Amir Asiaee Taheri

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## Academic Appointments

2017–present **Postdoctoral Fellow**, *Mathematical Biosciences Institute* and *Department of Biomedical Informatics*, The Ohio State University.

## Education

2017 **Ph.D. in Computer Science**, *University of Minnesota*, Minneapolis, MN, USA.
- Thesis Topic: *High Dimensional Learning with Structure Inducing Constraints and Regularizers*
- Adviser: Professor Arindam Banerjee

2010 **M.S. in Artificial Intelligence and Robotics**, *University of Tehran*, Tehran, Iran.
- Thesis Topic: *Studying the Effect of Structure on Spreading Process in Complex Networks*
- Adviser: Professor Masoud Asadpour

2007 **B.S. in Computer Engineering - Software**, *University of Tehran*, Tehran, Iran.

## Research Interests

- Data Science
- Cancer Genomics
- Computational Biology
- Bioinformatics
- Machine Learning
- High-Dimensional Statistics
- Causal Inference
- Biostatistics

## Honors & Awards

- Student Travel Award, SIAM International Conference on Data Mining, SDM 2016
- Student Travel Award, Uncertainty in Artificial Intelligence, UAI 2015
- University of Minnesota ECE Department Fellowship, Fall of 2010
- Awarded M.Sc. position by the Office of Gifted Students, 2007
- Top 0.1% in National University Entrance Exam among ∼500,000 participants, Iran 2003

## Publications

### Peer-reviewed Articles

[1] **Amir Asiaee***, Zachary B. Abrams*, Samantha Nakayiza, Deepa Sampath, and Kevin R. Coombes. Explaining gene expression using twenty-one micrornas. *Journal of Computational Biology*, Forthcoming, 2020 (*Equal contribution).

[2] **Amir Asiaee**, Samet Oymak, Kevin R. Coombes, and Arindam Banerjee. Data enrichment: Multi-task learning in high dimension with theoretical guarantees. In *Adaptive and Multi-Task Learning Workshop at ICML 2019*, 2019.

[3] Min Ho* Cho, **Amir Asiaee***, and Sebastian Kurtek. Elastic statistical shape analysis of biological structures with case studies: A tutorial. *Bulletin of Mathematical Biology*, 81(7):2052–2073, 2019.

[4] Zachary B. Abrams, Mark Zucker, Min Wang, **Amir Asiaee Taheri**, Lynne V. Abruzzo,

and Kevin R. Coombes. Thirty biologically interpretable clusters of transcription factors distinguish cancer type. *BMC Genomics*, 19(1):738, Oct 2018.

[5] **Amir Asiaee T.**, Hardik Goel, Shalini Ghosh, Vinod Yegneswaran, and Arindam Banerjee. Time series deinterleaving of dns traffic. In *1st Deep Learning and Security Workshop*, 2018.

[6] **Amir Asiaee T.**, Soumyadeep Chaterjee, and Arindam Banerjee. High dimensional structured estimation with noisy designs. In *16th SIAM International Conference on Data Mining (SDM)*, pages 801–809. SIAM, 2016.

[7] Golshan Golnari*, **Amir Asiaee T.***, Arindam Banerjee, and Zhi-Li Zhang. Revisiting non-progressive influence models: Scalable influence maximization in social networks. In *31st Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 316–325, 2015 (*Equal contribution).

[8] **Amir Asiaee T.**, Mohammad Afshar, and Masoud Asadpour. Influence maximization for informed agents in collective behavior. In *Distributed Autonomous Robotic Systems*, pages 389–402. Springer, 2013.

[9] **Amir Asiaee T.**, Mariano Tepper, Arindam Banerjee, and Guillermo Sapiro. If you are happy and you know it... tweet. In *21st ACM international conference on Information and knowledge management (CIKM)*, pages 1602–1606. ACM, 2012.

### Submitted and Preprints

[1] **Amir Asiaee**, Zachary B Abrams, Samantha Nakayiza, Deepa Sampath, and Kevin R Coombes. Identification and comparison of genes differentially regulated by transcription factors and miRNAs. 2019. bioRxiv:803643.

[2] **Amir Asiaee**, Samet Oymak, Kevin R Coombes, and Arindam Banerjee. High dimensional data enrichment: Interpretable, fast, and Data-Efficient. Under review in *SIAM Journal on Mathematics of Data Science*. arXiv:1806.04047.

[3] Zachary B. Abrams, Anoushka Joglekar, Gregory R. Gershkowitz, Sara Sinicropiyao, **Amir Asiaee**, David P. Carbone, and Kevin R. Coombes. Personalized transcriptomics: Selecting drugs based on gene expression profiles. Under review in *PLOS Computational Biology*.

### Articles in Progress

[1] Phillip B. Nicol, Courtney Deaver, Oksana Chkrebtii, Kevin R. Coombes, Subhadeep Paul, and **Amir Asiaee**. Disjunctive bayesian network infers cancer progression.

