Approved by the Regents
May 16, 2024

PROMOTION RECOMMENDATION
THE UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF COMPUTATIONAL MEDICINE AND BIOINFORMATICS
COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Jie Liu, Ph.D., assistant professor of computational medicine and bioinformatics, Department of Computational Medicine and Bioinformatics, Medical School, and assistant professor of electrical engineering and computer science, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to associate professor of computational medicine and bioinformatics, with tenure, Department of Computational Medicine and Bioinformatics, Medical School, and associate professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.	2014	University of Wisconsin, Madison, WI
M.S.	2011	Statistics, University of Wisconsin, Madison, WI
M.S.	2009	Computer Science, University of Wisconsin, Madison, WI
M.S.	2007	Peking University, Beijing, China
B.S.	2004	Beijing University of Posts and Telecom, Beijing, China

Professional Record:

2019-present	Assistant Professor, Department of Electrical Engineering and Computer Science, Computer Science and Engineering, University of Michigan
2019-present	Assistant Professor, Department of Computational Medicine and Bioinformatics, University of Michigan

Summary of Evaluation:

Teaching: Dr. Liu actively participates in the educational mission of the department and nationally, both in the classroom and in the laboratory. Learners include graduate students and undergraduate students, many of whom have gone on to successful careers. In terms of curriculum development, he co-developed and taught (with Dr. Welch) a new course "Machine Learning in Computational Biology" (BIOINF593/EECS 598). His teaching evaluations are very good to excellent, with scores consistently above the median. Dr. Liu also was a guest instructor for "Image Processing and Advanced Machine Learning for Cancer Bioinformatics" (BIOINF/590) and facilitator of "Data Storage" (PIBS503). In 2021, he was the co-chair of a workshop on machine learning methods for single-cell analysis for the Association for Computing Machinery's conference on bioinformatics, computational biology, and health informatics.

Research: Dr. Liu is an expert in the field of computational biology whose research focuses on using computational approaches to understand the functions of the human genome and the genetic basis of human diseases, with a specialty in machine-learning approaches. He uses deep learning and knowledge graphs to analyze high-resolution data of 3D chromatin organization and its

connections with the epigenome and transcriptome. Dr. Liu has an extraordinary record of success in garnering support with current funding as the principal investigator totaling more the $20M. His current research has been funded by the National Institutes of Health (NIH), the National Human Genome Research Institute, and through institutional awards. Dr. Liu has authored 20 peer-reviewed manuscripts in top-tier journals such as *Nature Communications*, *eLife*, and *PLoS Computational Biology*. He has an additional 17 conference proceedings. He has been invited on 25 occasions to present his work nationally. In 2022, he was awarded the Genomic Innovator Award from the National Human Genome Research Institute (NHGRI).

Five Recent Significant Publications:

Zhang Z, Feng F, Qiu Y, Liu J*, "A generalizable framework to comprehensively predict epigenome, chromatin organization, and transcriptome," *Nucleic Acids Res.* 2023 Jul 7;51(12):5931-5947. PM37224527

Feng F, Tang F, Gao Y, Zhu D, Li T, Yang S, Yao Y, Huang Y, Liu J*, "GenomicKB: a knowledge graph for the human genome," *Nucleic Acids Research*. 51(D1): D950-D956, 01/2023. PM36318240

Feng F, Yao Y, Wang XQ D, Zhang X, Liu J*, "Connecting high-resolution 3D chromatin organization with epigenomics," *Nature Communications*, 2022.13(1)12/2022. PM35440119

Huang Y, Wang B, Liu J*, "NucleoMap: A computational tool for identifying nucleosomes in ultra-high resolution contact maps," *PLoS Computational Biology*, 2022. 18(7)07/2022. PM35834552

Zhang Z, Feng F, Liu J*, "Characterizing collaborative transcription regulation with a graph-based deep learning approach," *PLoS Computational Biology*. 18(6)06/2022. PM35666736

