# Abraham Puthuvana Vinod

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# Education

# Doctoral student in Electrical Engineering

2014 – 2018 (expected) **GPA:** 4.26/4.0

The University of New Mexico (UNM), USA Advisor: Prof. Meeko M. K. Oishi

PhD Thesis: Safe autonomy using stochastic reachability

#### Bachelor & Master of Technology

2009 - 2014

Indian Institute of Technology Madras (IIT-M), India

**GPA:** 8.59/10

Major: Electrical Engineering Minor: Biomedical Engineering

Master Thesis: Deterministic Attitude Estimation

#### Research interests

Control of stochastic systems under constrains (reachability, motion planning, model predictive control), optimization (convex, stochastic, combinatorial), human-in-the-loop systems, reinforcement learning

### Awards

Best student paper award, ACM Hybrid Systems: Computation and Control, 2017.

Prof. Achim Bopp prize for the best student hardware project at IIT-M, 2014.

Central Board of Secondary Education scholarship for undergraduate studies at IIT-M.

IIT Joint Entrance Examination Rank of  $709/\sim400,000$  and All India Engineering Entrance Examination All-India Rank  $609/\sim1,000,000$ .

# Publications (Google scholar)

### Journal Articles

A. P. Vinod and M. M. K. Oishi, "Scalable Underapproximation for Stochastic Reach-Avoid Problem for High-Dimensional LTI Systems using Fourier Transforms," in IEEE Control Systems Letters (L-CSS), vol. 1, no. 2, pp. 316 – 321, Oct. 2017.

Presented at CDC 2017, Melbourne, Australia. (pp. 4297 — 4302)

A. P. Vinod, A. D. Mahindrakar, S. Bandyopadhyay, and V. Muralidharan, "A Deterministic Attitude Estimation Using a Single Vector Information and Rate Gyros," in IEEE/ASME Transactions on Mechatronics, vol. 20, no. 5, pp. 2630-2636, Oct. 2015.

### **Proceedings**

- \* denotes equal contribution among the authors.
  - A. P. Vinod and M. M. K. Oishi, "Scalable Underapproximative Verification of Stochastic LTI Systems using Convexity and Compactness," in Proceedings of ACM Hybrid Systems: Computation and Control (HSCC), Porto, Portugal, 2018. (accepted)
  - A. P. Vinod, B. HomChaudhuri, C. Hintz, A. Parikh, S. P. Buerger, M. M. K. Oishi, G. Brunson, S. Ahmad, R. Fierro, "Multiple Pursuer-Based Threat Intercept via Forward Stochastic Reachability," in Proceedings of American Control Conference (ACC), Milwaukee, WI, USA, 2018. (accepted)
  - J. Gleason\*, A. P. Vinod\*, and M. M. K. Oishi, "Underapproximation of Reach-Avoid Sets for Discrete-Time Stochastic Systems via Lagrangian Methods," in Proceedings of IEEE Conference on Decision and Control (CDC), Melbourne, Australia, pp. 4283 4290, 2017.
  - B. HomChaudhuri\*, A. P. Vinod\*, and M. M. K. Oishi, "Computation of forward stochastic reach sets: Application to stochastic, dynamic obstacle avoidance," in Proceedings of American Control Conference (ACC), Seattle, WA, USA, pp. 4404 4411, 2017.
  - H.T. (Lewis) Chiang, B. HomChaudhuri, A. P. Vinod, M. M. K. Oishi, L. Tapia, "Dynamic Risk Tolerance: Motion Planning by Balancing Short-Term and Long-Term Stochastic Dynamic Predictions," in Proceedings of IEEE International Conference on Robotics and Automation (ICRA), Singapore, Singapore, pp. 3762 3769, 2017.
  - A. P. Vinod, B. HomChaudhuri, and M. M. K. Oishi, "Forward stochastic reachability analysis for uncontrolled linear systems using Fourier Transforms," in Proceedings of ACM Hybrid Systems: Computation and Control (HSCC), Pittsburg, PA, USA, 2017.
  - Best Student Paper Award | Repeatability Evaluated
  - J. Gleason, A. P. Vinod, M. M. K. Oishi, and R. S. Erwin, "Viable Set Approximation for Linear-Gaussian Systems with Unknown, Bounded Variance," in Proceedings of IEEE Conference on Decision and Control (CDC), Las Vegas, USA, pp. 7049 7055, 2016.
  - A. P. Vinod, Y. Tang, M. M. K. Oishi, K. Sycara, C. Lebiere, and M. Lewis, "Validation of Cognitive Models for Collaborative Hybrid Systems with Discrete Human Input," in Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, Korea, pp. 3339 3346, 2016
  - A. P. Vinod, T. H. Summers, and M. M. K. Oishi, "User-interface design for MIMO LTI human-automation systems through sensor placement," in Proceedings of American Control Conference (ACC), Boston, MA, USA, pp. 5276 5283, 2016.

#### Workshops

A. P. Vinod, B. HomChaudhuri, C. Hintz, A. Parikh, S. P. Buerger, J. Salton, D. Novick, M. M. K. Oishi, and R. Fierro, "Aerial Suppression of Airborne Platforms (ASAP): Coordinated Capture of a Threat UAS via Stochastic Reachability," in International Symposium on Aerial Robotics, Philadelphia, PA, USA, July 2017.

#### Book chapters

A. P. Vinod and A. D. Mahindrakar, "Deterministic Attitude Estimation," Multisensor Attitude Estimation: Fundamental Concepts and Applications, H. Fourati and D. E. C. Belkhiat (Eds.), CRC Press, 2016.

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### Professional activities

#### Reviewer

Journal: Automatica

Conferences: IEEE Conference on Decision and Control,

American Control Conference,

ACM Hybrid Systems: Computation and Control,

IEEE International Conference on Robotics and Automation

Volunteer at the 2016 American Control Conference organization

# Teaching

ECE 514: Nonlinear Control at UNM (guest lectured for Dr. Christopher Petersen)

ECE 546: Multivariate Control Theory at UNM (guest lectured for Prof. Chaouki Abdallah)

ECE 101: Introduction to Electrical Engineering at UNM (teaching assistant)

Advanced Control Systems Lab at IIT-M

# Industry experience

#### Student Intern — R&D (Connected cars)

Summer 2017

Nissan Research Center — Silicon Valley, Sunnyvale, California, US

- o Developed location estimation techniques using CAN and GPS data for cars
- o Created Python code compilation workflow for secure code deployment

### Interim Engineering Intern

Summer 2012

 $Qualcomm\ Incorporated,$  Hyderabad, India

- Analyzed performance of the DRAM with the existing mobile platform builds
- Created a framework that sped up the debugging process by 30%

### Relevant Courses

*UNM*: Probability and stochastic processes, Advanced calculus — I & II, Detection and estimation theory, Advanced probability theory, Complex systems theory, Multivariable control theory, Linear systems

IIT-M: Computer Methods in Electrical Engineering, Nonlinear systems, Mechanics of Robotic Manipulators, Fundamentals of Medical Instrumentation

Online: Machine learning, Optimization (convex and discrete), Game theory

# Miscellaneous

Developed a PhoneGap application to visualize personal mobility data using MQTT and Amazon AWS.

Developed an Android application to recognize American Sign Language for TATA EngiNX Innovation Challenge.

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Developed the control algorithms and managed the team as the team leader for the Indian team to the Robosoccer World Cup, 2013, held in Bristol, UK.

Conducted several hands-on workshop on embedded systems as the core member of the IIT-M Institute Electronics Club.

Last updated: February 21, 2018