Marcos M. Vasconcelos

Research Assistant Professor
Virginia Tech
900 N. Glebe Rd.
Arlington, VA 22203

Tel: (301) 326-5635
Email: marcosv@vt.edu
Web: https://mullervasconcelos.github.io
Google scholar: https://tinyurl.com/pjapzd4z

Education

- **University of Maryland** — College Park, MD
  Ph.D. Electrical Engineering — 2016
    - Thesis: Optimality of event-based policies for decentralized estimation over shared networks
    - Advisor: Prof. Nuno C. Martins

- **University of Maryland** — College Park, MD
  M.Sc. Electrical Engineering — 2014
    - Advisor: Prof. Nuno C. Martins

- **Federal University of Pernambuco** — Recife, Brazil
  M.Sc. Electrical Engineering — 2006
    - Thesis: Iterative decoding of Low-Density Parity-Check codes
    - Advisor: Prof. Valdemar C. da Rocha, Jr.

- **Federal University of Pernambuco** — Recife, Brazil
  B.Sc. Electrical Engineering — 2004
    - Thesis: A Matlab toolbox for signal processing over finite fileds
    - Advisors: Profs. Hélio Magalhães de Oliveira and Ricardo M. Campelo de Souza

Employment

- **Commonwealth Cyber Initiative** — Virginia Tech
  Research Assistant Professor — Jan. 2021 -

- **Department of Electrical and Computer Engineering (by courtesy)** — Virginia Tech
  Research Assistant Professor — Jan. 2021 -

- **Dept. of Electrical Engineering** — University of Southern California
  Postdoctoral research associate — Sep. 2016 - Dec. 2020
    - Advisor: Prof. Urbashi Mitra

- **Dept. of Electrical and Computer Engineering** — University of Maryland, College Park
  Research assistant — Jan. 2008 - Aug. 2016

- **Dept. of Electrical and Computer Engineering** — University of Hawaii at Manoa
  Research assistant — Sep. 2006 - Dec. 2007

- **Laboratory of Communication Systems** — Federal University of Pernambuco
  Research assistant — Apr. 2004 - Jul. 2006

- **Laboratory of Devices and Nanostructures** — Federal University of Pernambuco
  Intern — Jan. 2004 - Mar. 2004

Awards & Honors

- **Travel Award to Japan**
  54th IEEE Conference on Decision and Control   *2015*
- **Distinguished Teaching Assistant Award**
  U. of Maryland   *2012*
- **Fulbright fellowship**
  Fulbright Commission   *2006–2010*
- **Distinguished Undergraduate Student Award**
  Federal University of Pernambuco   *1999*

Research interests

- Multi-agent systems

- Distributed learning, estimation, control and optimization

- Game theory

- Systems Biology

- Machine Learning for control and communication networks

Publications

Journal Articles

7. M. Gangan, **M. M. Vasconcelos**, U. Mitra, O. Camara and J. Boedicker. "Optimal strategy for public good production is set by balancing intertemporal trade-off between population growth rate and carrying capacity." iScience – Cell Press (**under review**), 2021.

6. X. Zhang, **M. M. Vasconcelos**, W. Cui and U. Mitra. "Remote estimation over the collision channel with and without local communication." (**To appear**) *IEEE Transactions on Control of Network Systems*, 2021.

5. **M. M. Vasconcelos** and U. Mitra, "Data-driven sensor scheduling for remote estimation in wireless networks," *IEEE Transactions on Control of Network Systems*, vol. 8, no. 2, pp. 725–737, 2021.

4. **M. M. Vasconcelos**, M. Gagrani, A. Nayyar, and U. Mitra, "Optimal scheduling for networked estimation with energy harvesting," *IEEE Transactions on Control of Network Systems*, vol. 7, no. 4, pp. 1723–1735', 2020.

3. **M. M. Vasconcelos** and U. Mitra. "Observation-driven scheduling for remote estimation of two Gaussian random variables." *IEEE Transactions on Control of Network Systems*, vol. 7, no. 1, pp. 232–244, 2020.

2. **M. M. Vasconcelos** and N. C. Martins. "Optimal remote estimation of discrete random variables over the collision channel," *IEEE Transactions on Automatic Control*, vol. 64, no. 4, pp. 1519–1534, 2019.

1. **M. M. Vasconcelos** and N. C. Martins. "Optimal estimation over the collision channel," *IEEE Transactions on Automatic Control*, vol. 62, no. 1, pp. 321–336, 2017.

