



April 12, 2021

Dr. Michael Baumgartner
Executive Director
Coordinating Commission for
Postsecondary Education
140 N. 8th Street, Suite 300
Lincoln, NE 68509

Dear Michael:

Enclosed is a copy of the proposal to establish the Center for Biomedical Informatics Research and Innovation to be jointly administered by UNMC and UNO. The proposal was approved by the Board of Regents at the April 9, 2021 meeting.

Please do not hesitate to contact me if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Susan M. Fritz".

Susan M. Fritz, PhD
Executive Vice President and Provost

Enclosure

c: Chancellor Jeffrey Gold
Senior Vice Chancellor Dele Davies, UNMC
Senior Vice Chancellor Sacha Kopp, UNO
Vice Chancellor Jennifer Larsen, UNMC
Associate Vice Chancellor Ken Bayles, UNO
Vice Provost David Jackson

TO: The Board of Regents Addendum XI-A-8

Academic Affairs Committee

MEETING DATE: April 9, 2021

SUBJECT: Establishment of the Center for Biomedical Informatics Research and Innovation to be jointly administered by the University of Nebraska Medical Center and the University of Nebraska at Omaha

RECOMMENDED ACTION: Approval to establish the Center for Biomedical Informatics Research and Innovation (CBIRI) to be jointly administered by the University of Nebraska Medical Center (UNMC) and the University of Nebraska at Omaha (UNO)

PREVIOUS ACTION: January 25, 2013 – The Board approved the joint Master of Science/PhD in Biomedical Informatics at UNO and UNMC.

April 24, 2004 – The Board approved the Bachelor of Science in Bioinformatics in the College of Arts and Science and the College of Information Science and Technology at UNO

EXPLANATION: Biomedical informatics (BMI) has become a critical part of biomedical research due to the nature of data collection, storage, curation, analysis, and inference involved. With parallel developments in computer science and high-throughput technologies in life sciences, biomedical data is being generated at a much faster pace than it can be analyzed. Sophisticated mathematical, statistical, computational, and inferential tools are often required to extract the meaning hiding within this deluge of “Big Data.” Ever-evolving technologies, techniques, and tools make it challenging to stay current. Hence, it is difficult for an individual investigator, or even one campus, to maintain cutting-edge infrastructure and technical expertise in BMI. The existing BMI resources are freestanding with discrete missions and goals and spread across UNMC and UNO. CBIRI will better align this existing infrastructure to efficiently meet BMI needs, so that these critical resources and expertise are easily accessible to all members of the biomedical research community in Nebraska and beyond.

This proposal has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

PROGRAM COST: \$0

SOURCE OF FUNDS: N/A

SPONSORS: Sacha E. Kopp
Senior Vice Chancellor for Academic Affairs

Jeffrey P. Gold, Chancellor
University of Nebraska at Omaha

RECOMMENDED:

/s/ Susan M. Fritz
Executive Vice President and Provost

DATE:

March 5, 2021



January 15, 2021

Susan Fritz, Ph.D.
Executive Vice President and Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583
smfritz@nebraska.edu

Dear Provost Fritz:

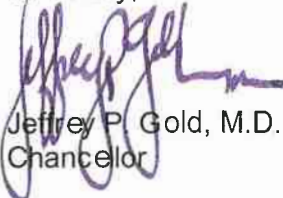
RE: Proposed Center for Biomedical Informatics Research and Innovation

I am forwarding you the materials relating to a proposed Center for Biomedical Informatics Research and Innovation to be jointly administered by UNMC and UNO.

The center will serve as a coordination and communication vehicle for biomedical informatics (BMI) educational and research activities, and resources. It is designed to build new collaborations pertinent to both academia and industry by horizontal integration of expertise, resources, and users under one umbrella organization to facilitate effective utilization of BMI resources and expertise in the realms of all types of health research.

This proposal has been reviewed and it has my approval. I am requesting your review and approval and that it be reported to the Board of Regents at an upcoming meeting.

Sincerely,



Jeffrey P. Gold, M.D.
Chancellor

Enclosure

Board of Regents Request to Approve Center for Biomedical Informatics Research and Innovation (CBIRI)

Descriptive Information

- Name of the center: Center for Biomedical Informatics Research and Innovation (CBIRI)
- Names of the affiliated programs/units:
 - Bioinformatics and Biomedical Informatics Degree programs at UNMC and UNO:
 - BS in Bioinformatics – joint degree program between College of Information Science and Technology (IS&T) and College of Arts and Sciences (CAS), UNO
 - MS in Biomedical Informatics – joint program between UNMC and UNO
 - PhD in Biomedical Informatics - joint program between UNMC and UNO
 - PhD in Bioinformatics and Systems Biology (BISB), a subplan of the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS) - BISB is a joint program between UNMC and UNO
 - Bioinformatics Computing Lab (BCL) - UNO
 - Public Health Informatics Research Lab (PHIR) - UNO
 - Bioinformatics and Systems Biology (BSB) Core - UNMC
 - Electronic Health Records Core (EHR) - UNMC
 - Clinical Informatics Group - UNMC
 - College of Arts and Sciences - UNO
- Other programs offered in this field by this institution: None
- Administrative unit for the center: Jointly administered by the Vice Chancellor for Research at UNMC and the Associate Vice Chancellor for Research at UNO.
- Physical location, if applicable: Virtually – the CBIRI web interface will be operated from the Durham Research Center at UNMC and the Peter Kiewit Institute at UNO.
- Proposed date center will be initiated: Upon approval

1. Purpose of the Center

Vision of the Center: To be recognized as a national leader in providing biomedical informatics (BMI) expertise and resources to promote and advance basic, clinical, translational, and public health research.

Mission of the Center: To serve as a coordination and communication vehicle for biomedical informatics (BMI) educational and research activities, and resources. Build new collaborations pertinent to both academia and industry by horizontal integration of expertise, resources, and users under one umbrella organization to facilitate effective utilization of BMI resources and expertise in the realms of all types of health research.

Definition: The term “biomedical informatics” is used differently in various settings. For the purpose of this Center and proposal, we define biomedical informatics as a collection of disciplines that include bioinformatics and systems biology (using biomolecular data), clinical and health informatics, and bioimaging informatics. While biostatistics and epidemiology informatics are integral to the analysis of data in public health systems informatics, they are a

part of other centers such as the Center for Collaboration on Research Design and Analysis (CCORDA). Because of this, these faculty will be included in seminars, outreach activities, and membership but will not serve as the core of this proposal.

History: Biomedical Informatics has been an integral part of basic, clinical and public health research across the University of Nebraska campuses since the 1990's. Starting the 2000's, the demand for BMI expertise and resources grew rapidly and significantly, warranting the need to establish a dedicated institutional infrastructure for BMI and affiliated academic programs. To meet this need, the VCR's office at UNMC took the initiative and established the Bioinformatics and Systems Biology Core (BSB Core) in 2010, the Electronic Health Records Core (EHR) in 2011, the Nebraska Biobank in 2012, and the Research Information Technology Office (RITO) Core in 2013. In 2012, the BSB Core currently supports hundreds of independent investigators in the Great Plains region. Development of BMI academic programs followed suit with the Regent's approval of the joint Biomedical Informatics graduate programs between UNMC and UNO in 2013 and the establishment of the MS and PhD degree programs in three different tracks: Bioinformatics, Clinical Informatics, and Health Informatics. Over the past eight years, UNMC's BSB, EHR, and RITO Cores, as well as UNO's Bioinformatics Computing lab (BCL) and Public Health Informatics Research (PHIR) lab have been supporting a number of large institutional and research grants that require significant biomedical informatics support. Awards from these projects have totaled over \$175 million (see Table 1 in the "Need and Demand of the Center" section below) in the last five years. Currently, these awards serve investigators at all four Nebraska University (NU) campuses, and over a dozen other undergraduate and research institutions in Nebraska, South Dakota, North Dakota, Kansas, and Colorado.

