To whom it may concern,

I am writing to recommend, in the strongest possible terms, [name], for the Ph.D. program at your institution. [name] is a 2nd year student in the Computer Science Master's program at [university], currently conducting research on neural information retrieval (IR) under my supervision at the [research lab], a world leading research lab in IR. Their enthusiasm for research, combined with exceptional technical skills, and unwavering dedication to their project make [name] an ideal candidate for a top Ph.D. program.

[name] reached out to me last year in the beginning of Fall [year] with the intention of working on a research project related to representation learning for IR for their Master's thesis. [name] has published three papers in diverse areas of research, which clearly demonstrates their abilities to identify important research problems, carefully review the literature, mindfully propose novel solutions, and accurately evaluate their solutions using a combination of standard and innovative evaluation methodologies. I have worked with numerous Master's students in the past in different capacities and [name] is clearly a young rising star among all. Let me go into more details to better demonstrate their extraordinary abilities in conducting research.

In our initial meetings, I pointed them to a few recent papers in the literature and met with them for a few brainstorming meetings, and they quickly came up with an interesting, challenging, and important problem which is understudied: learning accurate query and document representations for search through efficient and effective negative sample generation. This is an extremely important research direction with real-world applications in search engines, question answering systems, and recommender systems. Optimizing ranking models require efficient and effective negative document selection. Existing machine learning models for ranking select negative samples from the collection. [name] proposed to improve this negative sample selection process by generating (instead of selecting) some negative instances. This is a very fresh perspective to such an important and well-studied problem that one can barely see in even most senior Ph.D. students, let alone a MS student who just started their graduate degree. I was extremely impressed by their intellectual abilities. Together another MS student in my group, they submitted a short paper to SIGIR (the flagship and most prestigious conference in the field of IR) in February [year]. This paper got accepted with very positive feedback (three strong accepts).
In this paper, [name] was involved in developing ideas, shaping the problem, analyzing the results, and writing the paper. Since then, they have fully focused on negative instance generation, which is tightly coupled with ideas introduced by generative adversarial networks (GANs). However, the discrete and sparse nature of natural language makes it quite challenging

for GAN models to perform effectively. [name] has recently found a way to solve this issue. Instead of generating negative documents they focus on generating dense representations for negative instances that can be used for ranking optimization. This brilliant idea automatically solves most of the issue we have been facing in this research.

[name] has also applied for the NSF Graduate Research Fellowships Program (GRFP) with a proposal on multi-modal question answering. I looked at their proposal and I believe their proposal for NSF GRFP is quite impressive. The proposed problem has a lot of technical challenges (i.e., significant intellectual merits) and more importantly, it has various applications in real-world. [name] proposes to work on context-aware question answering, where the context is an image (and text). This is a challenging problem and requires significant progress in multi-modal representation learning. The current MS project that [name] is working on can be applied to their proposed task too. The proposed project benefits from very important broader impacts. For instance, visually impaired users can take advantage the proposed technology to ask questions about the environments around them. This can completely change their abilities and can empower them throughout their lives. In addition, this can be used in various educational tools for young students who want to learn about things they observe in images in their textbooks.

To conclude, [name] is an extremely self-motivated and dedicated student who has already demonstrated their research abilities by publishing at a top venue. [name] has keen insight in selecting important problems to work on and the maturity to bring ideas to fruition. I have no doubt that they will be a successful Ph.D. candidate and researcher. Their proposed project is inspiring, important, and impressive. I highly recommend them for top Ph.D. programs with no reservation. Please do not hesitate to contact me with your questions.

Sincerely,
[name]