[2] **Amir Asiaee**, Phillip B. Nicol, Kevin R. Coombes, Courtney Deaver, Oksana Chkrebtii, Subhadeep Paul, and Amanda E. Toland. Inferring progression trajectory of melanoma.

[3] **Amir Asiaee**, Kevin R. Coombes, Melanie Davis, and Erin Hertlein. High throughput screening of drug combination with single doses.

## Talks & Posters

### Talks

2019 Nov. *Searching for Effective Combination Cancer Therapy Using Single Doses*, MBI Seminar, Columbus, OH

2019 Nov. *Disjunctive Bayesian Network Infers Cancer Progression Network*, Evolutionary Dynamics in Cancer Workshop, MBI, Columbus, OH

2018 Oct. *Inferring Mutations Order from Cross-sectional Cancer Data*, MBI Seminar, Columbus, OH

2018 Mar. *Generalized High Dimensional Data Sharing with Application*, MBI Seminar, Columbus, OH

### Posters

2018 Oct. *Precision Cancer Treatment with High Dimensional Data Enrichment*, Nature Conference on Big Data and Cancer Precision Medicine, Boston, MA

2018 May. *Precision Cancer Treatment with High Dimensional Data Sharing Model*, Stanford Conference on Big Data in Precision Health, Stanford, CA

2015 Jul. *Revisiting Non-progressive Influence Models: Scalable Influence Maximization in Social Networks*, 31st Conference on Uncertainty in Artificial Intelligence, Amsterdam, Netherlands

2012 Oct. *If You are Happy and You Know It... Tweet*, 21st Conference on Information and Knowledge Management, Maui, HI

## Research Experience

### Postdoctoral Fellowship - Ohio State University, Columbus

2018–present **Determining role of microRNA in gene regulation across human tissues.**.

Studying the role of microRNA in gene regulation by causal inference methods using TCGA and GTEx datasets to understand the downstream effect of microRNA based targeted cancer therapies.

- *Collaborators:* Prof. Kevin Coombes and Prof. Deepa Sampath
- *Theory:* Causal Inference
- *Implementation:* R

2018–present **Inferring the order of mutation in melanoma from cross-sectional data**.

Using a population of melanoma tumor data and tools from Bayesian networks to infer the most probable cancer progression network.

- *Collaborators:* Prof. Kevin Coombes and Prof. Amanda Toland
- *Theory:* Bayesian Network
- *Implementation:* Python

2017–present **Biomarker detection for cancer drug-sensitivity**.

Leveraging tools from high-dimensional statistics to predict responses of lung cancer patients to different drugs and detecting relevant genetic markers using genetic and epigenetic information of 150 lung cancer cell lines and their response to 35 drugs.

- *Collaborators:* Prof. Kevin Coombes
- *Theory:* High-dimensional data enrichment
- *Implementation:* R

2017–present **Finding combination therapy for Acute Myeloid Leukemia**.

Investigating the efficacy and potency of combinations of some experimental drugs with more than 700 approved drugs in treating AML using the dose-response data of *only* one drug concentration.

- *Collaborators:* Prof. Kevin Coombes and Dr. Erin Hertlein
- *Theory:* Newman test
- *Implementation:* R

### Research Assistantship - University of Minnesota, Minneapolis

2017–2018 **Structured high-dimensional data sharing model**.

We propose a fast algorithm to exploit the given grouping of samples in high-dimensional regime and learn per group differences for a given prediction task.

- *Collaborators:* Prof. Arindam Banerjee and Prof. Samet Oymak
- *Theory:* High-dimensional statistics
- *Implementation:* R

2016–2018 **Fine-grained analysis of malware domain groups**.

We propose to leverage recent advances in large-scale machine learning algorithms to develop novel analytics that can uncover previously unknown malicious domains in massive streams of DNS resolution traffic.

- *Collaborators:* Prof. Arindam Banerjee, Dr. Shalini Ghosh, and Dr. Vinod Yegneswaran
- *Theory:* Deep learning, LSTM
- *Implementation:* TensorFlow and Python

2015–2016 **Structured high dimensional linear regression with error-in-variables**.

We developed efficient algorithm for estimating linear regression parameter, under the assumption that it is structured (i.e., sparse, group sparse, etc.) and the observations are corrupted with noise.

- *Collaborators:* Prof. Arindam Banerjee and Dr. Soumyadeep Chaterjee
- *Theory:* High-dimensional statistics
- *Implementation:* MATLAB

2012–2015 **Influence maximization in social networks**.

We propose a new non-progressive model for social influence and provided efficient algorithm to find most influential individuals.

- *Collaborators:* Prof. Arindam Banerjee, Prof. Zhi-Li Zhang, and Dr. Golshan Golnari
- *Theory:* Random walks, submodularity
- *Implementation:* MPI for Python

2011–2012 **Twitter sentiment analysis**.

Using supervised learning techniques along with compressed sensing, we predict if a tweet is positive, negative or neutral about a given topic of interest.