The UNO College of Information Science & Technology (CIST) is a national leader in bioinformatics education and was one of the first in the country to offer an undergraduate degree in bioinformatics. Today it is one of the few institutions to grant undergraduate, masters, and doctoral degrees in bioinformatics and biomedical informatics. The Bachelor of Science in Bioinformatics degree (approved by the University Board of Regents in 2004) is a joint program with the College of Arts and Science. Although the number of bioinformatics programs has grown since then, at the time of its creation, the program was one of a few. In 2013 a joint UNO and UNMC MS/PhD in Biomedical Informatics degree was approved as a multidisciplinary, interprofessional program that integrated the theory and practice of information technology management, computer science, telecommunications, decision support systems, applied computing with medical science, biological sciences, bio-imaging, and public health. The goal of this program is to develop the next generation biomedical data scientists and researchers who are uniquely positioned to advance research and practice in contemporary information and communication technologies that impact healthcare services, healthcare practice, public healthcare, and healthcare delivery in general.

In parallel, the Department of Biology at UNO has significant expertise in bioinformatics within individual research programs in virology, infectious disease biology, immunology, host-gut microbiome interactions and neurogenomics. These have served as fertile ground for the training of students in this discipline. In addition, this work has fostered the development of the Advanced Defense Education Pipeline and Training (ADEPT) program that serves as a conduit for workforce development within the government labs such as the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) and the Los Alamos National Laboratories (LANL). With funding from a NSF Major Research Infrastructure award, the Department is creating a sequencing and bioinformatics core to support research and provide more opportunities for training students. The department also

has core faculty who conduct discipline-based education research on bioinformatics pedagogy. These best practices are implemented in Course-based Undergraduate Research Experiences in lower division and upper division coursework.

Complementing the workforce development within federal government laboratories, the proposed CBIRI will further enable our relentless focus on student success by providing internships and training opportunities that expose students to the many facets of research in academia and the healthcare industry (see sections 5-7). Over the past five years, graduates of UNO's undergraduate bioinformatics program have gone on to pursue various medical and healthcare degrees, doctoral degrees, medical doctorates, or jobs in industry related to biotechnology, health, IT, and agriculture. The interdisciplinary nature of UNO promotes seamless collaboration with experts in multiple departments (i.e., Biology, Mathematics, Computer Science and Information Systems & Quantitative Analysis) as well as other NU partners. We established external partnerships with U Mass, Boys Town, Children's Hospital and Medical Center, and Creighton University. The proposed Center would provide a synergy of resources, expertise, and mentorship/networking for NU faculty and students (see section 8).

Resources available to UNO's BMI program include:

- The School of Interdisciplinary Informatics' Bioinformatics Computing lab and the Public Health Informatics Research lab.
- Access to computer scientists, information technology researchers, cybersecurity experts, and bioinformatics undergraduate and graduate students and biomedical informatics graduate students.
- Collaborative opportunities through the academic ties with UNO's longstanding history of community engagement.

These resources provide a cost-effective source of biomedical and IT expertise, a means for mentoring junior faculty, and a constant flow of multidisciplinary collaboration opportunities. The School of Interdisciplinary Informatics also provides a formal structure to recruit students and retain multidisciplinary experts.

The aforementioned developments at the infrastructure, service, and academic fronts have spurred the demand for advanced BMI expertise, diversified services, and custom resources in the areas of Bioinformatics and Health Informatics. Growth, driven by continued demand, is happening at a pace that is not sustainable by individual core facilities and research labs. For instance, the number of users and the research projects handled by the BSB Core at UNMC have more than doubled over the past five years. Because core facilities are sustained by operating in a business model (fee-for-service), an umbrella organization such as the proposed Center is needed to streamline shared resources, share expertise, and coordinate the common outreach activities that help nurture a sense of community among various units. CBIRI is expected to offer a high level of academic service to synergize and accelerate BMI research activities across the NU campuses and beyond. This can be done through the coordination of training and outreach activities, sharing personnel's expertise across units, negotiating site licenses for common software, and facilitating the exchange of information and networking activities. Several components of the proposed Center currently support a variety of extramural awards, including a series of research, cooperative agreement, project/center, and training grants across institutions within and outside of Nebraska (Table 1). The experiences and successes gained through the building of the BMI infrastructure at UNMC and UNO will be leveraged for the creation of the CBIRI. Once established, the core capabilities of CBIRI could leverage the University-Affiliated Research

Center (UARC) status of the University of Nebraska to offer biomedical informatics training and services to federal government laboratories across the country.

The goals of the Center:

- Strategically position the University of Nebraska to advance from a regional leader in biomedical informatics to a nationally recognized program by actively engaging faculty in developing and expanding unique expertise, growing faculty focused on biomedical informatics, and training students to accelerate biomedical discoveries.
- Develop and disseminate training and outreach activities, such as seminars, vendor-sponsored workshops, mini-symposiums and short non-credit courses related to biomedical informatics to enable faculty and students to collaborate with BMI experts.
- Develop a platform for sharing personnel and resources across sub-disciplines and campuses, including the acquisition and distribution of BMI data analysis software by leveraging collective bargaining and group licensing.
- Identify and develop research infrastructure that allows BMI to adapt to the rapidly changing needs of diverse disciplines.
- Increase the number and variety of services, contracts, and grants that will sustain and grow the Center in the long term. In particular, the expertise and collaborations within CBIRI will be leveraged at UNO to compete for a new COBRE grant focused on the gut microbiome.

The goals of the proposed center are aligned with the corresponding mission and strategic plans of UNMC and UNO as outlined in Section 9. The Center would be strategically positioned to meet these goals through the holistic approach of encompassing the infrastructure, service, and academic sectors of Biomedical Informatics. While the explicit focus of the proposed Center is to support the advancement of basic, clinical, and translational discoveries in the academic enterprise, the unique and specialized nature of the infrastructure and expertise is expected to attract service contracts and collaborative proposals from non-academic entities. These entities include biotech, pharma, and technology companies that have limited research and development footprint but are focused on adaptation and application of technologies.

