Vishaal Krishnan

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Education

- **University of California, San Diego** — La Jolla, CA
  Ph.D. in Engineering Sciences (Mechanical Engineering); GPA: 3.93 — *Sep 2014 – Dec 2019*
- **University of California, San Diego** — La Jolla, CA
  M.S. in Engineering Sciences (Mechanical Engineering); GPA: 3.93 — *Sep 2014 – Jun 2015*
- **Indian Institute of Technology, Madras** — Chennai, India
  B.Tech and M.Tech in Mechanical Engineering; GPA: 8.47/10 — *Aug 2009 – Jun 2014*

Positions Held

- **University of California, Riverside** — Riverside, CA
  Postdoctoral Scholar (Advisor: Prof. Fabio Pasqualetti) — *Jan 2020 to present*
- **University of California, San Diego** — La Jolla, CA
  Graduate Student Researcher (Advisor: Prof. Sonia Martínez) — *Oct 2014 to Dec 2019*
  - **Dissertation**: Large-scale multi-agent transport: Theory, Algorithms and Analysis
  - **Committee**: Prof. Jorge Cortés, Prof. Miroslav Krstić, Prof. Lei Ni, Prof. Andrej Zlatos
- **Indian Institute of Technology, Madras** — Chennai, India
  Research Assistant (Advisor: Prof. Arun D. Mahindrakar) — *Aug 2012 to May 2014*
  - Dynamics and Control Lab, Electrical Engineering Department
- **National Center for Biological Sciences** — Bangalore, India
  Research Assistant (Advisor: Prof. Madhusudhan Venkadesan) — *May 2013 to Aug 2014*
  - Biomechanics and Motor Control Lab

Research Interests

- **Control and Learning**: Distributed control and optimization, Control of large-scale multi-agent systems, Nonlinear and optimal control, Robust learning and Robust control, Learning-based/Data-driven control, Multiscale methods for learning and control.
- **Complex Adaptive Systems**: Modeling, analysis and control of large-scale distributed systems, Self-organization, Pattern formation, Morphogenesis, Information-theoretic perspectives on regulatory feedback/Homeostasis.
- **Mathematics**: Transport of probability measures, Gradient flows, Fluid dynamics, Optimal transport, Variational methods, Inverse problems, Differential Geometry, Functional Analysis and PDEs.

Publications (*in reverse chronological order*)

Journal Publications:

1. Learning Robust Feedback Controllers from Demonstrations,
   A. Al Makdah, **V. Krishnan** and F. Pasqualetti,
   In preparation.

2. A Multiscale Analysis of Multi-Agent Coverage Control Algorithms,
   V. Krishnan and S. Martínez,
   In Review.

3. Data-Driven Attack Detection for Linear Systems,
   V. Krishnan and F. Pasqualetti,
   IEEE Control Systems Letters, 5(2), pp. 671–676, 2021.

4. Distributed Online Optimization for Multi-Agent Optimal Transport,
   V. Krishnan and S. Martínez,
   In Review.

5. A Probabilistic Framework for Moving Horizon Estimation: Stability and Privacy Considerations,
   V. Krishnan and S. Martínez,
   IEEE Transactions on Automatic Control, 66(4), pp. 1817–1824, 2021.

6. Identification of critical nodes in large-scale spatial networks,
   V. Krishnan and S. Martínez,
   IEEE Transactions on Control of Network Systems, 6(2), pp. 842–851, 2019.

7. Distributed Control for Spatial Self-Organization of Multi-Agent Swarms,
   V. Krishnan and S. Martínez,
   SIAM Journal on Control and Optimization, 56(5), pp. 3642–3667, 2018.

8. Formation control and trajectory tracking of nonholonomic mobile robots,
   A. Saradgi, V. Muralidharan, **V. Krishnan**, S. Menta and A. D. Mahindrakar
   IEEE Transactions on Control Systems Technology, 26(6), pp. 2250–2258, 2017.

Conference Proceedings:

1. On Direct vs Indirect Data-Driven Predictive Control,
   V. Krishnan and F. Pasqualetti,
   IEEE Conference on Decision and Control, 2021, To Appear.

2. Lipschitz Bounds and Provably Robust Training by Laplacian Smoothing,
   V. Krishnan, A. Al Makdah and F. Pasqualetti,
   Advances in Neural Information Processing Systems, 2020.

3. On Observability and Stability of Moving-Horizon Estimation in a Distributional Framework,
   V. Krishnan and S. Martínez,
   American Control Conference, Philadelphia, USA, July 2019.

4. Distributed optimal transport for the deployment of swarms,
   V. Krishnan and S. Martínez,
   IEEE Conference on Decision and Control, Miami Beach, USA, December 2018.

5. Identification of critical node clusters for consensus in large-scale spatial networks,
   V. Krishnan and S. Martínez,
   IFAC World Congress, Toulouse, France, July 2017.

6. Self-Organization in Multi-Agent Swarms via Distributed Computation of Diffeomorphisms,
   V. Krishnan and S. Martínez,
   Int. Symposium on Mathematical Theory of Networks and Systems, Minneapolis, USA, July 2016.

Conferences and Invited Talks

1. Optimization and Systems Theory Division, KTH Sweden *Oct 2021*
2. 2020 CDC Workshop on Data-Driven Control *Dec 2020*
3. 59th IEEE Conference on Decision and Control (CDC) *Dec 2020*
4. Advances in Neural Information Processing Systems (NeurIPS) *Dec 2020*
5. American Control Conference *July 2019*
6. 57th IEEE Conference on Decision and Control *Dec 2018*

7. 35th Southern California Control Workshop *Nov 2018*
8. ASME Int. Mechanical Engineering Education Leadership Summit *(Poster)* *Mar 2018*
9. IFAC World Congress *July 2017*
10. 22nd Int. Symposium on Mathematical Theory of Networks and Systems *July 2016*

Teaching and Service

- **Teaching**: MAE 247 – Cooperative Control of Multi-Agent Systems, Course TA for Prof. Martínez, Spring 2018. Taught several classes in Spring 2018 and 2019.
- **Reviewer**: SIAM Journal on Control and Optimization, IEEE Transactions on Automatic Control, IEEE Transactions on Control of Network Systems, IEEE Transactions on Robotics, Journal of Geometric Mechanics, IEEE Trans. on Signal and Information Processing over Networks, IEEE Conference on Decision and Control, American Control Conference.

References

1. Prof. Fabio Pasqualetti, Professor, ME Dept., UC Riverside fabiopas@engr.ucr.edu
2. Prof. Sonia Martínez, Professor, MAE Dept., UC San Diego soniamd@ucsd.edu
3. Prof. Jorge Cortés, Professor, MAE Dept., UC San Diego cortes@ucsd.edu