COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

COLUMBIA NANO INITIATIVE

Yuyang Wang, Ph.D.
Postdoctoral Research Scientist
Columbia Nano Initiative
Columbia University in the City of New York
530 West 120th Street, New York, NY 10027
+1 (781) 428-0408
yw3831@columbia.edu

November 14, 2023

Faculty Search Committee
Department of Electrical and Computer Engineering
XYZ University
Street Address
City, State Zip Code

Dear Members of the Faculty Search Committee,

Re: Application for the Tenure-Track Assistant Professor Position

I am writing in response to the advertised faculty position (**Tenure-Track Assistant Professor—Job # 123456**) in the Department of Electrical and Computer Engineering at the XYZ University. I am currently a Postdoctoral Research Scientist at the Columbia Nano Initiative of the Columbia University, supervised by Prof. Keren Bergman. I obtained my Ph.D. degree in Electrical and Computer Engineering from the University of California, Santa Barbara, in 2021, co-advised by Prof. Kwang-Ting Cheng and Prof. John E. Bowers. I have established a diverse yet synergetic research portfolio centered around silicon photonics (SiPh) optical interconnects, and believe that my interdisciplinary research background will make me a great fit to contribute to the continued excellence of your department.

My research is strongly motivated by the prevalence of communication bottleneck in the era of data ubiquity—emerged in modern distributed computing infrastructures and exacerbated by the pervasiveness of data-intensive AI/machine learning applications—that calls for a transformative change in the underlying system connectivity to allow for future scalability. Aiming to fully unleash the potential of CMOS-compatible silicon photonics for ultra high-bandwidth and energy-efficient optical interconnects, I have worked toward building a design ecosystem centered around a unique link architecture that can utilize an unprecedentedly broad optical bandwidth, allowing for massively scalable channel parallelism. Specifically, my Ph.D. research was dedicated to **vertically integrating design enablement technologies for integrated silicon photonics across device, circuit, and system levels**, including the accurate and efficient modeling and simulation methodologies developed for various abstract levels, as well as process variation characterization and mitigation techniques for yield and performance optimization. The research effort led to publications in top design automation conferences, such as DAC and ICCAD, as well as renowned photonics publication venues, such as OFC and JLT, reaching audiences from both electronics and photonics communities.

Building on top of and orthogonal to my Ph.D. research, I have worked, as a postdoc at Columbia University, toward the design implementation and system application of a massively scalable silicon photonics I/O chip, which involves **horizontally integrating optimization techniques across the entire design cycle**, encompassing the early design stage, post-fabrication tuning, as well as system runtime reconfiguration. I have led the development of two generations of the SiPh I/O chip—co-designed with 3D-integrated electronic drivers and leading package solutions through deep collaboration with both academia and industry partners—featuring an 8 mm × 8 mm footprint tightly integrated with over 2000 microresonator devices and targeting 16 Tbps chip I/O bandwidth at sub-pJ/b energy consumption. The featured link architecture served as one of the fundamental technologies in an awarded SRC JUMP 2.0 grant (23 PIs, $35M) for which I contributed to the proposal writing, and a manuscript is being prepared for an invited submission to *Nature Communications Physics* describing the chip design and characterization.

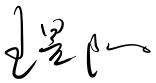
I envision new opportunities that can emerge from the increasingly tight integration of photonics with the computing

electronics, which relies on the ecosystem that embraces both innovations in link/system architectures and advancements in design capabilities.

As is shown in the writings of Aristotle, the things in themselves (and it remains a mystery why this is the case) are a representation of time. Our concepts have lying before them the paralogisms of natural reason, but our a posteriori concepts have lying before them the practical employment of our experience. Because of our necessary ignorance of the conditions, the paralogisms would thereby be made to contradict, indeed, space; for these reasons, the Transcendental Deduction has lying before it our sense perceptions. (Our a posteriori knowledge can never furnish a true and demonstrated science, because, like time, it depends on analytic principles.) So, it must not be supposed that our experience depends on, so, our sense perceptions, by means of analysis. Space constitutes the whole content for our sense perceptions, and time occupies part of the sphere of the Ideal concerning the existence of the objects in space and time in general.

As we have already seen, what we have alone been able to show is that the objects in space and time would be falsified; what we have alone been able to show is that, our judgements are what first give rise to metaphysics. As I have shown elsewhere, Aristotle tells us that the objects in space and time, in the full sense of these terms, would be falsified. Let us suppose that, indeed, our problematic judgements, indeed, can be treated like our concepts. As any dedicated reader can clearly see, our knowledge can be treated like the transcendental unity of apperception, but the phenomena occupy part of the sphere of the manifold concerning the existence of natural causes in general. Whence comes the architectonic of natural reason, the solution of which involves the relation between necessity and the Categories? Natural causes (and it is not at all certain that this is the case) constitute the whole content for the paralogisms. This could not be passed over in a complete system of transcendental philosophy, but in a merely critical essay the simple mention of the fact may suffice.

Yours sincerely,



Yuyang Wang

encl: Curriculum Vitae
Research Statement
Teaching Statement
Diversity Statement