2. Need and Demand of the Center

Biomedical informatics has become a critical part of all facets of biomedical research due to the high-throughput nature of data collection, storage, curation, analysis, and inference involved – all of which require the use of mathematical, statistical, computational, and inferential tools – to extract the meaning hiding within the deluge of data, popularly known as ‘Big Data’. A tremendous need has ensued for the development of computational infrastructure for the collection, processing, storage, and analysis of data; as well as the facilitation and use of such data by the research community. With parallel developments in computer science and high-throughput technologies in life sciences, biomedical data is being generated at a much faster pace than it can be analyzed and understood. Ever-evolving technologies and data analysis tools make it more complex and challenging to keep up with the dynamic and evolving landscape of this field. *Hence, it is hard to expect an individual investigator, or even one institution, to develop and maintain holistic and cutting-edge infrastructure and technical expertise in biomedical informatics. The existing BMI resources are freestanding with discrete missions and goals and spread across the UNMC and UNO campuses. Despite their common interests in promoting BMI education and research, they are non-aligned under one umbrella organization for effective coordination and utilization of expertise and personnel and infrastructural resources.* To address these

needs, **the primary goal of CBIRI is to make the resources, technology, tools, and expertise easily accessible to all members of the biomedical research community in Nebraska and beyond.** This Center will serve as a central hub for all BMI activities, identify gaps of expertise, help strategic recruitment of faculty across BMI domains, proactively assess and develop or procure common resources, leverage the larger user base to negotiate more affordable pricing for site licenses for BMI software, and help accelerate discoveries in all fields of human health research. Existing IT support for UNMC and UNO will serve as the backbone for technology development to support the Center, but the Center will not subsume roles currently performed by both IT organizations.

Over the past 20 years, significant progress has been made to develop the BMI infrastructure at UNO and UNMC. This has resulted in supporting a variety of extramural research projects at various NU campuses and neighboring institutions through NIH-funded INBRE, COBRE and IDeA-CTR projects. Currently, the BSB Core at UNMC also supports the analysis of next-generation sequencing datasets for the EPSCoR-supported Center for Root and Rhizobiome Innovation (CRRI) at UNL. UNL also has an active bioinformatics community that mainly operates in the domains of plant and food sciences; however, the BMI groups at UNMC and UNO have tightly intertwined educational and research activities in the BMI domains. This joint center will foster collaboration among various stakeholders, including the UNL informatics community. As shown in Table 1, **BMI's support of multiple projects has helped attract over \$175 million of extramural funding to Nebraska in the last 5 years**, and the demand continues to grow. CBIRI will support this growing need by streamlining existing and new resources and catalyzing synergistic collaborations through a shared platform.

Table 1: Funded projects in the last 5 years (2014-2019) that substantially utilize BMI expertise and resources.

Project (Funding Agency)	Year Awarded	PI(s)	Primary Institution(s)	Total Award	Institutions Served	Research domain
Multiple R01 Awards (five)	2017-19	Carlson/Roy/Mirnic/Wang/Padanilam Guda (Co-I)	UNMC	\$6,675,831	UNMC	Basic/Translational
EPSCoR/NSF	2019	Gheri, Cooper	UNO	\$194,000	UNO	Applied
PPG (NIH/NCI)	2018	Batra Guda (Co-I)	UNMC	\$8,200,000	UNMC	Basic/Translational
COBRE-Phase III (NIH/NIGMS)	2018	Bronich Guda (Co-I)	UNMC	\$5,700,000	UNMC, UNL, Creighton	Basic/Translational
NNTC-Renewal (NIH/NIMH)	2018	Fox Guda (Co-I)	UNMC	\$4,600,000	UNMC, UTMB, UCSD, UCLA, Mount Sinai Medical Center	Basic/Translational
EHR STUDY (CHILDREN's HOSP)	2018	Fruhling	UNO	\$25,000	UNO	Applied/Translational
CHAIN (NIH/NIMH)	2017	Buch/Fox Guda (Co-I)	UNMC	\$7,500,000	UNMC, UNO	Basic/Translational

Drug Devt. Pipeline (NSRI-AFRRRI)	2017	Berkowitz/ Bayles/ Guda (Co-I)	UNL/UNMC	\$1,660,000	UNL, UNMC	Translational
WSU-PPG (NIH/NIA)	2017	Bousfield Guda (Core-Lead)	WSU/UNMC	\$8,500,000	UNMC, WSU, UC Denver	Basic
NE Research Initiative (NRI)	2017	Ali Hollingsworth	UNO	\$60,000 (UNO sub-award)	UNO, UNMC	Basic/Trans.
CCSG (NIH/NCI)	2016	Cowan Guda (Core-Lead)	UNMC	\$10,500,000	Eppley Institute, UNMC	Basic/Clinical/ Translational
EPSCOR (NSF)	2016	Choobineh Guda (Co-I)	UNL	\$20,000,000	UNMC, UNL, UNK	Basic
IDeA-CTR (NIH/NIGMS)	2016	Rizzo McClay (Core-lead)	UNMC	\$20,000,000	UNMC, UNO, UNL, UNK, Boys Town, USD, UND, NDSU	Clinical/ Translational
HAZMAT (USDOT/UNL)	2016	Fruhling	UNO, UNL, UNMC	\$174,500	UNL, UNO, UNMC	Applied/ Translational
IDeA-CTR (NIH/UNMC)	2016	Myers, Fruhling, Stergiou, French	UNO, UNMC	*\$996,750	UNO, UNMC	Clinical/ Translational
CITIZEN SCIENCE (NSF)	2016	Fruhling, Kolok	UNO	\$100,000	UNO	Applied/ Translational
JCMS (NCC)	2016	Fruhling	UNO	\$220,000	UNO	Applied/ Translational
NIH/NHGRI	2016	Campbell	UNMC	\$1,100,000	UNMC	Clinical
UKMC Res. Institute, Inc.	2016	McClay	UNMC	\$184,000	UNMC	Clinical
Network Models (NRI)	2015	Cooper	UNO	\$194,100	UNO	Basic/Applied
Precision Medicine (NRI)	2015	Gherzi	UNO	\$200,000	UNO	Translational
Life Sciences Education (NSF)	2015	Pauley/ Tapprich	UNO	\$500,000	UNO, WPI, UF, SDSU, Ohio U, College of Wooster, Georgetown, Wash U, U Delaware, Cal Poly State U	Basic
EHR Usability (NIH)	2014	Windle Fruhling(Co-I)	UNMC/UNO	\$2,400,000	UNMC, UNO	Clinical/ Translational
RCN:UBE Incubator (NSF)	2014	Pauley	UNO	\$49,000	UNO	Applied
INBRE (NIH/NIGMS)	2014	Sorgen Guda (Core-Lead)	UNMC	\$16,500,000	UNMC, UNL, UNO, UNK, Creighton, Doane, Nebraska Wesleyan, Wayne State College, College of St. Mary, Chadron State College	Basic/ Applied
Total award value in the last 5 years				\$176,436,431		

*counted in the parent CTR award to Rizzo

In summary, there is a tremendous need and demand for BMI expertise and resources to support research projects that span across basic, clinical, translational, and applied research realms of the human health sciences. This need can be fulfilled through CBIRI by providing a common platform for all vested members of the Center to communicate, collaborate, and share resources. **Based on the usage of our BMI Cores over the past five years (Table 2), we estimate that up to a thousand unique users will be served by CBIRI across UNMC and UNO campuses and from other academic and non-academic entities in Nebraska and nationally.** The users include *faculty, staff, and student researchers* from the realms of bioinformatics, clinical informatics, and public health informatics. CBIRI will also serve as a central hub for graduate student and resident training at UNMC, UNO and other NU campuses. CBIRI is expected to synergize collaborative opportunities within, as well as across, several higher education institutions in Nebraska.

Table 2. User statistics for BMI resources for the past five years. Users are unique in each category.

