Hrayr Harutyunyan

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EDUCATION

University of Southern California   **Aug. 2018 - present**
PhD in Computer Science   **Current GPA: 4.0**
Advisors: Aram Galstyan and Greg Ver Steeg

Coursework:
- · CSCI 670: Advanced analysis of algorithms, Fall 2018
- · EE 546: Mathematics of high-dimensional data, Fall 2018
- · DSO 699: Statistical learning theory, Spring 2018
- · CSCI 699: Advanced topics in deep learning, Spring 2018
- · CSCI 699: Theoretical machine learning, Fall 2019
- · CSCI 699: Topics in Discrete Optimization and Learning, Fall 2020

Teaching assistantship:
- · CSCI 670: Advanced analysis of algorithms, Fall 2019
- · CSCI 270: Introduction to Algorithms and Theory of Computing, Spring 2020

Research assistantship:
- · Global analysis of weak signals for enterprise event detection, Fall 2018 to Fall 2019
- · Learning with less labels, Spring 2020 to Fall 2022

Yerevan State University   **Sept. 2016 - June 2018**
MSc in Discrete Mathematics and Theoretical Informatics   **GPA: 19.9/20**
Thesis: Extension of linear CorEx for time series
Advisor: Anahit Chubaryan

Yerevan State University   **Sept. 2012 - June 2016**
BSc in Computer Science and Applied Mathematics   **GPA: 19.6/20**
Thesis: Spoken language identification with deep learning
Advisor: Armen Andreasyan

EXPERIENCE

Google Research   **May 2022 - Aug. 2022, Sept. 2022 - Oct. 2022**
Research Intern, Student Researcher   *New York, NY, USA*

Project: Supervision complexity and its role in knowledge distillation
- · Introducing a new theoretical perspective on knowledge distillation
  through a measure of alignment between the teacher-provided supervision
  and the student's neural tangent kernel.

Amazon.com, Inc   **May 2021 - Aug. 2021**
Applied Scientist Intern   *Remote*

Project: Test error prediction and analysis via sample information measures
- · Estimating the number of samples needed to reach a certain level of
  performance in a supervised learning task
- · Finding which sub-populations of examples should be sampled more
  in order to achieve the goal efficiently

Amazon.com, Inc　　　　　　　　　　　　　　　　　**May 2020 - Aug. 2020**
Applied Scientist Intern　　　　　　　　　　　　　　　　　　　　　*Remote*

Project: Information content of samples
- · Defining and estimating the unique information content of
  samples in supervised learning tasks

YerevaNN Research Lab　　　　　　　　　　　　　　　　　**June 2016 - July 2018**
Machine Learning Researcher　　　　　　　　　　　　　　　*Yerevan, Armenia*

- · Establishing benchmarks for clinical prediction tasks
- · Automated question answering using deep learning
- · Representation learning with generative models

USC Information Sciences Institute　　　　　　　　　**June 2017 - Sept. 2017**
Machine Learning Researcher, Intern　　　　　　　　　　*Marina Del Rey, CA, USA*

- · Learning disentangled representations via synergy minimization
- · Temporal covariance estimation using non-overlapping Gaussian latent factor models

RESEARCH INTERESTS

My main research direction is studying information stored in neural network weights or activations, and its connections to generalization, memorization, stability and learning dynamics. More broadly, I am interested in learning theory, generalization under domain shifts, unsupervised/self-supervised representation learning, and in the generalization phenomenon of deep neural networks.

PUBLICATIONS AND PREPRINTS

[1]　A. Jain, G. Swaminathan, P. Favaro, H. Yang, A. Ravichandran, **H. Harutyunyan**,
A. Achille, O. Dabeer, B. Schiele.
A Meta-Learning Approach to Predicting Performance and Data Requirements.
CVPR, 2023

[2]　**H. Harutyunyan**, A.S. Rawat, A.K. Menon, S. Kim, S. Kumar.
Supervision Complexity and its Role in Knowledge Distillation.
ICLR, 2023

[3]　**H. Harutyunyan**, GV. Steeg, A. Galstyan.
Formal limitations of sample-wise information-theoretic generalization bounds.
IEEE Information Theory Workshop, 2022

