoting comprehensive problem-solving across the healthcare ecosystem.

10. Relationship of program to other programs within the institution.

10.1. How will the program support or be supported by other programs within the institution?

The Ph.D. in Biomedical and Health Informatics has been developed in coordination with other programs at UAB. We discuss each of the main areas of collaboration here:

The School of Health Professions offers a Masters of Science in Health Informatics and has submitted a proposal for a Masters of Science in AI for Health Services. Courses within these programs are appropriate for the Clinical and Health Informatics track of this proposed Ph.D. in Biomedical and Health Informatics program and will be integrated. The proposed program also has some relation and overlap to the Ph.D. in the Health Services Administration department (PhD-Administration-Health Services).

In terms of the relation and overlap, some of the core knowledge and skills are similar, as they would be for many PhD level programs. More simply stated, there are a set of knowledge and skills that we expect PhDs to have when they graduate, such as research methods, for example. While graduates from both programs will conduct data intensive research, it is the application of those knowledge and skills that sets the two programs apart. For example, graduates in the PhD-Administration-Health Services historically conduct research focusing on questions and techniques relevant to the applied use of a broad variety of innovations within health care delivery organizations, including a broader understanding of how health systems work and responses to internal and external forces; whereas graduates in the Ph.D. in Biomedical and Health Informatics will be more focused on the application of knowledge and skills to answer questions around bioinformatics, AI, and clinical and health informatics, such as those centered around genomics, the use of AI in new knowledge discovery, and how those concepts impact clinical care. Another area where the two programs differ is in the types of students recruited. Students in the HSA-PhD program historically come from public health or health administration backgrounds, whereas we expect Ph.D. Biomedical and Health Informatics students to come from computer science, bioinformatics, and engineering backgrounds.

The School of Engineering offers a PhD degree in Biomedical Engineering, and one of its tracks is bioinformatics. The courses would be essential to provide key concepts and advanced training in developing bioinformatics algorithms and tools. We will collaborate with the School of Engineering and the Department of Biomedical Engineering to offer these as curriculum electives.

The School of Medicine offers the Graduate Biomedical Science (GBS) Doctoral Program. In the program, the Genetics, Genomics & Bioinformatics (GGB) theme provides flexible, didactic, and integrated interdisciplinary training opportunities across the broad disciplines of genetics, genomics, and bioinformatics. GGB training incorporates hands-on experience in state-of-the-art molecular techniques to study gene structure, expression, and function in diverse experimental systems. The theme fosters collaborations between graduate students, postdoctoral fellows, and faculty during the PhD training period while encouraging participation in the community of biological scientists at UAB and Hudson Alpha Institute of Biotechnology. We will work with the School of Medicine to include the GGB courses as electives for Ph.D. in Biomedical and Health Informatics students.

The College of Arts and Sciences Department of Computer Science offers PhD in Computer Science that prepares students for a professional

career in the field of machine learning and data science. In this program, students are equipped with fundamental knowledge and skills in AI, machine learning, data science, etc. This program is domain agnostic, while the proposed Ph.D. in Biomedical and Health Informatics focuses on the domain of biomedical informatics. We will work with the department to include their course offerings as electives in the proposed Ph.D. in Biomedical and Health Informatics.

Summary: There is a growing demand for graduate education that is focused on biomedical and health informatics research and application across the greater healthcare ecosystem. It is recognized that singularly focused programs lack inclusivity of diverse knowledge and skills applications within the broader healthcare ecosystem. We are specifically planning for this degree to build upon and leverage the strengths of the current HSA (current and proposed), BME, GGB, and CS PhD programs and the strengths of diverse knowledge and skills across UAB, especially in the application of biomedical and health informatics to solve real-world problems in real-world settings.

10.2. Will this program replace any existing program(s) or specialization(s), option(s) or concentration(s) within existing programs?

- No

11. If this program is similar or duplicative of any other programs in the system or the state, please give your rationale for program duplication.

The program is not similar or duplicative of any other programs in the system or the state. There are three degrees in Alabama that fall under this CIP code. Two of those are here at UAB and the third is a B.S. in Health Informatics at the University of South Alabama.

12. Do you plan to explore possible program collaboration with other institutions? Please explain.

We have long-standing internal collaborations established and opportunities for partnerships with other University of Alabama System Institutions will be considered.

Please describe the need and/or level of student demand for this program.

Through bioinformatics and clinical informatics conferences nationally and internationally and anecdotally with our current bioinformatics and health informatics students, we are already aware of the demand for this program. For example, there are currently five graduates from our Master of Science program in the School of Health Professions who have gone on to PhD programs at other schools because UAB did not offer an appropriate Biomedical and Health Informatics PhD program. Equally as relevant is the recent surge in the application of AI across the multitude of biomedical and health environments in the healthcare ecosystem. As an industry leader in education and the application of learning, UAB finds itself responsive to industry and carving a path as a leader in educational offerings.