Resources & Services	# of users
Bioinformatics & Systems Biology Core Users	248
BioCyc/EcoCyc/MetaCyc Software Suite (combined)	417
EHR Core Projects	265
Ingenuity Pathway Analysis	140
Graphpad PRISM Software	250
Letters of Support for Grants	151

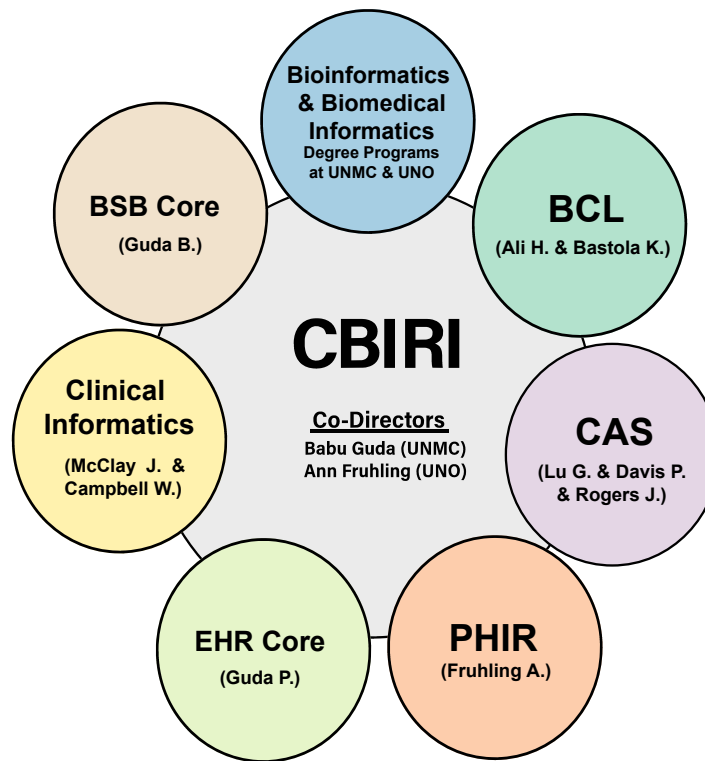
3. Adequacy of Resources

The Vice Chancellor for Research (VCR) Office at UNMC and the Vice Chancellor for Academic Affairs at UNO with UNO Deans have made substantial investments in the development of BMI resources at their respective campuses and are committed to providing the following support for CBIRI.

Administrative members

- Co-Director at UNMC - Babu Guda (5% FTE)
- Co-Director at UNO - Ann Fruhling (5% FTE)
- Center coordinator/admin support by UNMC VCR Office
- Center coordinator/admin support at UNO by UNO CIST
- Center coordinator/admin support at UNO by College of Arts and Sciences
- Web Development support at UNMC – by UNMC Bioinformatics and Systems Biology Core

Several BMI-related units at both campuses will provide expertise on developing, maintaining, and facilitating access to a broad range of resources (i.e., bioinformatics and systems biology services, software/hardware programming support, electronic health record data access, RedCap support, etc.). The UNMC and UNO units participating at the Center are depicted in the figure below:



- Bioinformatics and Biomedical Informatics degree programs at UNO and UNMC
- Bioinformatics Computing Lab (BCL) at UNO - led by Drs. Hesham Ali and Kiran Bastola
- Bioinformatics and Systems Biology (BSB) Core at UNMC - led by Dr. Babu Guda
- Clinical Informatics Research at UNMC - led by Drs. James McClay and Walter (Scott) Campbell
- College of Arts and Sciences (CAS) at UNO – Bioinformatics research programs focused on pathogenesis of disease, immunology, host-gut microbiome interactions, ecology, and computational methodology, and coordination of the ADEPT program led by Dr. Paul Davis
- Electronic Health Records (EHR) Core at UNMC - led by Dr. Purnima Guda
- Public Health Informatics Research lab (PHIR) - led by Dr. Ann Fruhling

These various participating units currently employ several FTEs that are funded by the Vice Chancellor for Research Office at UNMC, the College of Information Science and Technology at UNO, Nebraska Research Initiative (NRI), and extramural grants. The funding of support staff for these participating units is approximately 10 FTEs between the two campuses.

Additional physical facilities needed

No additional physical facilities are needed at this time. Different components of the proposed Center are equipped with several high-performance computing (HPC) clusters at UNMC and the Holland Computing Center. These are crucial to carrying out the proposed Center activities. The Center will have an online presence and most resources will be

made accessible from the Center's website. All the administrative tasks will be conducted by the Co-Directors from their respective campuses.

Budget Projections

The budget has been projected for five years. After that time, the plan is for the Center to be self-supporting through grants, contracts, and fees for research-related services. The VCR at UNMC will contribute by releasing .05 FTE for the Center's Co-Director, Babu Guda, PhD, and support funds for a coordinator at 0.1 FTE to help coordinate the Center's activities. Likewise, the College of IS & T at UNO will contribute by releasing .05 FTE for the Center's Co-Director, Ann Fruhling, PhD, and support funds for a coordinator/administrative assistant at 0.1 FTE to help coordinate the Center's activities. To develop and maintain the website for the Center, a 0.10 FTE is required for the web developer for the first 5 years. After this period, this cost will be supported through grant support or the Center's revenues. Additional funds to purchase relevant software and equipment will be supported by multiple sources that include the VCR's Office at UNMC, Office of Research and Creative Activity at UNO, the Dean of the College of Medicine at UNMC, the Dean of the College of IS & T and the Dean of College of Arts and Sciences at UNO, and NIH's institutional development awards such as NE-INBRE and Great Plains IDeA-CTR. Please refer to the attached budget pages for further details.

4. Organizational Structure and Administration

The Center will be administered by two Co-Directors, a steering committee, an Internal Advisory Committee (IAC), an External Advisory Committee (EAC) and a Community Advisory Board (CAB). Policies and procedures will be developed by the steering committee, which will meet quarterly. Key strategic goals and plans will be developed through broadly based input from internal and external advisory committee members. The IAC, EAC and CAB are expected to meet on an annual basis with the steering committee members.

(i) Co-Directors:

Dr. Babu Guda, PhD, Professor and Chief Bioinformatics & Research Computing Officer at UNMC, and Dr. Ann Fruhling, PhD, MBA, Professor and Director of the School of Interdisciplinary Informatics at UNO, will serve as Co-Directors of this joint Center.

Dr. Guda is the Assistant Dean for Research Development, College of Medicine, UNMC, who manages a well-funded Bioinformatics and Systems Biology research program. He is also the founding director of the Bioinformatics and Systems Biology Core facility, which currently supports over 150 independent investigators across the four NU campuses and many other institutions in Nebraska and surrounding states. He has an interdisciplinary training background in molecular biology, computer science, and computational biology, with over 22 years of experience in bioinformatics research, teaching, and mentoring. Dr. Guda has been the PI or Co-PI of numerous research projects funded by NIH and other agencies since 2008 and a member of various study sections at NIH. He has mentored over 60 mentees that include junior faculty, postdocs, graduate students, and student interns in different areas of biomedical informatics. Dr. Guda has published over 100 peer-reviewed research articles that cover a wide range of topics related to bioinformatics, systems biology, microbiome and metagenomics, cancer genomics, and precision medicine. His expertise also encompasses clinical diagnostics, translational informatics, and database and web application development. He currently serves as a PI, Co-I, or

Core-Lead on over ten extramurally funded research projects at UNMC that generate over \$1.2 million directs per year to support a combined 12 FTEs between his Research and Core groups.

