I am applying to the PhD Program at University of Toronto's Department of Statistical Sciences. My goal is to prepare for a research career in statistics, working on foundational issues related to the application and validation of modern statistical methodologies.

I have submitted two papers in scientific journals related to Bayesian nonparametrics and published one short paper in our Canadian mathematics student journal (the *Notes from the Margin*). The latter is about applications of convergence in Sobolev norms to some aspects of topological data analysis. This short paper, later complemented with a poster that won a best poster award at the Canadian Statistics Student Conference (2018), has also been the subject of a talk at the *MLBytes Speaker Series* (Duke University). My paper *Bayesian Nonparametrics for Directional Statistics* provides a framework of density estimation on compact metric space using sieve priors together with an asymptotic theory, and applies this framework in the context of directional statistics to improve upon known models. I have talked about this work at University of Sherbrooke, at University of Quebec at Montreal and while visiting Texas A&M University. My last paper is a note submitted as a correspondence to the IEEE Transaction on Information Theory. It provides optimal upper bounds on f-divergences in terms of the total variation distance and likelihood ratio extremums, which is of interest in Bayesian nonparametrics.

Recently, I have been working on probable bounds for posterior concentration in finite samples, building upon the framework of Bhattacharya, Pati and Yang (2019)[1]. Moreover, I am collaborating with Professor Debdeep Pati from Texas A&M University this winter on fast learning rates for Bayesian nonparametric plug-in classifiers.

The unifying theme in my research has been the study of the mechanisms of Bayesian inference and the provision of meaningful results that come with statistical guarantees. A PhD at University of Toronto would now give me the opportunity to broaden my reach beyond classical Bayesian statistics. I am especially interested in applying my background to the study of more scalable methods that are suitable to complex and high-dimensional data. Many problems in this broad area are fascinating to me. One of them, related to my current work, is about topological consistency for surface estimation algorithms. The "complexity" of the data in this context stems from an underlying manifold structure. While there has been significant progress recently, for instance through density ridge estimation, there are still challenges associated with obtaining minimax convergence rates and scaling to high dimension. While this exemplifies one of my current projects, I expect a PhD at Toronto to bring me new ideas and directions. Some of my other interests can be found on my personal blog mathstatnotes.wordpress.com and on my professional webpage olivierbinette.ca.

I would love University of Toronto to be the institution where I take my next big step forward. This would enable me to consolidate my abilities as a statistician and advance my research under the supervision of world-leading scholars.

[1] Bhattacharya, A., Pati, D., & Yang, Y. (2019). Bayesian fractional posteriors. *The Annals of Statistics*, 47(1).