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Resolution

Granting Initial Approval of and Permission to Submit to the Alabama Commission on Higher Education (ACHE) a Proposal for a Doctor of Philosophy (Ph.D.) Degree in Biomedical and Health Informatics (CIP Code 51.2706)

WHEREAS, the interdisciplinary field of Biomedical and Health Informatics is rapidly growing, combining elements of computer science, statistics, bioinformatics, and healthcare, to address complex problems in life sciences and health systems; and

WHEREAS, there is a critical need for highly trained individuals who can develop and apply advanced computational, informatics, and analytical methods to solve challenges in biomedical science and healthcare, advancing human health outcomes; and

WHEREAS, The University of Alabama at Birmingham (UAB) has demonstrated excellence in biomedical informatics and data science through the Department of Biomedical Informatics and Data Science, and is well-positioned to lead innovative education in this field; and

WHEREAS, the proposed Doctor of Philosophy (Ph.D.) degree in Biomedical and Health Informatics (BHI-PhD) will be the first of its kind in the state of Alabama, enhancing UAB's leadership in health and informatics; and

WHEREAS, the BHI-PhD program aligns with UAB's mission to advance research, education, and clinical innovation in the health sciences, and will support collaboration with existing programs such as Biomedical Engineering, Genetics, Genomics & Bioinformatics, Graduate Biomedical Sciences, Computer Science, and Health Informatics;

NOW, THEREFORE, BE IT RESOLVED by The Board of Trustees of The University of Alabama that it approves granting approval of and submission to the Alabama Commission on Higher Education (ACHE) of a proposal for a Doctor of Philosophy (Ph.D.) degree in Biomedical and Health Informatics (BHI-PhD) (CIP Code 51.2706) program, housed within the Department of Biomedical Informatics and Data Science in The University of Alabama at Birmingham Marnix E. Heersink School of Medicine.

RAY L. WATTS, M.D.
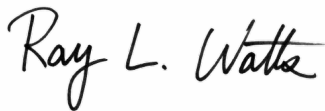President

September 18, 2024

Interim Chancellor Sid J. Trant
The University of Alabama System
500 University Boulevard East
Tuscaloosa, AL 35401

Dear Interim Chancellor Trant:

The Heersink School of Medicine at UAB proposes to establish a Ph.D. in Biomedical and Health Informatics. The Department of Biomedical Informatics and Data Science in the UAB Heersink School of Medicine will coordinate this graduate certificate. The program aims to graduate students who can effectively bridge advanced computational techniques, biomedical sciences, and health system science. These graduates will engage in interdisciplinary research to innovate and drive progress in human health. They will be equipped to design and implement novel, data-driven solutions and develop robust information infrastructures. Additionally, they will conduct rigorous research, enhancing our understanding of complex biological systems and health challenges, ultimately advancing healthcare and improving patient outcomes.

The proposal has been thoroughly reviewed here at UAB and has my full support. If you approve, please include this item on the Board's agenda for its November 8, 2024 meeting and then forward it to the Alabama Commission on Higher Education. If additional information is needed, we will be pleased to provide it.

Sincerely,

Ray L. Watts, M.D.
President

RLW:khm

Attachments

cc: Dr. Janet Woodruff-Borden
        Dean Anupam Agarwal
        Mrs. Kirsten Burdick
        Dr. Tonja Johnson

OFFICE OF THE PRESIDENT

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September 18, 2024

MEMORANDUM

TO: Ray Watts, M.D.
              President

FROM: Janet Woodruff-Borden, Ph.D.
              Senior Vice President for Academic Affairs and Provost

SUBJECT: Academic Affairs Items for November 8, 2024, Board of Trustees Meeting

For the November 8, 2024, Board of Trustees meeting, we are submitting the following Academic Affairs items from the following UAB Deans:

Maria Shirey, Dean of the School of Nursing
- Establishment of a Clinical Research Management (CRM) Concentration within the existing MSN

Andrew Butler, Dean of the School of Health Professions
- Graduate Certificate in Dissemination and Implementation Science in Health Care

Teresa Taber-Doughty, Dean of the School of Education
- 15-hour Undergraduate Certificate in eSports Performance and Coaching in Kinesiology
- Bachelor of Science in eSports Management and Coaching

Kecia Thomas, Dean of the College of Arts and Sciences
- 15-hour Graduate Certificate in Cultural Resource Management for Archaeology
- Data-Driven Modeling and Tech Concentration in the current Bachelor of Science in Physics
- Undergraduate Certificate in Data-Driven Modeling

Anupam Agarwal, Dean of the Heersink School of Medicine
- Ph.D. Biomedical Informatics

These requests have my full endorsement for submission to the Board of Trustees for review and approval at their November 8, 2024, meeting. Please let me know if you have any questions.

