

# Lang Liu

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## Contact Information

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## Current Address

6400 NE Radford DR APT 627  
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## Education

**University of Washington, Seattle** Sep. 2017 – Present  
Ph.D. in Statistics (Machine Learning and Big Data Track)  
Advisor: [Zaid Harchaoui](#)

**Tsinghua University, Beijing** Sep. 2013 – Jun. 2017  
B.S. in Mathematics and Applied Mathematics  
Thesis: Bayesian Structure Learning for Stationary Time Series

## Preprint

- **Lang Liu**, Joseph Salmon, Zaid Harchaoui (2019). Score-based change detection for gradient-based learning machines. Manuscript. Available at [this URL](#).
- **Lang Liu**, Fabian Moerchen. Text-based search by a deep query-entity joint embedding model. Working paper.

## Software

*Autodetect*, a package of a gradient-based change detection method for monitoring a learning machine as it learns from a continuous, possibly evolving, stream of data. Available at <https://github.com/langliu95/autodetect>.

## Research Experience

**Gradient-based monitoring of learning machines** Jul. 2018 – Mar. 2019  
Adviser: Zaid Harchaoui  
Collaborator: Joseph Salmon

- Developed a generic score-based change detection method for monitoring learning machines within a differentiable programming framework.
- Established theoretical guarantees for the proposed approach.
- Illustrated the versatility of the method on machine learning models ranging from text topic models to time series models.

**Bayesian structure learning for stationary time series** Jul. 2016 – Sep. 2016  
Advisers: Emily Fox, Nicholas Foti

- Designed a complex multi-frequency extension of Birth-Death MCMC algorithm (CBDMCMC) to learn graphical structure of high-dimensional stationary time series.
- Proposed a novel sampler for complex G-Wishart distribution by blocked Gibbs sampling.
- Implemented the CBDMCMC algorithm in C++ and integrated it in the R package BDgraph.

**Nonparametric  $K$ -sample test** Dec. 2015 – Jul. 2017  
Adviser: Xuegong Zhang

- Proposed a scalable divergence-based statistic for  $K$ -sample test problem by segmentation.
- Demonstrated significant improvements compared to other tests in detecting heteroscedasticity and nonlinearity.

<b>Professional Experience</b>	<b>Applied Scientist Intern</b> , Music ML Group, Amazon Jun. 2019 – Sep. 2019 Manager & Mentor: Fabian Moerchen & Brandyn Kusenda <ul style="list-style-type: none"> <li>• Worked on developing a deep track-query joint embedding model to search for relevant music for infrequent queries.</li> <li>• Collected, analyzed, and preprocessed data for modeling using PySpark.</li> <li>• Built a joint embedding model upon pre-trained query embeddings and track embeddings.</li> <li>• Demonstrated significant improvements compared to the baseline.</li> </ul>
<b>Honors and Awards</b>	Second Prize in the Mathematical Contest in Modeling, <i>CUMCM</i> 2016 Academic Excellence Award, <i>Department of Mathematics, Tsinghua University</i> 2015 Excellent Volunteer, <i>Learning and Development Center, Tsinghua University</i> 2015 Honorable Mention in the Mathematical Contest in Modeling, <i>COMAP</i> 2015 First Prize in the Math Olympiad, <i>Hunan Province, China</i> 2011 & 2012
<b>Teaching</b>	Teaching Assistant, <i>University of Washington</i> <ul style="list-style-type: none"> <li>• STAT 538: Statistical Learning 2019 &amp; 2020</li> <li>• STAT 311: Elements of Statistical Methods 2017 &amp; 2018</li> </ul> Tutor for mathematics, <i>Tsinghua University</i> 2015
<b>Extracurricular Activities</b>	Bassist in a class band, <i>Tsinghua University</i> Mar. 2016 – Apr. 2017 Captain of department volleyball team, <i>Tsinghua University</i> Mar. 2015 – Jan. 2016 Organizer of Psychology Reading Group, <i>Tsinghua University</i> Mar. 2015 – Jun. 2015 Guitarist in the annual student festival, <i>Tsinghua University</i> Mar. 2013 – Apr. 2013
<b>Skills</b>	Python, R, C++, MATLAB, Excel