

Navid Naderializadeh

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Research Interests

- Decentralized multi-agent reinforcement learning
- Self-supervised and graph representation learning
- Information-theoretic and learning-based wireless resource allocation

Education

- 2014 – 2016 **PhD. in Electrical Engineering**, *University of Southern California*, Los Angeles, CA.
Advisor: Salman Avestimehr.
- 2011 – 2014 **M.Sc. in Electrical and Computer Engineering**, *Cornell University*, Ithaca, NY.
Advisor: Salman Avestimehr.
- 2007 – 2011 **B.Sc. in Electrical Engineering**, *Sharif University of Technology*, Tehran, Iran.
Advisor: S. Jamaloddin Golestani.

Professional Experience

- Feb. 2020 – **Research Scientist**, *HRL Laboratories*, Malibu, CA.
Present Investigated novel graph learning methods using the linear optimal transport theory, multi-agent deep reinforcement learning algorithms with centralized training and decentralized execution, and self-supervised learning techniques for learning with limited labels.
- Jan. 2017 – **Research Scientist**, *Intel Labs*, Santa Clara, CA.
Feb. 2020 Designed novel resource allocation algorithms based on multi-agent deep reinforcement learning and information theory for 5G wireless networks and beyond.
- Jan. 2014 – **Graduate Research Assistant**, *University of Southern California*, Los Angeles, CA.
Dec. 2016 Studied the fundamental limits of interference management in cache-aided wireless networks, and developed a new algorithm, called ITLinQ, for spectrum sharing in wireless device-to-device (D2D) systems.
- Jun. 2015 – **Wireless Networks Research Intern**, *Bell Labs, Alcatel-Lucent*, Crawford Hill, NJ.
Aug. 2015 Designed an algorithm for interference management in wireless networks using caches at both transmitter and receiver sides, and studied the impact of multicast groups on the per-user rates of single-server caching networks.
- Jan. 2012 – **Graduate Research Assistant**, *Cornell University*, Ithaca, NY.
Dec. 2013 Formulated a novel condition for the optimality of treating interference as noise in interference channels, and identified the theoretical impact of topology on interference management in wireless networks.

Publications

Book Chapters

- B1 **N. Naderializadeh**, M. A. Maddah-Ali, and A. S. Avestimehr, “Edge Caching,” in *Information Theoretic Perspectives on 5G Systems and Beyond*, Cambridge University Press, Dec. 2020.

Preprints

- P5 **N. Naderializadeh**, “Contrastive self-supervised learning for wireless power control,” Oct. 2020.
- P4 **N. Naderializadeh**, F. H. Hung, S. Soleyman, and D. Khosla, “Graph convolutional value decomposition in multi-agent reinforcement learning,” Oct. 2020.
- P3 S. Kolouri*, **N. Naderializadeh***, G. K. Rohde, and H. Hoffmann, “Wasserstein embedding for graph learning,” Jun. 2020.
- P2 **N. Naderializadeh**, J. Sydir, M. Simsek, and H. Nikopour, “Resource management in wireless networks via multi-agent deep reinforcement learning,” Feb. 2020.
- P1 **N. Naderializadeh**, “On the communication latency of wireless decentralized learning,” Feb. 2020.

Journal Papers

- J8 P. Dong, H. Zhang, G. Y. Li, I. S. Gaspar, and **N. Naderializadeh**, “Deep CNN based channel estimation for mmWave massive MIMO systems,” *IEEE Journal of Selected Topics in Signal Processing*, vol. 65, no. 5, pp. 989–1000, Sep. 2019.
- J7 **N. Naderializadeh**, M. A. Maddah-Ali, and A. S. Avestimehr, “Cache-aided interference management in wireless cellular networks,” *IEEE Transactions on Communications*, vol. 67, no. 5, pp. 3376–3387, May 2019.
- J6 H. Yang, **N. Naderializadeh**, A. S. Avestimehr, and J. Lee, “Topological interference management with reconfigurable antennas,” *IEEE Transactions on Communications*, vol. 65, no. 11, pp. 4926–4939, Nov. 2017.
- J5 **N. Naderializadeh**, A. El Gamal, and A. S. Avestimehr, “Fundamental limits of non-coherent interference alignment via matroid theory,” *IEEE Transactions on Information Theory*, vol. 63, no. 10, pp. 6573–6586, Oct. 2017.
- J4 **N. Naderializadeh**, M. A. Maddah-Ali, and A. S. Avestimehr, “Fundamental limits of cache-aided interference management,” *IEEE Transactions on Information Theory*, vol. 63, no. 5, pp. 3092–3107, May 2017.
- J3 C. Geng, **N. Naderializadeh**, A. S. Avestimehr, and S. Jafar, “On the optimality of treating interference as noise,” *IEEE Transactions on Information Theory*, vol. 61, no. 4, pp. 1753–1767, Apr. 2015.
- J2 **N. Naderializadeh** and A. S. Avestimehr, “Interference networks with no CSIT: Impact of topology,” *IEEE Transactions on Information Theory*, vol. 61, no. 2, pp. 917–938, Feb. 2015.
- J1 **N. Naderializadeh** and A. S. Avestimehr, “ITLinQ: A new approach for spectrum sharing in device-to-device communication systems,” *IEEE Journal on Selected Areas in Communications*, vol. 32, no. 6, pp. 1139–1151, Jun. 2014.

