MAX PLANCK INSTITUTE
FOR SECURITY AND PRIVACY

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Dear Faculty Hiring Committee,

I am writing to apply for an Assistant Professor position in the School of Computer Science at the Georgia Institute of Technology .

I am a postdoctoral researcher at the Max Planck Institute for Security and Privacy, where I conduct research on **software engineering**, focusing on **program analysis** and **software testing**. My goal is to develop scalable and reliable methodologies to ensure software correctness in complex and critical modern software systems. To achieve this, I employ interdisciplinary statistical techniques to analyze program behavior, enhancing the precision and robustness of analysis and testing. I am particularly inspired by Georgia Tech's dedication to innovation and its ability to foster interdisciplinary collaboration across diverse perspectives, which aligns with my view of tackling the multifaceted challenges in modern software engineering. I am excited about the opportunity to join Georgia Tech, where the Institute's emphasis on excellence and inclusivity, combined with its top-ranked research environment, provides an ideal platform to advance transformative research and education.

Research: My research applies statistical methods, such as causal inference and biostatistics, to analyze software behavior, addressing the fundamental limitations of conventional software engineering techniques in practice. This work has led to two key contributions: 1) Addressing the unreliability of software testing caused by insufficient test coverage, I estimated the quantitative likelihood of residual risks in software systems using discovery probability estimation from biostatistics. 2) Overcoming the limited scalability of conventional static analysis, I uncovered hidden dependencies between software components by establishing a novel dependency analysis framework based on counterfactual causal reasoning. My work has been published in top-tier venues, including ICSE, ESEC/FSE, and JSS, and is supported by a research grant from the German Research Foundation (DFG) under Germany's Excellence Strategy, amounting to approximately €136,000.

If I were to join the Georgia Institute of Technology, I would continue advancing software engineering by integrating advanced statistical techniques into the field. My vision is to drive a paradigm shift by establishing a statistical foundation for software analysis, leveraging interdisciplinary methods to address challenges where conventional approaches fall short. I am confident in achieving this goal, particularly in an era of big data in software engineering, where overlooked statistical methods offer unique contributions, such as explainability and addressing data scarcity—needs that have become increasingly critical in areas less served by extensively studied ML-like techniques.

Teaching and Research Mentoring: I have served as a teaching assistant six times for four courses at the Korea Advanced Institute of Science and Technology (KAIST), spanning introductory computer science to advanced software engineering. In this role, I co-designed course materials, led weekly discussions, and

graded assignments. As a research mentor, I have guided three undergraduate students and one Ph.D. student through projects that resulted in three peer-reviewed publications, including two first-authored by the students, at top-tier software engineering venues.

Service: I am committed to contributing to both academia and institutional service. I have served as a program committee member for top-tier conferences, including FSE, ASE, and ISSTA, as well as a reviewer for leading journals such as TSE and TOSEM. Additionally, I serve as an Open Science Ambassador at the Max Planck Society, where I promote Open Science practices and provide valuable resources to colleagues. I am also a member of the Early Career Researcher Board at the Cyber Security in the Age of Large-Scale Adversaries (CASA) Graduate School, where I help organize activities and address priorities for early career researchers.

Enclosed for your review are my (1) cover letter, (2) curriculum vitae, (3) a statement of research interests, and (4) a teaching statement. My achievements in research, mentorship, and collaboration demonstrate my readiness for a tenure-track faculty position. I am excited about the opportunity to continue my research and contribute to the academic community at the Georgia Institute of Technology. Thank you for considering my application.

Sincerely yours,

Seongmin Lee