Dr. Fruhling is a Professor and the founding Director of the School of Interdisciplinary Informatics, College of IS&T, UNO and a Charles W. and Margre H. Durham Distinguished Professor. The College of Information Science and Technology at UNO offers four degrees: Cybersecurity, Bioinformatics, Biomedical Informatics, and IT Innovation. Since 2004, Dr. Fruhling has served as the Director of the Public Health Informatics Research Laboratory, employing several FTEs and funding dozens of graduate assistantships and over 70 undergraduate, graduate, and doctoral students. She has over 100 publications and has been a PI/Co-I on research projects totaling over \$8.53 million. Dr. Fruhling's research focuses on health informatics and evaluating and improving human-computer interaction efficiency and effectiveness in the healthcare and public health domains. Since 2002, she has been the PI of an emergency response system and bioterrorism surveillance system for public health laboratories called STATPack™, which has been deployed in over 65 health laboratories. Recently, Dr. Fruhling was a Co-I on an NIH R01, ARHQ grant that focuses on optimizing the EHR for cardiac care. Currently, she is the PI for a UNO/UNMC collaborative grant sponsored by the Department of Transportation and awarded by UNL's University Transportation Center. This project is developing an application to minimize the health impact to first responders in the case of a HAZMAT transportation incident using internet of things (IoT) technologies including biosensors. In addition, Dr. Fruhling is a Co-I for the Biomedical Informatics KCA that supports the UNMC NIH IDeA Center for Translational Research. She is Co-I for a NU 2019 Collaborative Initiative project called, Enhancing Senior Living, Quality of Life and Independence through Utilizing Assistive and Interactive Technology that includes researchers from UNO Gerontology and UNMC.

(ii) Steering Committee (SC):

The following experts in different BMI sub-disciplines at UNO and UNMC are identified to serve on the steering committee. The initial committee will consist of seven members. These members interact extensively with the BMI services and resources and hence are suitable to serve on the steering committee:

- Ann Fruhling, PhD, Professor, School of Interdisciplinary Informatics (Si2), UNO;
- Babu Guda, PhD, Professor, College of Medicine, UNMC;
- Dario Ghersi, MD, PhD, Associate Professor, Si2, UNO;
- Jim McClay, MD, Professor, College of Medicine, UNMC;
- Paul Davis, PhD, Associate Professor, Department of Biology, UNO
- Guoqing Lu, PhD, Professor, Department of Biology, & member of Si2, CAS, UNO;
- Scott Campbell, PhD, Assoc. Professor, Senior Director of Research and IT, UNMC

(ii) Internal Advisory Committee (IAC):

The following leaders at UNO and UNMC campuses are identified to serve on the Internal Advisory Committee:

- Jennifer Larsen, MD, Vice Chancellor for Research, UNMC;
- Howard Fox, MD, PhD, Senior Associate Dean for Research Development, UNMC;

- Kenneth Bayles, PhD. Assoc. Vice Chancellor for Research at UNMC, and Associate Vice Chancellor for Research and Creative Activity at UNO;
- Dele Davies, MD, Senior Vice Chancellor for Academic Affairs, UNMC;
- Sacha Kopp, PhD, Senior Vice Chancellor for Academic Affairs, UNO
- Hesham Ali, PhD, Dean, College of Information Science & Technology, UNO;
- LaReesa Wolfenbarger, PhD, College of Arts and Sciences, UNO;
- Sara Myers, PhD, Assistant Vice Chancellor for Res. and Creative Activity, UNO;
- Michael Dixon, PhD, President and CEO, UNeMed Corporation, Inc. UNMC.

(iii) External Advisory Committee (EAC):

The following experts in the field of Biomedical Informatics are identified to serve on the Scientific Advisory Committee:

- Michael Ash, MD, Vice Chancellor for Information Technology, UNMC;
- Peter J. Embi, MD. Associate Dean for Informatics and Health Services Research, IUPUI, Indianapolis, IN;
- Tammy Toscos, PhD. Director, Health Services and Informatics Research at Parkview Health, Fort Wayne, IN;
- Zhongming Zhao, PhD, MS, Chair Professor & Director, Center for Precision Health, The University of Texas Health Science Center at Houston;
- Ramana Davuluri, PhD, Professor of Preventive Medicine, Feinberg School of Medicine, Northwestern University.
- Chris Maloney, MD, PhD, Senior Vice President-Chief Medical Officer, Children's Hospital, Omaha, NE

(iv) Community Advisory Board (CAB)

In consultation with the internal and external advisory committees, we will invite community stakeholders including senior leaders from local biotech companies such as Streck Labs and Neogen, and not for profit organizations such as the Henry Doorly Zoo at Omaha. These organizations have shown interest in utilizing various BMI services and are expected to provide valuable advice to promote the mission of the Center.

5. Partnerships with Business

Members of CBIRI may provide a wide variety of expertise spanning the BMI research spectrum. We foresee that CBIRI will have many opportunities to collaborate and offer services to non-academic and industry partners and build partnerships at various levels. As an example, a biotech company, Neogen Corporation, based in Lincoln, Nebraska, uses high-resolution genotyping for a variety of animal and plant species and expressed interest in collaborations for the development of rapid genomics-based genotyping tools. We were previously approached with similar needs by clients such as Streck labs and Omaha's Henry Doorly Zoo and Aquarium with customized requests for specific genomics and bioinformatics related projects. The CBIRI will offer a platform to build such partnerships and offer services in coordination with UNeMed, a technology transfer unit of the NU system.

6. Collaborations with Higher Education Institutions and Agencies External to the University of Nebraska

There are multiple BMI undergraduate and graduate programs at UNO and UNMC. Faculty associated with these programs will become members of the Center, and graduate students will be matched with interested faculty members to carry out short-term and long-term

research projects. The Center will actively coordinate the existing and new graduate training and outreach activities through BMI seminar series, journal clubs, the INBRE- and IDeA-CTR scholar program, and vendor-sponsored workshops. The Center will leverage its platform and resources to attract industry sponsors for student internships or long-term student scholarships, such as the previous Purdue Pharma Scholar Program at UNMC. As a model, the Advanced Defense Education Pipeline and Training (ADEPT) program is a joint training program between UNO-CAS and UNMC faculty that is specifically designed to provide undergraduate and graduate students hands-on experiences and career opportunities with the US Army Medical Research Institute for Infectious Diseases (USAMRIID). Currently, six students are pursuing their PhD, working on Department of Defense projects either at UNO/UNMC or USAMRIID laboratories. Twelve students have received summer internships at USAMRIID. Programs such as ADEPT will lead to the development of the local workforce by training the next generation of BMI experts that could serve both regionally and nationally.

7. Constituencies to be Served

The primary constituency to be served is the faculty, staff, and students of UNMC and UNO, who are engaged in BMI research, training, or service activities. Similar requests from the other NU campuses will also be served as needed. External constituencies include Creighton University, Children's Hospital and Medical Center, Boys Town National Research Institute, Nebraska Department of Health and Human Services, Omaha's Henry Doorly Zoo and Aquarium, the biotechnology industry in Nebraska, and the Department of Defense (DoD) through the ADEPT program.