Conference Papers

- C22 **N. Naderializadeh**, M. Eisen, and A. Ribeiro, “Wireless power control via counterfactual optimization of graph neural networks,” in *Proceedings of IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, May 2020 (*invited paper*).
- C21 **N. Naderializadeh**, J. Sydir, M. Simsek, and H. Nikopour, “Resource management in wireless networks via multi-agent deep reinforcement learning,” in *Proceedings of IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, May 2020.
- C20 J. F. Comer, R. W. Andrews, **N. Naderializadeh**, S. Kolouri, and H. Hoffmann, “SAR automatic target recognition with less labels,” in *Proceedings of SPIE Automatic Target Recognition*, Apr. 2020 (*invited paper*).
- C19 **N. Naderializadeh** and S. M. Asghari, “Learning to code: Coded caching via deep reinforcement learning,” in *Proceedings of Asilomar Conference on Signals, Systems, and Computers*, Nov. 2019.
- C18 **N. Naderializadeh** and M. Hashemi, “Energy-aware multi-server mobile edge computing: A deep reinforcement learning approach,” in *Proceedings of Asilomar Conference on Signals, Systems, and Computers*, Nov. 2019.
- C17 V. Narasimha Swamy, **N. Naderializadeh**, V. Nallampatti Ekambaram, S. Talwar, and A. Sahai, “Monitoring under-modeled rare events for URLLC,” in *Proceedings of IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, Jul. 2019 (*invited paper*).
- C16 P. Dong, H. Zhang, G. Y. Li, **N. Naderializadeh**, and I. S. Gaspar, “Deep CNN for wideband mmWave massive MIMO channel estimation using frequency correlation,” in *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 2019.
- C15 O. Orhan, H. Nikopour, J. Nam, **N. Naderializadeh**, and S. Talwar, “A power efficient fully digital beamforming architecture for mmWave communications,” in *Proceedings of IEEE 89th Vehicular Technology Conference (VTC)*, Apr. 2019.
- C14 **N. Naderializadeh**, H. Nikopour, O. Orhan, and S. Talwar, “Feedback-based interference management in ultra-dense networks via parallel dynamic cell selection and link scheduling,” in *Proceedings of IEEE International Conference on Communications (ICC)*, May 2018.
- C13 **N. Naderializadeh**, O. Orhan, H. Nikopour, and S. Talwar, “Ultra-dense networks in 5G: Interference management via non-orthogonal multiple access and treating interference as noise,” in *Proceedings of IEEE 86th Vehicular Technology Conference (VTC)*, Sep. 2017.
- C12 **N. Naderializadeh**, M. A. Maddah-Ali, and A. S. Avestimehr, “On the optimality of separation between caching and delivery in general cache networks,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, Jun. 2017.
- C11 **N. Naderializadeh**, M. A. Maddah-Ali, and A. S. Avestimehr, “Cache-aided interference management in wireless cellular networks,” in *Proceedings of IEEE International Conference on Communications (ICC)*, May 2017.
- C10 **N. Naderializadeh**, M. A. Maddah-Ali, and A. S. Avestimehr, “Fundamental limits of cache-aided interference management,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, Jul. 2016.

- C9 H. Yang, **N. Naderializadeh**, A. S. Avestimehr, and J. Lee, “Topological interference management with reconfigurable antennas,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, Jul. 2016.
- C8 A. El Gamal, **N. Naderializadeh**, and A. S. Avestimehr, “When does an ensemble of matrices with randomly scaled rows lose rank?,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, Jun. 2015.
- C7 **N. Naderializadeh**, A. El Gamal, and A. S. Avestimehr, “Topological interference management with just retransmission: What are the “best” topologies?,” in *Proceedings of IEEE International Conference on Communications (ICC)*, Jun. 2015.
- C6 **N. Naderializadeh**, D. T.H. Kao, and A. S. Avestimehr, “How to utilize caching to improve spectral efficiency in device-to-device wireless networks,” in *Proceedings of 52nd Annual Allerton Conference on Communication, Control, and Computing*, Oct. 2014 (*invited paper*).
- C5 **N. Naderializadeh** and A. S. Avestimehr, “ITLinQ: A new approach for spectrum sharing in device-to-device communication systems,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, Jul. 2014.
- C4 **N. Naderializadeh** and A. S. Avestimehr, “ITLinQ: A new approach for spectrum sharing,” in *Proceedings of IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, Apr. 2014.
- C3 C. Geng, **N. Naderializadeh**, A. S. Avestimehr, and S. Jafar, “On the optimality of treating interference as noise,” in *Proceedings of 51st Annual Allerton Conference on Communication, Control, and Computing*, Oct. 2013.
- C2 **N. Naderializadeh** and A. S. Avestimehr, “Impact of topology on interference networks with no CSIT,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, Jul. 2013.
- C1 O. Javidbakht, **N. Naderializadeh**, and S. M. Razavizadeh, “Dynamic relay selection and resource allocation in cooperative networks based on OFDM,” in *Proceedings of 11th Sustainable Wireless Technologies (European Wireless) Conference*, Apr. 2011.