Book Chapters

1. **M. M. Vasconcelos** and N. C. Martins. "A survey on remote estimation problems," *Principles of Cyber-physical Systems*, S. Roy and S. Das, Eds., Cambridge University Press, 2020.

Working papers

5. A. Verma, **M. M. Vasconcelos**, U. Mitra and B. Touri, "Distributed Optimization via Maximal Dissent." (**to be submitted**) *IEEE Transactions on Automatic Control*, 2021.

4. **M. M. Vasconcelos**, T. T. Doan and U. Mitra, "Distributed optimization with finite bits and expanding quantizers: almost sure convergence and rate analysis." (**to be submitted**) *IEEE Transactions on Automatic Control*, 2021.

3. **M. M. Vasconcelos**, U. Mitra. "Distributed regression via social learning with privacy guarantees." (**to be submitted**) *IEEE Transactions on Signal Processing*, 2022.

2. **M. M. Vasconcelos**, U. Mitra. "Distributed wireless medium access control via Federated Learning." (**to be submitted**) *IEEE Transactions on Control of Network Systems*, 2022.

1. **M. M. Vasconcelos** and U. Mitra. "Implicit communication over collision networks." (**to be submitted**) *IEEE Transactions on Communications*, 2022.

Conference Proceedings

18. **M. M. Vasconcelos**, "Learning distributed channel access policies for networked estimation: data-driven optimization in the mean-field regime" (**submitted**) *4th Conference on Learning for Dynamics and Control - L4DC*, Stanford - California, 2022.

17. **M. M. Vasconcelos**, "Global games with Poisson observations: Bio-inspired distributed coordination of multi-agent systems" (**submitted**) *American Control Conference* , Atlanta - Georgia, 2022.

16. A. Verma, **M. M. Vasconcelos**, U. Mitra and B. Touri, "Max-Gossip subgradient method for distributed optimization" *IEEE Conference on Decision and Control*, Austin - Texas, 2021.

15. **M. M. Vasconcelos**, T. T. Doan and U. Mitra, "Improved convergence rate for a distributed two-time-scale gradient method under random quantization" *IEEE Conference on Decision and Control*, Austin - Texas, 2021.

14. **M. M. Vasconcelos** and U. Mitra, "A sample-efficient scheme for channel resource allocation in networked estimation" *IEEE International Conference on Acoustics, Speech and Signal Processing Systems and Computers*, Toronto - Canada, 2021.

13. X. Zhang, **M. M. Vasconcelos**, W. Cui and U. Mitra, "An optimal symmetric threshold strategy for remote estimation over the collision channel" *IEEE International Conference on Acoustics, Speech and Signal Processing Systems and Computers*, Barcelona - Spain, 2020.

12. **M. M. Vasconcelos** and U. Mitra, "Optimization for data-driven wireless sensor scheduling" *Asilomar Conference on Signals, Systems and Computers*, Pacific Grove - California, 2019.

11. **M. M. Vasconcelos**, O. Camara, U. Mitra, M. Gangan and J. Boedicker, "A continuous-time decision-making model for bacterial growth via quorum sensing: theory and evidence" *International Conference on Nanoscale Computing and Communication*, Dublin - Ireland, 2019.

10. **M. M. Vasconcelos**, O. Camara, U. Mitra, and J. Boedicker, "A sequential decision making model of bacterial growth via quorum sensing" *Asilomar Conference on Signals, Systems and Computers*, Pacific Grove - California, 2018.

9. M. Gagrani, **M. M. Vasconcelos**, A. Nayyar, "Scheduling and estimation strategy design in a sequential networked estimation problem" *56th Allerton Conference on Communication, Control and Computing*, Monticello - Illinois, 2018.

8. **M. M. Vasconcelos**, U. Mitra, O. Camara, K. P. Silva, and J. Boedicker, "Bacterial quorum sensing as a networked decision system" *IEEE International Conference on Communications*, Kansas City - Missouri, 2018.

7. **M. M. Vasconcelos**, A. Nayyar and U. Mitra. "Optimal sensor scheduling strategies in networked estimation," *IEEE Conference on Decision and Control*, Melbourne - Australia, 2017.

6. **M. M. Vasconcelos** and U. Mitra. "The multiple-access collision channel without feedback: capacity region and a mutual information game," *55th Allerton Conference on Communication, Control and Computing*, Monticello - Illinois, 2017.

5. **M. M. Vasconcelos** and U. Mitra. "Observation-driven sensor scheduling," *IEEE International Conference on Communication*, Paris - France, 2017.