[4]　T. Galstyan, **H. Harutyunyan**, H. Khachatrian, GV. Steeg, A. Galstyan.
Failure Modes of Domain Generalization Algorithms.
CVPR, 2022

[5]　KSM. Hossain, **H. Harutyunyan**, Y. Ning, B. Kennedy, N. Ramakrishnan, A. Galstyan.
Identifying Geopolitical Event Precursors using Attention-based LSTMs.
Frontiers in Artificial Intelligence, 2022

[6]　**H. Harutyunyan**, M. Raginsky, GV. Steeg, A. Galstyan.
Information-theoretic generalization bounds for black-box learning algorithms.
NeurIPS, 2021

[7]　**H. Harutyunyan**, A. Achille, G. Paolini, O. Majumder, A. Ravichandran, R. Bhotika, S. Soatto.
Estimating informativeness of samples with Smooth Unique Information.
ICLR, 2021

[8]　**H. Harutyunyan**, K. Reing, GV. Steeg, A. Galstyan.
Improving Generalization by Controlling Label-Noise Information in Neural Network Weights.
ICML, 2020

[9]   GV. Steeg, **H. Harutyunyan**, D. Moyer, A. Galstyan.
Fast structure learning with modular regularization.
NeurIPS, 2019

[10]   **H. Harutyunyan**, H. Khachatrian, DC. Kale, GV. Steeg, A. Galstyan.
Multitask learning and benchmarking with clinical time series data.
Nature Scientific Data, 2019.

[11]   **H. Harutyunyan**, D. Moyer, H. Khachatrian, GV. Steeg, A. Galstyan
Efficient covariance estimation from temporal data.
arXiv:1905.13276, 2019

[12]   S. Abu-El-Haija, B. Perozzi, A. Kapoor, N. Alipourfard, K. Lerman,
H. Harutyunyan, GV. Steeg, A. Galstyan.
MixHop: higher-order graph convolutional architectures via sparsified neighborhood mixing.
ICML, 2019

[13]   GV. Steeg, R. Brekelmans, **H. Harutyunyan**, A. Galstyan.
Disentangled representations via synergy minimization.
Allerton Conference on Communication, Control, and Computing (Allerton), 2017.

SKILLS

Programming Languages	Python, C/C++
Software & Tools	PyTorch, Tensorflow, Keras, MATLAB, Wolfram Mathematica
Languages	English, Armenian (native), Russian

AWARDS, HONORS AND ACHIEVEMENTS

KAUST Rising Stars in AI Symposium, Speaker	2023
USC Annenberg Graduate Fellow	2018
ACM ICPC World Finals, Finalist	2017
Google HashCode, Finalist	2017, 2018
Russian Code Cup, Finalist	2016
Yerevan State University Gold Medal For outstanding results in programming competitions	2016
ACM ICPC Northeastern European Regional Contest	
First Diploma, 17th place	2016
Second Diploma, 33th place	2015
Champion of Armenia	2013 - 2016
Champion of Southern Caucasus	2015, 2016
Open Southern Caucasus Championship, First Diploma	2013 - 2016
Independence Cup of Armenia, First Place	2013 - 2017
International Olympiad in Informatics, Bronze medal	2012
National Olympiads in Physics, Mathematics and Informatics 2 First, 2 Second, 3 Third Degree Diplomas	2008 - 2012

NOTABLE ACTIVITIES

FAST Foundation *NextGen Council Member*	June 2021 - present

Conference Reviewing
NeurIPS'20, ICML'21, NeurIPS'21, ICLR'21, ICML'22, ICLR'23

ACM ICPC Trainings at USC Fall 2018
Lecturer

Weekly Machine Learning Seminars Sept. 2017 - July 2018
Co-organizer
Presented and discussed recent advances in machine learning.

National Olympiad in Informatics 2013 - 2018
Committee member
Prepared tasks for the national Olympiad in informatics.
Trained students for international Olympiad in informatics.

International Olympiad in Informatics 2016
Deputy leader of Armenian national team
Trained students for the competition.

INTERESTS

Reading, art house, billiards, skiing, chess, music, philosophy.