Patents

- 2020 **N. Naderializadeh**, H. Nikopour, S. Talwar, O. Orhan, B. Sadeghi, C. Cordeiro, and H. Moustafa, “Interference Mitigation in Ultra-Dense Wireless Networks,” *U.S. Patent 10,701,641*, granted.
- 2019 A. S. Avestimehr and **N. Naderializadeh**, “Spectrum Sharing in Device-to-Device Communication Systems,” *U.S. Patent 10,200,873*, granted.
- 2018 O. Orhan, E. Aryafar, B. Carlton, N. Himayat, C. Hull, **N. Naderializadeh**, H. Nikopour, S. Pellerano, M. Rahman, S. Talwar, and J. Zhu, “Non-Orthogonal Multiple-Access and Multi-Finger Beamforming,” *App. No. PCT/US2018/041813*.
- 2018 M. T. Galeev, O. Orhan, A. L. Amadjikpe, B. Grewell, **N. Naderializadeh**, H. Nikopour, S. Sudhakaran, S. Talwar, L. Xian, “Millimeter Wave (mmWave) System and Methods,” *App. No. PCT/US2018/038906*.

Selected Presentations

- 2020 **Resource management in wireless networks through the lens of information theory and machine learning**, *The University of Texas at Austin*.
- 2020 **Wireless power control via counterfactual optimization of graph neural networks**, *IEEE SPAWC'20*.
- 2020 **Resource management in wireless networks via multi-agent deep reinforcement learning**, *IEEE SPAWC'20*.
- 2019 **Learning to code: Coded caching via deep reinforcement learning**, *Asilomar'19*.
- 2019 **Interference mitigation techniques in ultra-dense wireless networks**, *ITA Workshop'19*.
- 2018 **Feedback-based interference management in ultra-dense networks via parallel dynamic cell selection and link scheduling**, *IEEE ICC'18*.
- 2017 **Ultra-dense networks in 5G: Interference management via non-orthogonal multiple access and treating interference as noise**, *IEEE VTC Fall'17*.

Selected Honors and Awards

- 2017 **Bronze Prize**, *23rd Samsung Electronics HumanTech Paper Contest*.
- 2016 **Shannon Centennial Student Competition Finalist**, *Nokia Bell Labs*.
- 2015–2016 **Ming Hsieh Institute PhD Scholar**, *University of Southern California*.
- 2011 **Jacobs Scholarship**, *Cornell University*.
- 2008 **Dean's Honorary Award**, *Sharif University of Technology*.
- 2007 **1st Rank out of 270,000+ Participants**, *Nationwide entrance examination of Iranian universities*.

Professional Service

- 2020 **Associate Editor**, *IEEE JSAC Special Series on Machine Learning in Communications*.
- 2020 **Technical Program Committee Member**, *21st IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*.
- 2020 **Special Session Organizer**, *Interplay between machine learning and resource management in wireless networks*, *21st IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*.
- 2019 **Technical Program Committee Member**, *5th International Workshop on Non-Orthogonal Multiple Access Techniques for 5G*, *IEEE International Conference on Communications (ICC)*.
- 2018 **Technical Program Committee Member**, *4th International Workshop on Non-Orthogonal Multiple Access Techniques for 5G*, *IEEE Global Communications Conference (GLOBECOM)*.

- 2013–2020 **Invited Journal Reviewer**, *IEEE Trans. on Communications*, *IEEE Trans. on Information Theory*, *IEEE/ACM Trans. on Networking*, *IEEE Trans. on Wireless Communications*, *IEEE Journal on Selected Areas in Communications*, *IEEE Trans. on Mobile Computing*, *IEEE Communications Letters*, *EURASIP Journal on Wireless Communications and Networking*.
- 2012–2020 **Invited Conference Reviewer**, *IEEE Intl. Conf. on Communications (ICC)*, *IEEE Intl. Symp. on Information Theory (ISIT)*, *IEEE Global Communications Conference (Globecom)*, *IEEE Wireless Communications and Networking Conference (WCNC)*, *IEEE Information Theory Workshop (ITW)*, *Intl. ITG Conference on Systems, Communications and Coding (SCC)*, *Australian Communications Theory Workshop (AusCTW)*, *Iran Workshop on Communication and Information Theory (IWCIT)*.