4. **M. M. Vasconcelos** and N. C. Martins. "The structure of optimal communication policies for remote estimation over the collision channel with private and common observations," *55th IEEE Conference on Decision and Control*, Las Vegas - Nevada, 2016.

3. **M. M. Vasconcelos** and N. C. Martins. "Optimal threshold strategies for estimation over the collision channel with communication costs," *54th IEEE Conference on Decision and Control*, Osaka - Japan, 2015.

2. **M. M. Vasconcelos** and N. C. Martins. "Remote estimation games over shared networks," *51st Annual Allerton Conference on Communication, Control, and Computing*, Monticello - Illinois, 2014.

1. **M. M. Vasconcelos** and N. C. Martins. "Estimation over the collision channel: structural results," *50st Annual Allerton Conference on Communication, Control, and Computing*, Monticello - Illinois, 2013.

Invited Talks

- **Learning policies for distributed channel access for networked estimation**   Blacksburg - VA
  Wireless @ VT - Virginia Tech   *November 2021*
- **Optimization and Learning for the Next Generation IoT and CPS**   Arlington - VA
  Commonwealth Cyber Initiative - Virginia Tech   *July 2020*
- **Data-driven sensor scheduling**   Rio de Janeiro - Rio de Janeiro
  Pontifical Catholic University, Rio de Janeiro   *March 2020*
- **Data-driven sensor scheduling for estimation over wireless networks**   San Diego - California
  Information Theory and Applications Workshop   *February 2020*
- **Observation-driven sensor scheduling**   Riverside - California
  University of California, Riverside   *May 2019*
- **Observation-driven sensor scheduling**   Princeton - New Jersey
  Siemens Corporate Technology   *April 2019*
- **Estimation over the collision channel & Observation-driven scheduling** Sta. Barbara - California
  University of California, Sta. Barbara   *April 2018*
- **Estimation of discrete random variables over the collision channel**   Princeton - New Jersey
  IEEE Conference on Information Sciences and Systems   *March 2018*
- **Estimation over the collision channel & Observation-driven scheduling** Pittsburgh - Pennsylvania
  Carnegie Mellon University   *March 2018*
- **Optimal sensor scheduling strategies in networked estimation**   San Diego - California
  Information Theory and Applications Workshop   *February 2018*
- **Collaborative estimation over the collision channel**   Las Vegas - Nevada
  Communication Aware Control and Robotics Workshop   *December 2016*
- **Optimal remote estimation over the collision channel**
  CommNetS Seminar (USC)   *September 2016*
- **Optimal remote estimation over the collision channel**
  Prof. George Pappas' Group Meeting (UPenn)   *April 2016*
- **Estimation over the collision channel with minimum probability of error**
  Communication, Control and Signal Processing Seminar (U. of Maryland)   *April 2016*
- **Estimation over the collision channel with communication costs**   YouTube video
  ECEGSA Academic Seminar (U. of Maryland)   *December 2015*
- **Distributed estimation over the collision channel**
  Communication, Control and Signal Processing Seminar (U. of Maryland)   *November 2014*

Research Experience

- **Bio-inspired coordination schemes with applications to nanorobotic networks**   VT
  Principal Investigator   *Spring 2021 –*
  - Bacterial global games models under molecular communications, social learning for quorum sensing nanorobots

- **Service-centric network resiliency via edge provisioning and device autonomy**   VT
  Principal Investigator   *Fall 2021 –*
  - Latency-performance trade-offs in distributed machine learning and relevance-of-information data schedulers for near real-time communications

- **Private and communication efficient algorithms for distributed statistical inference**   USC
  Research Associate   *Fall 2020*
  - Design of privacy preserving communication algorithms for distributed machine learning
  - PI: Profs. Urbashi Mitra

- **Modeling of bacterial quorum sensing as a networked decision system**   USC
  Research Associate   *Fall 2016 – Fall 2020*
  - Developement of a mathematical decision-making model, experimental data analysis
  - PI's: Profs. Urbashi Mitra and James Boedicker

- **Energy and delay: network optimization in CPS human sensing systems**   USC
  Research Associate   *Fall 2016 – Fall 2018*
  - Optimal design of observation-driven sensor scheduling policies
  - PI's: Profs. Urbashi Mitra and Ashutosh Nayyar

- **Optimization-based modeling of bat-prey capture dynamics**   UMD/Johns Hopkins U.
  Research Assistant   *Spring 2015 – Summer 2016*
  - Model predictive control in denied sensing areas
  - PI's: Profs. Nuno C. Martins (UMD) and Cindy Moss (JHU)