In addition, through the NIH funded INBRE and Great Plains IDeA-CTR awards, extensive BMI support is being provided to four other research institutions (Creighton University Medical Center, University of South Dakota, University of North Dakota, and North Dakota State University) and six other primarily undergraduate institutions in Nebraska (Chadron State College, College of Saint Mary, Creighton University College of Arts and Sciences, Doane University, Nebraska Wesleyan University, and Wayne State College). The Center's platform and resources will enhance the overall research capacity in Nebraska and produce better health outcomes for its citizens.

8. Anticipated Outcomes, Significance, and Specific Measures of Success

Outcomes:

- A website disseminating the Center's mission, goals, administrative units, list of members and their expertise, and services and resources accessible to the research community.
- A joint biomedical informatics monthly seminar series that invites nationally reputed speakers to UNO and UNMC campuses to promote collaborations and create networking opportunities for students and faculty. CBIRI website will host archives of the recorded lectures for access by the Center members.
- Efficient coordination and dissemination of information on a number of BMI training and outreach activities to students and faculty using the Center's platform.
- Access to high-performance computing hardware and BMI-related software resources by leveraging group licensing and resource sharing.
- Enhanced partnerships with federal government and industrial laboratories to promote growth in student projects, summer internships, and graduate scholarships.

- A joint BMI Center will expand recruitment of nationally recognized faculty and attract extramural funding.
- A graduate training pipeline to produce a qualified workforce in specialized areas of BMI, who could be employed by entities such as USAMRIID in various DoD-supported research projects.

Significance:

The Center can help advance BMI research and keep NU on the cutting edge of evolving technology to fully utilize 'Big Data' in the realms of health sciences research. The time is right to develop the Center due to the growing demand at various fronts of the BMI research and parallel growth in the volume of biomedical data to be analyzed and understood. In the first few years, CBIRI will work towards homogenizing BMI user community, consolidate BMI resources for effective utilization, and operationalize a common BMI seminar series across the campuses. These initial goals will help build a sense of community among all stakeholders of CBIRI and facilitate communication and coordination to achieve long-term goals of the Center. We will use the following metrics to measure the growth and success of the Center.

Measures of success:

- Number of services provided per year through the Center-affiliated components.
- Number of grants funded in which CBIRI is listed as a resource.
- Number of workshops and seminars organized or coordinated through the Center.
- Number of undergraduate and graduate internships secured.
- Number of new faculty members recruited who are BMI-associated faculty or those that require significant BMI support to drive their research projects.
- Growth in the number of users of BMI resources (hardware, software and personnel).
- Feedback from internal and external investigators.

9. Centrality to Role and Mission of the Institution

A joint center to represent the Biomedical Informatics research community is long overdue at the University of Nebraska and is enthusiastically supported by the senior administration at both campuses. Specifically, the Center will serve as a conduit for coordinating BMI seminars and other training activities, negotiating BMI software licenses through collective bargain, leveraging the interdisciplinary pool of talent for writing infrastructure development grants, and finally, serving as an externally visible overarching entity for recruiting nationally recognized faculty to University of Nebraska. The Center's goals that emphasize on developing infrastructure and expertise in the interdisciplinary area of Biomedical Informatics are in alignment with both UNMC and UNO strategic plans:

- UNMC's strategic plan (goal 2.2 under *Research Scope and Prominence* section), which emphasizes enhancing the campus-wide infrastructure and expertise for biomedical and health systems informatics.
- UNO's strategic plan (goal 2.4 under *Academic Excellence* section), which emphasizes Strategy 4 to identify and develop interdisciplinary/transdisciplinary academic priorities (specifically stated in UNO IST - 2.4.1. objective to continue to work closely with UNMC and UNL partners in education, research and support).

10. Potential for the Program to Contribute to Society and Economic Development

The expertise, resources, services, and activities provided through CBIRI will have a powerful impact on the basic and applied sciences and clinical and translational research, which ultimately seeks to provide improved quality of health care to the patient. The proposed Center will help the University gain national and international recognition, along with the benefits of increased recruitment and retention of nationally and internationally reputed faculty and attracting additional extra-mural funding. For instance, some of the DoD projects supported through the ADEPT program (section 6) will directly benefit the warfighter. CBIRI will continue to facilitate these sorts of efforts. Organizing workshops and potentially national-level meetings in Omaha will help the business community and benefit Nebraska's economic development.

11. Consistency with the Comprehensive Statewide Plan for Postsecondary Education: How this program will enhance relevant statewide goals for education.

The proposed training and outreach activities will provide and expand opportunities, specifically, in the interdisciplinary STEM areas for undergraduate and graduate students across the state of Nebraska. Through its overarching platform, CBIRI will help broaden the opportunities for multidisciplinary degree programs that integrate the theory and practice of quantitative disciplines (such as computer science, mathematics, and statistics) with the analytics needed to process experimental data generated in biomedical sciences (such as basic, clinical, translational, and epidemiological sciences). In addition, the Center will serve as an entrusted platform to effectively coordinate various training and outreach activities supported by projects such as NE-INBRE, IDeA-CTR, NE-EPSCoR. These projects are specifically designed to train undergraduate and graduate students, and junior faculty members covering most of the postsecondary educational institutions in the state of Nebraska. Hence, the Center can help achieve statewide education goals by community engagement through didactic and experiential learning, student internships and fellowships, contracts, and business partnerships.

August 3, 2020

Dear Members of the CCPE:

I am pleased to write this letter in support of establishing the Center for Biomedical Informatics Research and Innovation (CBIRI) co-directed by Dr. Ann Fruhling and Dr. Babu Guda and jointly located at the University of Nebraska at Omaha (UNO) and the University of Nebraska Medical Center (UNMC).

For the last two decades, the College of Information Science and Technology has invested significant resources in supporting various initiatives related to Biomedical Informatics. These initiatives include the development of UNO's Bachelor of Science in Bioinformatics program and the establishment of the UNO/UNMC joint MS/PhD degrees in Biomedical Informatics (BMI). These degrees represent innovative and multidisciplinary programs that integrates the theory and practice of information technology management, computer science, telecommunications, decision support systems, applied computing with medical science, biological sciences, bio-imaging, and public health. The proposed Center for Biomedical Informatics Research and Innovation will further support the NU efforts to focus on student success by providing internships and training opportunities that expose students to the many facets of research in academia and healthcare industry. Dr. Fruhling's 5% leadership effort as Co-Director of CBIRI that is proposed is included as part of her academic year research workload as a Professor in the School of Interdisciplinary Informatics.

Biomedical Informatics research has been, and will remain, critical to linking interdisciplinary approaches to help researchers understand biological data and link them to clinical data to advance biomedical research and healthcare. The Center will serve as a coordination and communication vehicle for BMI educational, research and outreach activities, provide bioinformatics resources for scientists, and facilitate new collaborations pertinent to both academia and industry through horizontal integration of expertise, resources, and users under one umbrella.

The Center for Biomedical Informatics Research and Innovation aligns with the mission of the College of Information Science and Technology and UNO to transform and improve the quality of life, locally, nationally, and globally. I am confident that through the synergistic leadership of the two co-directors, the Center will provide another significant step forward in further recognizing the University of Nebraska as a national leader in providing bioinformatics and biomedical informatics education and resources to promote and advance basic, clinical, translational, and public health research.



