TVs, mobile phones and all other products that Samsung makes – all these products utilize the circuits that I improve as a DFR (Design For Reliability) engineer in Samsung Electronics. I find they are even fulfilling for consumers not only in South Korea but in Alaska. I am enabling solutions ranging from performance to reliability by providing a more stable design environment. As Samsung fabrications operate 24 hours a day, I stayed up all night to acquire the proper data and solutions. This is because we should guarantee our commercial devices to maintain their operating specifications even if they are in severe environments (jungle or desert).

By doing so, I was recognized for my contributions to work, so I could get qualified for promotion to a senior engineer in only six years. I am still hungry, however, because we still have quality issues which may lead to serious personal injuries. Above all, the paradigm is shifting to the Era of Smart Everything(Artificial Intelligence, Internet Of Things, Autonomous flying cars) and semiconductors play the main role in every such product.

This is why I admire going to academia. Samsung is absolutely a competitive company, and I learned a lot for close to seven years. However, without clear ROI (Return On Investment), ideas that are creative but not profitable are hard to be realized. Moreover, at least from my point of view, the more we pursue PPA (main characteristics for device technology-Power, Performance, and Area), I recognize that the importance of reliability and robustness is increasingly overlooked. I felt limited to invest my time and resources to research and resolve issues.

I would like to intervene especially at the beginning of the design level. As nano-scale technology becomes more complicated, the challenges for modeling, methods, and tools are increasing. Therefore, I would like to do research on more accurate and faster design methodologies not only in terms of reliability but also in the design performance. Leveraging my work experience in transistor-level aging-aware design, I hope to extend my knowledge by seeking a solution to intrinsic and extrinsic failures and eventually enhance reliability and robustness of the product.

Not only did I acquire knowledge about semiconductors in general, but I also experienced the latest technologies for real products while working at Samsung. My team published a paper named “Aging-aware design verification methods under real product operating conditions” in the International Reliability Physics Symposium (IRPS). I contributed to implement models and tools to allow aging-aware simulation. To be more specific, we had issues that non-operating states, such as power down mode, caused unintended device degradation and aging-induced mismatching of the circuit. I implemented degradation modeling that can be easily missed but can cause significant failures: off-state HCI model, off-state TDDB model, and HCI body bias model. Through this experience, I developed a habit of looking at things from a different point of view and examining even the parts that were taken for granted.

The strong field experience is one of my strengths. I believe it is not the best choice to make products having excessive reliability. To increase performance without taking risk of failure, I developed a methodology using the short time TDDB reliability data by collaborating with the device reliability team. For instance, because efuse cells are highly biased to program data, they are not competitive with traditional analysis methods. Through new methods, I was able to increase their lifetime and meet customers’ needs by realizing an excessive margin. Such experience made me improve skills to identify needs and derive realistic plans no matter what kind of research I do.

I believe my work experience has broadened my perspective in the field. I have learned the importance of finding a balance between performance and reliability. Not only limited to reliability, I am also interested in VLSI design and device technologies collaborating with data analysis and machine learning. Eventually, I want to enable a solution where simulation-based analysis provides data to discuss both aspects (performance and reliability) without having to wait for tedious tests.

I have various research ideas that I want to study in your school, because a wide variety of factors from transistors to circuits make circuit reliability an extremely difficult topic. Beyond using the existing modeling method, if the aging effect can be observed through in-situ testing, not only intrinsic but also extrinsic modeling can be considered. Not only analog blocks, I think aging-aware STA, based on machine learning modeling, can be a way to verify digital blocks. Moreover, as a product's applications are getting complexed depending on different users, I want to do research on how to increase the speed of verifying all the scenarios.

I learned how to overcome when curveballs may be thrown in life. I won an amateur squash competition rehabilitating for more than a year after breaking ankle ligaments. I thought I was an introvert and afraid of change, but by participating in study groups at University of Connecticut, I found that I could enjoy new environments and like to get along with different people. I believe that this experience will give me strength to overcome the possible adversities I will face not only in my graduate years but also in my distant future. I received so much from society because I was fully sponsored by Korea Student Aid Foundation (KSAF) and I got an honors scholarship for academic excellence. Now I want to return the grace that I received through my life.

In conclusion, I am confident that I can do better with many renowned professors in your school by collaborating with industry. After finishing graduate programs and receiving Ph.D, I would like to go back to industry and contribute myself to overcome challenges. I want to dream of benefiting society with great professors and colleagues in such a place.