- **Distributed estimation over shared networks**   UMD
  Research Assistant   *Spring 2012 - Summer 2016*
  - Policy design and optimization algorithms for decentralized estimation
  - PI: Prof. Nuno C. Martins

- **Stochastic teams and optimization**   Queen's University
  Visiting Student   *Summer 2012*
  - Host: Prof. Serdar Yüksel

- **Iterative decoding of low-density parity-check codes**   UH
  Research Assistant   *Fall 2006 - Fall 2007*
  - Graphical models and the belief propagation algorithm
  - PI: Marc P. C. Fossorier

- **Design, analysis and implementation of low-density parity-check codes**   UFPE
  Research Assistant   *Spring 2004 - Spring 2006*
  - PI: Prof. Valdemar C. da Rocha, Jr.

Technical Skills

- Mathematical modeling

- Statistical data analysis

- Public speaking

- Programming Languages

  - Matlab, Mathematica, C, R, Python

Participation in Workshops and Conferences

- **IEEE Conference on Decision and Control** — Austin - Texas
  Session Chair – Optimization V — December 2021
- **NSF Workshop on Biology through Info., Comm. & Coding Theory** — Alexandria - Virginia
  Poster — January 2020
- **9th NSF Cyber-Physical Systems PI Meeting** — Alexandria - Virginia
  Poster — November 2018
- **8th NSF Cyber-Physical Systems PI Meeting** — Alexandria - Virginia
  Lightning Talk + Poster — November 2017
- **Communication Aware Control and Robotics Workshop** — Las Vegas - Nevada
  Speaker + round table panelist — November 2016
- **Workshop on Future Trends in Networks, Optim. and Controls** — Los Angeles - California
  Lightning Talk + Poster — December 2014

Academic Service and Contributions

- Reviewer for the following journals:
  - Nature Scientific Reports
  - IEEE Internet of Things Journal
  - IEEE Transactions on Automatic Control
  - SIAM Journal on Controls and Optimization
  - Elsevier Automatica
  - Elsevier Systems and Control Letters
  - IEEE Transactions on Wireless Communications
  - IEEE Transactions on Information Theory
  - IEEE Transactions on Communications
  - IEEE Transactions on Control of Network Systems
  - IEEE Control Systems Letters

- Reviewer for the following conferences:
  - Conference on Decision and Control
  - American Control Conference
  - International Symposium on Information Theory

Teaching Experience

- **Signals and Systems (ENEE 322)** *UMD*
  Teaching Assistant *Spring 2010 – Fall 2011*
  - Instructors: Profs. Anthony Ephremides, Steven A. Tretter, Nuno C. Martins and Carol Espy-Wilson

- **Programming for Engineers (EE 160)** *UH*
  Teaching Assistant *Fall 2007*
  - Instructor: Prof. David Y. Y. Yun

- **Probability and Statistics (EE 342)** *UH*
  Teaching Assistant *Fall 2006 – Spring 2007*
  - Instructors: Profs. James Yee and Anthony Kuh

Languages

- Portuguese (native)

- English (fluent)

- Spanish (basic)

References

Prof. Nuno C. Martins (PhD advisor)
Professor
Dept. of Electrical and Computer Engineering
University of Maryland
A.V. Williams, Room 2321
College Park, MD 20742
Phone: (301) 405-9198
nmartins@umd.edu

Prof. Urbashi Mitra (postdoc advisor)
Professor
Depts. of Electrical Eng. and Computer Science
University of Southern California
3740 McClintock Avenue EEB 536
Los Angeles, CA 90089
Phone: (213) 740-4667
ubli@usc.edu

Prof. Mihailo Jovanovic
Professor
Dept. of Electrical Engineering
University of Southern California
3740 McClintock Avenue EEB 324
Los Angeles, CA 90089
Phone: (213) 740-4474
mihailo@usc.edu

Prof. James Boedicker
Associate Professor
Dept. of Physics and Biological Sciences
University of Southern California
920 Bloom Walk SSC 223
Los Angeles, CA 90089
Phone: (213) 740-1104
boedicke@usc.edu

Prof. Behrouz Touri
Associate Professor
Dept. of Electrical and Computer Engineering
University of California, San Diego
9500 Gilman Drive – Room 6408
La Jolla, CA 92093
Phone: (858) 534-7044
btouri@ucsd.edu