Hesham H. Ali, Ph.D.
Professor of Computer Science
Lee D. and Willa Seemann Distinguished Dean
College of Information Science and Technology
University of Nebraska at Omaha
Omaha, NE 68182

December 3, 2020

Re: Center for Biomedical Informatics Research and Innovation (CBIRI)

To Whom It May Concern:

I write on behalf of the University of Nebraska Omaha College of Information Science and Technology (CIST) in support of the Center for Biomedical Informatics Research and Innovation (CBIRI) developed by Dr. Babu Guda of UNMC and Dr. Ann Fruhling of UNO. As Dean of the college, I can attest to the considerable need for a coordinating center for Biomedical Informatics (BMI) across our institutions. We have long been at the forefront of national efforts to advance BMI education, best evidenced through our early adoption of an undergraduate degree in bioinformatics. Today, we are one of the few institutions to grant undergraduate, master's, and doctoral degrees in bioinformatics and biomedical informatics, jointly with UNMC.

With its strong emphasis on education and training activities, the CBIRI will continue this trend for decades to come. Faculty working in BMI would benefit from a comprehensive coordinating center bringing these efforts into horizontal alignment under one umbrella. Drs. Guda and Fruhling have extensive leadership experience, a strong background in the successful implementation of complex organizational structures, and an understanding of faculty and students' needs to promote health research through informatics and make the CBIRI immediately impactful.

In support of this Center, UNO acknowledges the proposed roles and responsibilities to continue actively advancing CBIRI goals, primarily through the following resource-sharing activities

- The College Research labs and Core Facilities including the UNO Bioinformatics Core Facility and the Public Health Informatics Research lab
- Access to computer scientists, information technology researchers, cybersecurity experts, and bioinformatics undergraduate and graduate students, and biomedical informatics graduate students
- Collaborative opportunities through academic ties with UNO's longstanding history of community engagement in health care research

Our College looks forward to a long and fruitful collaboration through the CBIRI for years to come.

Sincerely,



Hesham H. Ali, Ph.D.
Professor of Computer Science
Lee D. and Willa Seemann Distinguished Dean
College of Information Science and Technology
University of Nebraska at Omaha
Omaha, NE 68182

December 2, 2020

Re: Center for Biomedical Informatics Research and Innovation (CBIRI)

To Whom It May Concern:

As the Senior Director of Research Technologies at UNMC and the Director of the Public Health Informatics Research Lab, I write supporting the CBIRI proposal developed by Drs. Babu Guda and Ann Fruhling. I strongly support this proposal and the Center's mission to serve as a communication vehicle for biomedical informatics (BMI) educational and research activities and resources. The need and demand for BMI expertise and resources have expanded tremendously over the past decade. With its broad scope of services, the proposed Center will significantly enhance competitiveness on cutting-edge research for the foreseeable future.

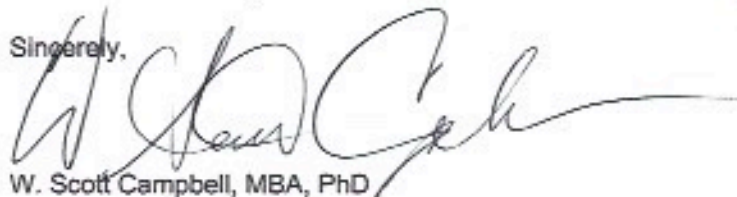
UNO and UNMC have a long history of working together in this domain. Solidifying efforts across campuses through the formation of the CBIRI will streamline and advance resources available across the University of Nebraska system. The CBIRI will transform the accessibility of training and outreach activities, IT and software resource sharing, and services available to support research across the spectrum.

I acknowledge through this letter that I will perform the following functions in this partnership:

- Serve on the Steering Committee to assist in the development of CBIRI policies and procedures
- Support IT and research informatics needs in the realm of public health
- Serve as a Research IT liaison for clinical informatics between the University of Nebraska and its commercial partners, namely Nebraska Medicine

I look forward to working collaboratively with the broader informatics community through the CBIRI under the excellent and capable leadership of Drs. Guda and Fruhling.

Sincerely,



W. Scott Campbell, MBA, PhD

Associate Professor
Sr. Director of Research Technologies
Director of Pathology and Public Health Informatics
Department of Pathology and Microbiology
College of Medicine
University of Nebraska Medical Center

985900 Nebraska Medical Center / Omaha, NE 68198-5900
402-559-9593 / FAX 402-559-5900 / www.unmc.edu/pathology

3 December 2020

RE: Center for Biomedical Informatics Research and Innovation (CBIRI)

I am writing this letter to confirm my strong support for the Center for Biomedical Informatics Research and Innovation (CBIRI) developed by Dr. Babu Guda of UNMC and Dr. Ann Fruhling of UNO.

As a faculty member in the UNO College of Arts and Sciences, I am aware of the extensive and growing research programs focused on the pathogenesis of disease, immunology, host-gut microbiome interactions, ecology, and computational methodology, all of which would benefit from shared biomedical informatics resources and knowledge. Further, as the Director of the UNO Health Careers Resource Center, I've been pleased to track an increased number of biomedical and informatics undergraduate students heading to local health professions training programs, such as UNMC School of Medicine.

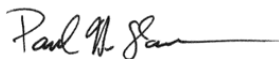
As leader of the Advanced Defense Education Pipeline and Training (ADEPT) program, I can attest to the national workforce's clear need for the development of the next generation of BMI leaders. This joint training program between UNO and UNMC faculty can provide undergraduate and graduate students with hands-on experiences with needs that are in-line with Department of Defense needs, for instance. The CBIRI will enable a more robust pool of experts to help with programs like ADEPT and allow continued progress toward a more agile workforce capable of meeting the changing technical needs of our industry partners.

In support of the CBIRI, I commit to the following roles and responsibilities:

- Serve as a member of the Steering Committee to provide feedback and direction
- Assist in program coordination for workforce development projects

Under Dr. Fruhling's and Guda's expert leadership, the CBIRI is poised to provide substantial improvements in BMI expertise and resources to promote and advance basic, clinical, translational, and public health research at our sister institutions. I look forward to working with them for years to come.

Sincerely,



Paul H. Davis, Ph.D.
Associate Professor of Biology
Director, Molecular Parasitology Lab
Director, UNO Health Careers Resource Center
University of Nebraska at Omaha
pdavis@unomaha.edu
402-554-3379



Purnima Guda, Ph.D.
Director, Electronic Health Record Access Core
Vice Chancellor for Research Office
University of Nebraska Medical Center

Phone: (402) 559-3845
Email: purnima.guda@unmc.edu
<https://www.unmc.edu/cctr/resources/ehr>

December 2, 2020

Re: Center for Biomedical Informatics Research and Innovation (CBIRI)

To Whom It May Concern:

I write in strong support of the Center for Biomedical Informatics Research and Innovation (CBIRI) led by Dr. Babu Guda of UNMC and Dr. Ann Fruhling of UNO to promote and advance biomedical informatics (BMI) expertise and resources. As the Director of the UNMC Electronic Health Record (EHR) Data Access Core, I strongly support the purpose of the Center's mission to serve as a coordination and communicational vehicle for BMI educational, training and research activities and resources. Growth in the use of EHR data for research has grown tremendously over the past decade. The CBIRI will accelerate the integration of EHR data with other critical tools and resources to expand research capabilities.