**Senior and corresponding author*

Service: Dr. Liu has an excellent institutional, national, and international service record. Internationally, he served on the program committee for numerous international conferences including the International Conference on Machine Learning (ICML), Associate for the Advancement of Artificial Intelligence (AAAI), International Joint Conferences on Artificial Intelligence (IJCAI), and Research in Computational Molecular Biology (RECOMB). Nationally, he has been on the program committee for several conferences, such as the American Medical Informatics Association and Machine Learning in Computational Biology. He is an ad hoc grant reviewer for an NIH study section, an associate editor of *PLOS Computational Biology,* and an ad hoc reviewer for numerous scientific journals including *Bioinformatics*, *Nature Communications*, and *PLOS Computational Biology*. Institutionally, he is the co-chair of the Ph.D. Program Admissions Committee for the Department of Computational Medicine and Bioinformatics (DCMB), he was a member of the master's program admissions committee and co-chair of the seminar committee for DCMB/Center for Computational Medicine and Bioinformatics (CCMB). He has also been a grant reviewer for the U-M MIDAS Propelling Original Data Science (PODS) grant and served on many dissertation/thesis committees, as well as preliminary exam committees in DCMB and Molecular Pathology.

External Reviewers:

Reviewer A: "His notable strengths, compared to his peers in this field, include his strong technical skills of applying and developing machine learning methods, and his emphasis on modeling and

utilizing 3D genome data in the study of gene regulation…I feel that Jie has a strong portfolio of research work, funding, and service records. He is a promising scientist, with the potential to leave a great impact on the field."

Reviewer B: "Scientifically, his published work is at the cutting edge of computational research of the non-coding genome, exploring relationships between the transcriptome, epigenome, and chromatin organization. The work leverages recent, technical advances in (epi)genomics, such high-resolution 3D chromatin contact mapping with Micro-C and Region Capture Micro-C, and single cell multi-omics. His work is mathematically and algorithmically rigorous, and the publications are in high quality journals. His funding portfolio is impressive for someone at his career stage and includes an R35 Outstanding Investigator award from NIH/NHGRI."

Reviewer C: "In addition to establishing his own independent program on computational epigenomics, Jie also actively collaborates with teams with biological expertise to address biological questions. For example, Jie and Xiaotian Zhang (a colleague [who] used to work [at] UM, but recently moved to UTHealth Houston) worked together and found a new role of specific CTCF binding sites in determining human beta globin gene expression (Himadewi et al., eLife, 2021). Jie also worked with other UM teams to dissect single cell epigenome and spatial regulation of human pancreas development, which won the teams two major R01 grants in the past two years."

Reviewer D: " Dr. Liu's teaching has been excellent, and his excellence in teaching has been demonstrated in both classroom instruction and trainee mentoring. He has developed a new course on machine learning for computational biology…In addition, Dr. Liu has an amazing record of mentoring trainees. Since he became independent, he has successfully mentored a large number of trainees, including 11 PhD students, 8 master's [sic] students, and 27 undergraduate students. His trainees are from different programs (such as bioinformatics and computer science), which reflects Dr. Liu's popularity and excellence in education and mentoring."

Reviewer E: "In regard to securing funding, Dr. Liu's track record is strong. Among his notable achievements, he received the Genomic Innovator Award R35 from NHGRI in 2020. Further reinforcing his commitment to resource development for the broader community, he has successfully secured two R03 grants from the Common Fund at the NIH. He also serves as Multi-PI and Co-I on several collaborative grants, substantiating the fact that his research program is indeed well supported to carry out his work."

Reviewer F: "…his work addresses a critical intersection of Genomic Medicine, Data Science, and Biomedical Informatics, with demonstrable endpoints in terms of 'downstream' improvements in the quality, safety, equity, and outcomes of care delivery when it is supported or enabled by such evidence and knowledge. Given current and foreseeable national trends in the healthcare delivery and research enterprises, such a unique combination is well positioned to make major contributions to the advancement of the health sciences. Of note and to Dr. Liu's credit, he identified and engaged in such unique and multi-disciplinary work well before it became a 'mainstream' focus of the national or international research community, thus demonstrating his ability to identify and predict such impactful and emergent research trends and position his own efforts to address such opportunities."

Reviewer G: "His works have also been recognized by several best paper awards in these conferences, including AMIA Marco Ramoni Distinguished Paper Award. Several funded NIH projects have clearly shown that he will continue to play a leading role in AI/ML and statistics method development, as well as their biomedical applications. I wholeheartedly believe that with all the funding support, his efforts will be exposed to a broader research community with a significantly increased impact on the research community, in particular in AI/ML and biomedicine."

Summary of Recommendation:
Dr. Liu is an expert in the field of computational biology. He has made significant contributions across the three missions of teaching, research, and service. We are pleased to recommend Jie Liu, Ph.D. for promotion to associate professor of computational medicine and bioinformatics, with tenure, Department of Computational Medicine and Bioinformatics, Medical School, and associate professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

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