

# Seojin Bang

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## PROFILE

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Broad research experience in machine learning and deep learning. Solve real-world problems. Graduate researcher in CS with math/stat backgrounds.

## EDUCATION

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01/15/2016	<b>The School of Computer Science, Carnegie Mellon University</b>	
– 08/15/2020	PhD candidate in Computational Biology	Advisor: Wei Wu
08/28/2013	<b>University of Connecticut</b>	
– 08/28/2015	MS in Statistics	Advisor: Haim Bar
03/01/2011	<b>Seoul National University, Korea</b>	
– 02/26/2013	MS in Statistics	Advisor: Taesung Park
03/01/2006	<b>Sungkyunkwan University, Korea</b>	
– 08/25/2010	BS in Mathematical Education · BE in Statistics	

## RESEARCH EXPERIENCE

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### Interpretable Machine Learning 2018 – 2020

Research Intern advised by Dr. Pengtao Xie

AI/ML Solution Team at Petuum, Pittsburgh, PA, USA

- (Worked as an intern at Petuum between May and Dec 2018. Worked as a student at Carnegie Mellon University from 2019.)
- Developed a system-agnostic interpretable ML approach using neural networks using information bottleneck principle.
- Developed an approach to improve an out-of-sample prediction of epitope-TCR binding using an interpretable model.
- Developed a pytorch based software: **VIBI** ([github.com/SeojinBang/VIBI](https://github.com/SeojinBang/VIBI)) and **TCR** ([github.com/SeojinBang/TCR](https://github.com/SeojinBang/TCR))
- A paper submitted to *[blinded]*

### Multimodal/Multiview Machine Learning for Asthma Subtype Identification 2015 – 2020

Research Assistant advised by Dr. Wei Wu

Carnegie Mellon University, Pittsburgh, PA, USA

- Developed a multiple kernel k-means clustering approach that is robust against adversarial features.
- Identified variable asthma subtypes by combining multiview clinical data to help clinicians make precision therapy.
- Developed an R-package: **MKKC** ([github.com/SeojinBang/MKKC](https://github.com/SeojinBang/MKKC))
- Three papers published in *AJRCCM*, *IEEE BIBM* and *Proteomes*, and a paper submitted to *[blinded]*.

### Machine Learning for Natural Language Processing 2018 – 2020

Graduate Researcher

Carnegie Mellon University, Pittsburgh, PA, USA

- Developed an ontology-based neural network model for patient need detection from an online ovarian cancer discussion forum. A paper submitted to *[blinded]*.
- Analyzed to detect attackable sentences in arguments for successful persuasion using online discussions from the Change-MyView (CMV) subreddit. A paper submitted to *[blinded]*.

### Interpretability and Robustness in Machine Learning 2019

Visiting Graduate Student advised by Dr. Adrian Weller

ML Group at University of Cambridge, UK

- Investigated the relationship between interpretability and robustness of machine learning and deep learning models.
- Developing a knowledge guided interpretable ML model using the posterior regularization.

### Statistical Modeling of Sparse Gene Networks 2013 – 2015

Research Assistant advised by Dr. Haim Bar

University of Connecticut, Storrs, CT, USA

- Developed a statistical mixture model for better estimating sparse gene network.
- Helped to release an R-package: **edgefinder**
- Submitted a paper to *Statistics in Medicine*.

## Statistical Approaches for Biomedical Problems

2012 – 2013

*Research Assistant and Scientist advised by Dr. Taesung Park*

*Seoul National University, Korea*

- Developed a joint feature selection method using the elastic-net regularization to high-dimensional data.
- Deployed a time-dependent survival model to identify subtypes of intraductal papillary mucinous neoplasm.
- Published two papers in *IEEE BIBM* and *Pharmacogenetics and genomics*.

## OTHER EXPERIENCE

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### Professional Experience

2020	Reviewer of <i>ACM CHIL</i> , <i>ISMB</i>
2019	Reviewer of <i>NeurIPS ML4H Workshop</i> , <i>IEEE Access</i> , and <i>IEEE TNNLS</i>
2018	Reviewer of <i>ACM BCB</i>
2018	Admission Committee at Computational Biology Department, Carnegie Mellon University
2012	Program Committee of two workshops held at Seoul National University and a conference of the Korean Statistical Society
2012 – 2018	Teaching Assistant at Carnegie Mellon University, University of Connecticut and Seoul National University

### Leadership Experience

2017 – 2018	Led the communication team in Korean Graduate Student Association to establish and maintain relationship with ~30 companies seeking to advertise events/job openings.
2016 – 2019	Led the squash team of 35 CMU students. Organized weekly training and trained beginners. Applied and got a financial support from KGSA.