The CBIRI will strategically place the University of Nebraska at the forefront of BMI capabilities, knowledge, and infrastructure to enhance all facets of health research. Through the consolidation of shared resources and enhancement of personnel fluidity across sub-disciplines and campuses, the CBIRI will make this a reality. Under the capable leadership of Dr. Guda and Dr. Fruhling, the Center will be able to adapt to the rapidly changing needs for BMI tools and infrastructure in near real-time.

In support of the CBIRI, the EHR Data Access Core commits to contribute to its mission to consolidate and coordinate BMI efforts across campuses and disciplines. We wish you the best of luck in this vital endeavor.

Sincerely,

A handwritten signature in black ink, appearing to read 'Purnima Guda'.

Purnima Guda, PhD



December 1, 2020

Re: Center for Biomedical Informatics Research and Innovation (CBIRI)

To Whom It May Concern:

As Vice Chancellor for Research, I enthusiastically support the CBIRI proposal jointly developed by Dr. Babu Guda at UNMC and Dr. Ann Fruhling at UNO. I helped recruit Dr. Guda to UNMC who serves as UNMC's Chief Bioinformatics and Research Computing Officer since 2015, and part of his leadership responsibilities.

Many of the activities of this position were envisioned and defined from the outset to include helping to develop and lead this proposed Center. The CBIRI proposal describes what infrastructure has been built for biomedical informatics (BMI), as well as a proposed leadership structure that will help to enhance communication around new resources and infrastructure, as it continues to grow, as well as the educational offerings of the joint Biomedical Informatics graduate program, of UNMC and UNO.

Thus, the 5% effort as Co-Director of CBIRI that is proposed is included as part of his existing stipend as UNMC's Chief Bioinformatics and Research Computing Officer.

There is a strong need for a comprehensive center focused on BMI education and research. For University of Nebraska to remain competitive for federal funding, particularly large grant programs, we need to continue to grow our expertise, through graduate training, recruitment, and training and resources for our existing faculty and graduate students.

Under the strong leadership of Drs. Guda and Fruhling, the CBIRI will continue to grow the expertise within the University of Nebraska system to collaborate in biomedical and health science of all types, as they have the background, experience, and collaborative skills to make the CBIRI successful. Biomedical informatics has become indispensable to almost all types of biomedical research, from basic science to clinical and public health science.

With this letter, I acknowledge and agree to the roles and responsibilities proposed as detailed in the partnership, which include:

- Serving as a member of the Internal Advisory Committee to support the CBIRI's goals and advise the Steering Committee, annually
- Continue to support the CBIRI through coordinator/administrative support
- Assist in collaborative purchases of relevant software and equipment that will benefit UNMC researchers through VCR funds beyond those already detailed as the need arises.

I look forward to working with the CBIRI as it aims to consolidate and expand BMI resources, both in personnel and other infrastructure, across the region.

Sincerely,

A handwritten signature in black ink that reads "Jennifer Larsen MD". The signature is written in a cursive, flowing style.

Jennifer L. Larsen, MD
Vice Chancellor for Research and Institutional Official
Louise and Morton Degen Professor of Internal Medicine
University of Nebraska Medical Center
Administrative Support: Pamela Welch (pswelch@unmc.edu)
Phone: 402-559-8490
FAX 402-559-8445

December 4, 2020

Chittibabu (Babu) Guda, PhD
6015 Durham Research Center
985145 Nebraska Medical Center
Omaha, NE, 68198-5145

Ann Fruhling, PhD
PKI 280A. 6001 Dodge Street
University of Nebraska Omaha
Omaha, NE, 68182

Dear Ann and Babu;

As the founding director of UNMC's Biomedical Informatics (BMI) graduate program, the principle investigator and director of the UNMC Clinical Research Analytics Environment (CRANE) and a leader in clinical informatics research at UNMC, I am writing this letter to confirm my support for the CBIRI proposal. The BMI graduate program is a joint program involving UNMC & UNO, leveraging expertise across campuses to provide an educational and research program with strengths in biological, health care, and technological aspects of biomedical informatics. It is a multidisciplinary, interprofessional effort integrating the theory and practice of information technology management, computer science, decision support systems, and applied computing with clinical science, bioinformatics, bio-imaging, and public health. The CRANE system builds upon the collective expertise of the UNMC BMI program to contribute to nation-wide healthcare evidence development.

The need for BMI expertise, resources, educational activities, and support continues to grow rapidly. Based on our strong relationships through our collaborative efforts advancing the study of Biomedical Informatics throughout the University of Nebraska system I believe the CBIRI will consolidate and expand resources in a manner that will place Nebraska at the forefront of the field to advance biomedical discoveries across all disciplines. This Center will address an immediate challenge of resource sharing across campuses by collectively sharing software, computing power, and ideas through leveraged experience, collective bargaining, and group licensing. This proposal demonstrates decades of work in advancing the multidisciplinary field of biomedical informatics in the state. Your team has the experience, leadership skills, and breadth of knowledge to lead the CBIRI and build collaborations in academia and industry.

I look forward to working with both of them for many years to come.

Sincerely,

A handwritten signature in black ink that reads "James McClay MD". The signature is written in a cursive style with a distinct loop for the letter 'J' and a clear 'MD' at the end.

James McClay MD, MS
Professor, Emergency Medicine, College of Medicine
Chair, UNMC Biomedical Informatics Program
University of Nebraska Medical Center,
Omaha, NE 68198

TABLE 1: PROJECTED EXPENSES - NEW ORGANIZATIONAL UNIT
Center for Biomedical Informatics Research and Innovation - UNMC and UNO Combined

	(FY2020-21)		(FY2021-22)		(FY2022-23)		(FY2023-24)		(FY2024-25)		Total
	Year 1		Year 2		Year 3		Year 4		Year 5		
Personnel	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Faculty											\$0
Non-teaching Staff											
Administrative											\$0
Professional											\$0
Support											\$0
Subtotal	0.00	\$0	0.00	\$0	0.00	\$0	0.00	\$0	0.00	\$0	\$0
Operating											
General Operating											\$0
Equipment											\$0
Facilities											\$0
Library/Information Resources											\$0
Other											\$0
Subtotal		\$0		\$0		\$0		\$0		\$0	\$0
Total Expenses		\$0		\$0		\$0		\$0		\$0	\$0

For both campuses, expenses are covered by current grant funding or personnel assignments. The center will reorganize and align existing efforts and resources for efficiencies. Existing faculty and staff are sufficient to implement the center. No new expenses are needed. The Center's Co-Directors (Babu Guda and Ann Fruhling) will contribute a small portion of their current FTE (0.05 ea.) to administering the proposed unit; the campuses also will redirect effort towards a staff coordinator/administrative assistant (0.2 FTE) and web site development (0.1 FTE).

TABLE 2: PROJECTED REVENUES - NEW ORGANIZATIONAL UNIT
Center for Biomedical Informatics Research and Innovation - UNMC and UNO Combined

	(FY2020-21)	(FY2021-22)	(FY2022-23)	(FY2023-24)	(FY2024-25)	Total
	Year 1	Year 2	Year 3	Year 4	Year 5	
Existing Funds from Institutional Support						\$0
Required New Public Funds						\$0
1. State Funds						\$0
2. Local Funds						\$0
Tuition and Fees						\$0
Other Funding						
1						\$0
2						\$0
Total Revenue	\$0	\$0	\$0	\$0	\$0	\$0