# Milind Kumar Vaddiraju

*Curriculum Vitae*

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## Interests

Decentralized Wireless, 5G Technology, Cryptography

## Education

2021-Present **PhD: ECE**, *University of Illinois at Urbana-Champaign*
CGPA - **4.00/4.00**
**Advisor:** Prof. Pramod Viswanath

2016-2020 **B.Tech: Electrical Engineering**, *Indian Institute of Technology Madras*
CGPA - **9.82/10.00**
**Advisor:** Prof. Radhakrishna Ganti

## Publications

HotNets 2022 [*Paper*] **Trust-free Service Measurement and Payments for Decentralized Cellular Networks**, *ACM Workshop on Hot Topics in Networks, 2022*
SVR Anand, Serhat Arslan, Rajat Chopra, Sachin Katti, **Milind Kumar Vaddiraju**, Ranvir Rana, Peiyao Sheng, Himanshu Tyagi, and Pramod Viswanath

## Awards and Scholarships

2022-2026 Awarded the **ECE Distinguished Research Fellowship** at UIUC

2022-2023 Awarded the **James M. Henderson Fellowship** at UIUC

2021-2022 Awarded the **Dilip and Sandhya Sarwate Fellowship** at UIUC

2019 Awarded the **S. N. Bose scholarship** (top 1.5% undergraduates in India)

2019 Selected for the **Caltech LIGO SURF Program**

2017 Awarded the **Sri S Subramanian Prize** and the **Sarasvidya Scholarship** by IITM for the highest CGPA among all first year students

2017,2018 Awarded the **O.P. Jindal Engineering and Management Scholarship** twice

2014 Awarded the **K.V.P.Y.** fellowship

## Scholastic Achievements

2020 Department rank **2 out of 127** students in the Department of Electrical Engineering, IITM at the end of 8 semesters.

- Secured **10/10** GPA in Fall 2016, Spring and Summer 2017, Fall 2018 and Spring 2020 terms at IIT Madras

2016 Ranked **189** out of 1.3 Million examinees in the **JEE Advanced Examination**

2016 Ranked **1** out of about 178,000 examinees in the **Karnataka CET exam**

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## Talks

Dec 2022 **Proof of Service: Trust-free OCS for Decentralized Cellular Networks**, *IIT Madras*, [*Slides*]

April 2022 **BFT Protocol Forensics**, *UIUC*, Given in CS 598: Fault-Tolerant Distributed Algorithms , [*Slides*]

Dec 2021 **VSSE: application to FOIA**, *UIUC*, Given in ECE 407: Cryptography, [*Slides*]

July 2020 **Receiver design and implementation for the Indigenous 5G Testbed**, *IITM*

July 2019 **Laser beam position tracking for LIGO interferometers**, *Caltech*, [*Slides*]

## Teaching

Jan 2021-May 2021 [*Content*]

**EE6143: Advanced Topics in Communications (5G NR)**, *Instructor: Prof. Radhakrishna Ganti*, IIT Madras

Teaching Assistant for the graduate level course with a class size of 60. Created and evaluated programming and theoretical assignments for the same.

## Projects and Internships

### Coordinated Science Laboratory, UIUC

Advisors: Prof. Pramod Viswanath, Prof. Himanshu Tyagi

*Work done in collaboration with Witness Chain*

Jan 2022-Present **Proof of Service**

- Designing a smart contract and state channel based trust-free OCS for decentralized cellular networks. Integrating with Magma, an open source network core for system evaluation. Introduced two-sided measurements for a trust-free design.

### Indigenous 5G Testbed, IITM

Advisor: Prof. Radhakrishna Ganti

Oct 2020-Aug 2021 **L1 Controller Design**

- Designed and implemented a software interface to translate inputs from L2/L3 to PHY into configurations for hardware modules. Optimized the interface to consume minimum time measured in the number of clock cycles.