## TECHNICAL STRENGTHS

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<b>Computer Languages</b>	<b>Python, R, C/C++, MATLAB, Bash, HTML</b>
<b>Library &amp; Others</b>	<b>Pytorch, Tensorflow, Caffe, Keras, Git, LaTeX</b>

## HONORS AND AWARDS

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2018	<b>The Center for Machine Learning and Health Fellowships in Digital Health</b>
2013	The Korean Statistical Society Paper Awards (3rd Place)
2012	The Korean Statistical Society Poster Awards (1st Place)
2006 – 2010	<b>National Science and Engineering Undergraduate Scholarship</b>

## PAPERS

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- [1] **Explaining a black-box using deep variational information bottleneck approach.**  
preprint *arXiv:1902.06918*, submitted, 2020.  
Bang, Seojin and Xie, Pengtao and Lee, Heewook and Wu, Wei and Xing, Eric.
- [2] **Robust multiple kernel k-means clustering using min-max optimization.**  
preprint *arXiv:1803.02458*, submitted, 2020.  
Bang, Seojin and Yu, Yaoliang and Wu, Wei.
- [3] **Kw-han: Knowledge infused hierarchical attention network for enhancing interpretability.**  
preprint, under review, 2020.  
Jang, Hyeju and Bang, Seojin.

- [4] **Detecting attackable sentences in arguments.**  
*preprint, under review*, 2020.  
 Jo, Yohan and **Bang, Seojin**.
- [5] **Identification of epitope-tcr binding using a generative adversarial network model.**  
*ICML WCB*, 2020.  
**Bang, Seojin** and Lee, Heewook.
- [6] **Dropout prediction over weeks in moocs via interpretable multi-layer representation learning.**  
*AAAI AI4EDU*, 2020.  
 Jeon, Byungsoo\* and Park, Namyong\* and **Bang, Seojin\*** (co-first).
- [7] **Phased-lstm based predictive model for ehra with complex missing patterns.**  
*preprint, <https://www.cs.cmu.edu/~epxing/Class/10708-17/project-reports/project8.pdf>*, 2019.  
**Bang, Seojin** and Yang, Yang and Wang, Yuchuan.
- [8] **A mixture model to detect edges in sparse co-expression graphs.**  
*Statistics in Medicine, under review, preprint arXiv:1804.01185*, 2019.  
 Bar, Haim and **Bang, Seojin**.
- [9] **Multiview cluster analysis identifies variable corticosteroid response phenotypes in severe asthma.**  
*American Journal of Respiratory and Critical Care Medicine, (IF 16.49) Highlighted Articles*, 2019.  
 Wu\*, Wei and **Bang\*** (co-first), **Seojin** and Bleecker, Eugene and Castro, Mario and Denlinger, Loren and Erzurum, Serpil and Fahy, John and Fitzpatrick, Anne and Gaston, Ben and Hastie, Annette and Israel, Elliot and Jarjour, Nizar and Kerr, Sheena and Levy, Bruce Meyers, Deborah and Moore, Wendy and Peters, Michael and Phipatanakul, Wanda and Sorkness, Ronald and Wenzel, Sally.
- [10] **Phosphoproteomic analysis of the amygdala response to adolescent glucocorticoid exposure reveals g-protein coupled receptor kinase 2 as a target for reducing motivation for alcohol.**  
*Proteomes*, 6(4), 2018.  
 Bertholomey, Megan L. and Stone, Kathryn and Lam, TuKiet T. and **Bang, Seojin** and Wu, Wei and Nairn, Angus C. and Taylor, Jane R. and Torregrossa, Mary M.
- [11] **Naïve bayes ensemble: A new approach to classifying unlabeled multi-class asthma subjects.**  
 In *IEEE International Conference on Bioinformatics and Biomedicine*, 2016.  
**Bang, Seojin** and Wu, Wei.
- [12] **Joint selection of snps for improving prediction in genome-wide association studies.**  
 In *IEEE International Conference on Bioinformatics and Biomedicine. Workshops*, 2012.  
**Bang, Seojin** and Kim, Yong-Gang and Park, Taesung.
- [13] **Ethnic variability in the allelic distribution of pharmacogenes between korean and other populations.**  
*Pharmacogenetics and genomics*, 22(12), 2012.  
 Kim, In-Wha and Im Kim, Kyung and Chang, Hyeu-jin and Yeon, Bora and **Bang, Seojin** and Park, Taesung and Kwon, Ji-sun and Kim, Sangsoo and Oh, Jung Mi.