- *Collaborators:* Prof. Arindam Banerjee, Prof. Guillermo Sapiro, and Dr. Mariano Tepper
- *Theory:* Compressed Sensing
- *Implementation:* Python and MATLAB

### Research Internship - Technicolor Research Center, Palo Alto

2013 Summ. **Modeling electro-dermal signal**.

We model audience responses to video content through an implicit biometric feedback, electro-dermal activity. The engagement of a viewer is the hidden switch variable that generates the observed continuous dermal signal.

- *Collaborators:* Dr. Fernando Silveira
- *Theory:* Switching auto-regressive process
- *Implementation:* MATLAB

### M.S. Thesis - University of Tehran, Tehran

2008–2010 **Influence maximization by changing the network structure**.

Using social influence models we try to find the best set of links to add to a network to facilitate the spreading process.

- *Collaborators:* Prof. Masoud Asadpour and Dr. Mohammad Afshar
- *Theory:* Graphical games, submodularity
- *Implementation:* MATLAB

### Software Engineering Internship - Iran Telecommunication Research Center (ITRC), Tehran

2006 Summ. **Statistical machine translation for Farsi language**.

I developed a part of machine translation toolbox and surveyed the literature of statistical machine translation.

- *Collaborators:* Prof. Ali-Mohammad Zareh-Bidoki
- *Theory:* Dynamic programming
- *Implementation:* C++

## Computing Skills

Proficient R, Python, MATLAB, C++, Java

Familiar C, C#, VB, Verilog, MySQL, UML

## Teaching Experience

### Ohio State University - Teaching

Fall 2019 Artificial Intelligence II *Teaching at the Computer Science & Engineering Department*

Spring 2019 Artificial Intelligence II *Teaching at the Computer Science & Engineering Department*

Fall 2018 Machine Learning for Bioinformatics *Co-teaching at the Biomedical Informatics Department*

### University of Minnesota - Teaching Assistant

- Artificial Intelligence II
- Machine Learning
- Algorithms and Data Structures
- Discrete Structures
- Advanced Algorithms and Data Structures

### University of Tehran - Teaching Assistant

- Artificial Intelligence
- Data Structures and Algorithm
- Theory of Formal Language and Automata
- Social Network Analysis
- Operating Systems

## Professional Development

2017-present Professional Development Seminars at Mathematical Biosciences Institute

2010 Preparing Future Faculty Practicum course which prepare students for teaching in higher education

## Academic Services

### Mentoring

2019 Undergraduate Research Mentor (**2** students), Ohio State University, REU Program

### Reviewer

2019 BMC Bioinformatics, Journal

### Others

2019 Panelist at *Career Path Panel* of Summer REU Program: Mathematical Biology Bootcamp, Mathematical Bioscience Institute, Ohio State University

2019 Judge at the *Edward F. Hayes Forum*, Ohio State University

2018 Curriculum development for *Machine Learning for Bioinformatics* course, Department of Biomedical Informatics, Ohio State University

2018 Panelist at *Career Path Panel* of Summer REU Program: Mathematical Biology Bootcamp, Mathematical Bioscience Institute, Ohio State University

## Workshop & Conference Participation

2019 Nov. MBI Workshop on Evolutionary Dynamics in Cancer, Columbus, OH

2019 Jun. MBI Workshop on Bayesian Causal Inference, Columbus, OH

2018 Oct. MBI Workshop on Math and the Microbiome, Columbus, OH

2018 Oct. Nature Conference on Big Data and Cancer Precision Medicine, Boston, MA

2018 Jul. CBMS Conference on Elastic Functional and Shape Data Analysis (EFSDA), Columbus, OH

2018 Aug. 34th Conference on Uncertainty in Artificial Intelligence, Monterey, CA

2018 May. Stanford Conference on Big Data in Precision Health, Stanford, CA

2015 Jul. 31st Conference on Uncertainty in Artificial Intelligence, Amsterdam, Netherlands

2015 May. IMA Workshop on Graphical Models, Statistical Inference, and Alg., Minneapolis, MN

2015 Apr. IMA Workshop on Information Theory and Concentration Phenomena, Minneapolis, MN

2015 Apr. Analytic Tools in Probability and Applications, Minneapolis, MN

2015 Feb. IMA Workshop on Convexity and Optimization: Theory and Applications, Minneapolis, MN

2012 Oct. 21st Conference on Information and Knowledge Management, Maui, HI

2012 Mar. IMA Workshop on Machine Learning: Theory and Computation, Minneapolis, MN

2011 Oct. IMA Workshop on Large Graphs: Modeling, Algorithms, and Applications, Minneapolis, MN

## Graduate Coursework

- Pattern Recognition
- Data Mining
- Artificial Intelligence I/II
- Machine Learning
- Introduction to Nonlinear Optimization
- Probability and Stochastic Processes

- Advanced Algorithm
- Software Engineering
- Data Structure
- Object-oriented Programming