JWB/khm

Janet Woodruff-Borden, Ph.D.
Senior Vice President for Academic Affairs and Provost

5/13/2024

James J. Cimino, MD, FACMI, FACP, FNYAM, FAMIA, FIAHSI
Distinguished Professor and Chair, Department of Biomedical Informatics and Data Science
Heersink School of Medicine | The University of Alabama at Birmingham
Tinsley Harrison Tower, Suite 142 | 1900 University Boulevard | Birmingham AL, 35294

Dear Dr. James Cimino,

The Department of Computer Science agrees to offer students from the proposed Biomedical and Health Informatics PhD program seats in the following courses if and when such seats are available:

- CS 716 Big Data Programming
- CS 760 Artificial Intelligence
- CS 763 Data Mining
- CS 765 Deep Learning
- CS 767 Machine Learning
- CS 773 Computer Vision and Convolutional Neural Networks

The schedule for offering these courses is entirely at the discretion of the Department of Computer Science.

Yours sincerely,

Yuliang Zheng, PhD
Professor & Chair of Department of Computer Science
University of Alabama at Birmingham

05/11/2024

Dear Dr. Chen.

I am writing to express my support for your proposed PhD program in Biomedical and Health Informatics (BHI) on behalf of the Genetics, Genomics, and Bioinformatics (GGB) theme of the Graduate Biomedical Sciences (GBS) Doctoral Training Program. The establishment of the Department of Biomedical Informatics and Data Science in the UAB School of Medicine (SOM) presents a timely opportunity to launch this program.

The BHI interdisciplinary PhD program incorporates elements of computer science, statistics, clinical medicine, healthcare, and bioinformatics, focusing on the creation and dissemination of solutions, infrastructure, and algorithms to tackle human health and disease issues. It will clearly equip UAB graduate students with the skills needed to develop and apply informatics theories and methods to address challenges throughout the health and life sciences sectors.

Whilst, as discussed, there is some overlap with GGB around development and application of Bioinformatics tools and methods, the BHI program is distinct and emphasizes a data science first core curriculum spanning clinical and translational informatics and bioinformatics, focused on biomedical research and healthcare. The GBS curriculum has more biologically focused requirements and lacks the space for specialized courses in clinical informatics and artificial intelligence. Because of these synergies, I see significant benefit in having both courses be available and great potential for students from the GBS and BHI programs to benefit from electives offered by the other. I view the presence of the two courses together as a strength that enhances all of our educational objectives.

As such, I believe that the curriculum you have and will continue to develop will be of great interest across UAB SOM Departments, Institutes, and faculty labs. To that end, I very much appreciate your assurances that the BHI program will support cross-disciplinary mentorship allowing faculty members from other departments within UAB to serve as mentors for the students enrolled in the BHI-PHD program. This will ensure that access to these critical skills will be widely available.

In summary, I am enthusiastic about the prospects of your program and look forward to continued collaboration, particularly around the inclusion of courses from your program that would provide valuable elective options for our GBS students.

Yours Sincerely,

Liz Worthey, PhD
Director GGB theme, UAB GBS

April 11, 2024

Jim Cimino
Biomedical Informatics and Data Science
1720 2nd Avenue South, THT 142
Birmingham, AL 35294

Dr. Cimino:

It is with great enthusiasm that the Department of Health Services Administration in the School of Health Professions supports the PhD in Biomedical and Health Informatics. We have been collaborating with the Department of Biomedical and Data Science since the inception of this PhD and envision many synergies with our current PhD in Health Administration and even with our Master of Science in Health Informatics. We commit to contributing curricular content and faculty for teaching, advising, and as appropriate, GRA support.

Sincerely,

Jane Catherine Banaszak-Holl, PhD
Chair and Professor
Department of Health Services Administration

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April 15, 2024

To:
Sandeep Bodduluri, MS, PhD
Director of AI Programs
Marnix E. Heersink Institute for Biomedical Innovation
University of Alabama at Birmingham

Letter of Support for Doctor of Philosophy (PhD) in Biomedical and Health Informatics

Dear Dr. Bodduluri,

On behalf of the Department of Biomedical Engineering (BME), we are delighted to provide this letter of support for the new Doctor of Philosophy (PhD) degree application in Biomedical and Health Informatics. In reviewing the proposal and following conversations with you and the program leadership, the proposed PhD degree in Biomedical and Health Informatics addresses a critical unmet need. Specifically, there is a demand for professionals that can unify advanced computational techniques, biomedical sciences, and health system science to innovate and progress the healthcare sector. Therefore, we feel that this is both timely and much needed.

The BME department is particularly interested in collaborating with you to provide new opportunities to BME graduates and partnering with you to develop new elective courses in the future. We do not see any overlap with our current BME degree programs or course offerings and feel that this will be an excellent addition to the graduate degree programs available at UAB.

We wish you all the best for successful approval of this new PhD degree in Biomedical and Health Informatics.

Sincerely,

Palaniappan Sethu, PhD
Professor and Program Director,
Engineering Education in Medicine,
Department of Biomedical Engineering

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