

**Research vision and achievements.** My vision is to enhance cloud security against adversaries through practical and rigorous approaches. To realize this vision, my immediate research focus has been (i) software compartmentalization, which involves dividing programs into isolated components, and (ii) confidential computing, particularly in terms of hardening it against side-channel attacks. Toward (i), during my Ph.D., I developed an approach for software compartmentalization with instructions introduced in modern CPUs, which earned the Distinguished Paper Award at the ACM CCS 2023 and the Korean government's BK21 Research Scholarship in 2024. For (ii), I developed frameworks for practically addressing side-channel attacks using operating system primitives and emerging hardware acceleration. These projects were featured at the IEEE S&P 2025 and ACSAC 2025, highly regarded security conferences.

At UBC, as a postdoctoral researcher, I aim to continue working toward realizing the vision of enhancing cloud security, building upon my experience to tackle new challenges arising from the tension between security and usability. Under the guidance of Aastha Mehta, I will pursue my research proposal, which aims to tame security threats within operating systems and utilize them to enhance the security and functionality of confidential computing. UBC is an ideal location for conducting this research due to its concentration of diverse expertise. In particular, I see strong connections with the work on system provenance by Margo Seltzer and Thomas Pasquier, as well as with application-aware memory management by Alexandra Fedorova. I also expect collaborations with Mohammad Shahradd, whose expertise in cloud computing will help scale my work in a distributed manner. My work can also benefit other fields that frequently handle private information in the cloud; for instance, [security compliance and cybersecurity](#) has always been the challenges for the Faculty of Medicine. To address them, I plan to initiate interdisciplinary research collaborations to develop secure cloud computing solutions for medical applications.

**Leadership and community engagement.** A good researcher is an outreaching one; as Richard Hamming observed in [his lecture](#), the scientists who leave doors open often make the most impactful contributions. During my doctoral studies, I independently initiated international collaborations beyond my immediate connections. This led to ongoing research projects with researchers at UBC and CISPA in Germany. At the same time, I contributed to the broader field through service on artifact evaluation and poster committees at major security conferences, which earned me the Noteworthy Reviewer Recognition at USENIX Security 2025. I also engaged in open-source work, participating in security discussions and contributing features to the Unikraft unikernel, including [CPU security feature support](#) and [hardware support](#). These outreach efforts expanded my horizons and built long-lasting connections that extended beyond research. I am eager to continue my outreach trajectory at UBC; its [collaborative, respectful, and inclusive research culture](#) being built deeply resonates with me.

**Teaching.** I believe that the most effective learning is achieved through interactive learning platforms. As a teaching assistant for Computer Security and System Programming at SKKU, I developed and maintained [ctf.skku.edu](#), a platform where students can participate in Capture-the-Flag (CTF) events modeled after real-world cybersecurity competitions. This game-like approach to teaching security not only ignited the curiosity of many students but also motivated several of them to join my lab. Maintaining the platform also strengthens my understanding of security concepts. I will bring my experiences in designing interactive cybersecurity learning to UBC's teaching mission. I plan to achieve this with the help of UBC's own [MapleBacon](#) CTF team. I will also incorporate CTF events into cybersecurity courses such as [CPSC 538M: Systems Security](#), where I have already served as a guest lecturer.

Another powerful tool in teaching is visualization, which helps students connect abstract concepts to intuitive understanding. At UBC, I plan to expand my visualization skill set, building on my experiences developing [video games](#) and visualizing [security algorithms](#). I aim to visualize abstract security concepts, such as compartmentalization and side channels, making the learning process more engaging. I will collaborate with visualization researchers at UBC, including Ivan Beschastnikh, who has expertise in

visualizing distributed systems, and Tamara Munzner, a leading expert in visualization. In addition to teaching, I will also help students create visualizations for their research projects to widen their reach.

# 1 Appendix: Guide

Address the following:

- Describe your research experience and relevant work experiences
- Describe your personal qualities through other activities such as athletic/artistic achievements, leadership activities, community engagements, volunteerism, etc.
- Describe your career aspirations
- Include details concerning what teaching, if any, you will be doing and how it is related to your work

## 2 Appendix: Evaluation criteria

The search is for candidates whose work is beyond “excellent” and whose research is convincingly groundbreaking.

Excellence in scholarly work and independent research - 60%

- quality of contributions to research to date
- scholarships and awards held
- duration of graduate studies, taking into account the nature of the program and relevant personal circumstances
- determination and ability to complete projects within an appropriate period of time
- critical thinking, judgment, and initiative
- resilience and flexibility in adjusting research plans, particularly in response to COVID-19 impacts

Quality of proposed research project - 30%

- originality in developing a research agenda
  - merit, potential significance, clarity, and feasibility of the proposed project
  - relevance of applicant’s work experience and academic training to the field of proposed research
  - suitability and quality of research environment (proposed supervisor, facilities, support of academic unit)
- Personal qualities of the applicant - 10%

Personal qualities of the applicant - 10%

- character: integrity, collegiality, and respect for others
- communication skills
- Preference will be given to applicants who have not already held a postdoctoral award or fellowship.
- leadership abilities as demonstrated by employment, athletic/artistic achievements, community engagement, volunteering, etc.