Nov 2019-Aug 2021 [*Abstract*] **5G NR Receiver Simulation**

- Designed and implemented a bits to bits communication system according to 5G NR specifications in MATLAB
- Evaluated the performance of multiple channel estimation and equalization algorithms in the single user, SISO case for AWGN and multipath fading channel

Dec 2019-May 2020 [*Overview*] [*Report*] **Half-duplex System Design using USRP N321**

- Set up and designed a user manual for USRP N321 at the Indigenous 5G Testbed
- Implemented a transmitter and receiver on the USRP using GNU Radio
- Tested functionality by transmitting and receiving 1 frame of 5G NR data using the USRP and Keysight VSA and VSG

Apr 2020- Jun 2020 [*Overview*] [*Github*]

**MIMO Channel Estimation using PDSCH DMRS**

- Generated PDSCH DMRS symbols according to TS 38.211 using MATLAB
- Implemented and evaluated channel estimation algorithms for the single user MIMO case
- Studied the effect of SNR on channel estimation in the case of a multipath fading channel

### 40 Meter Prototype Interferometer Laboratory, Caltech

Advisors: Prof. Rana Adhikari and Dr. Koji Arai

May 2019- Jul 2019 [*Report*]

**Laser Beam Position Tracking for LIGO Interferometers**

- Assisted in the installation of a Gigabit Ethernet camera at the viewport of the MC2 optic of the mode cleaner cavity of the 40m interferometer. Developed software using pypylon to interact with the installed camera.
- Evaluated the suitability of multiple image processing algorithms for tracking position of laser beam spot on the suspended mirror
- Used convolutional and LSTM networks for laser beam tracking and successfully detected motion of amplitude 3mm with maximum error under 20%

### Speech Lab, IIT Madras

Advisor: Prof. C. S. Ramalingam

Dec 2018- May 2019 [*Report*] [*Github*] [*Video*]

**Source Separation**

- Implemented multiple algorithms for Non-negative Matrix Factorization (NMF) in Python and evaluated their performance
- Implemented the paper "Monaural Sound Source Separation by Nonnegative Matrix Factorization With Temporal Continuity and Sparseness Criteria" and experimented extensively to determine the effect of temporal continuity and sparseness terms on the SNR in comparison with plain NMF

## Leadership Positions

May 2018- Apr 2019 [*Webpage*]

**Head, Lectures and Demonstrations team, Evolve, Shaastra 2019**, *IITM*

- **Headed a team of 15** to organize IIT Madras' annual lecture series and was in charge of a budget of over **7 Lakh INR (9,400 USD)**. Increased organizational efficiency to reduce operational costs by **5 Lakh INR (6,700 USD)**.
- Organized Shaastra's **first blockchain themed TEDx style event** catering to professionals
- Organized **15 lectures** over four days in extremely diverse areas including those of stalwarts such as **Viswanathan Anand** (Indian Chess grandmaster), **Prof. Venkatraman Ramakrishnan** (Nobel laureate in Chemistry) and **Prof. Juergen Schmidhuber**
- **Collaborated with an external conference (*CCBR*)** to co-host speakers and make their talks accessible to a broader, more general audience
- Catered to and managed **a live audience of around 3000** over a span of four days

May 2017- Apr 2018 [*Webpage*]

**Coordinator, Lectures and Demonstrations team, Evolve, Shaastra 2018**, *IITM*

- Organized **13 lectures** on topics as diverse as AI, Art, Ecology, Law, Economics, Neuroscience and Signal Processing in a **team of 10** catering to a **live audience of over 3600** and over **12000 online** over a span of four days
- Conducted Shaastra's **first TEDx style event, ShaastraX,** with five talks catering to over **400 schoolchildren** from all over the city of Chennai
- Personally set up and managed the first remote lecture in Shaastra's history by *Ron Klein*
- Personally invited, hosted and coordinated the lectures of **Prof. Karlheinz Brandenburg** (inventor of the MP3), **Prof. Geoffrey Hinton**, **Prof. Ada Yonath** (Nobel laureate in chemistry) and **Prof. Vilayanur Ramachandran** (acclaimed neuroscientist). Assisted in the organization of the remaining lectures

May 2020- Dec 2020 [*Webpage*]

**Student Mentor, CoEdu India, 2020**, *IITM*

- Organized and taught classes for over 100 schoolchildren belonging to underprivileged communities from class 8 to class 12 to fill in for lack of in person teaching due to Covid-19 over a span of several weeks
- Designed accessible content to introduce schoolchildren to Bioengineering, AI and Deep Learning and their applications in order to cultivate a passion for STEM

May 2017- Dec 2017 [*Webpage*]

**Coordinator, Inter IIT Sports meet Organizing Team**, *IITM*

- Worked in a team of 30 to organize the stay of the sports contingents from 23 IITs
- Personally coordinated and managed the aquatics team of IIT Kanpur for several weeks during their campaign at IIT Madras
- Prepared a security and awareness manual made available to all participants to ensure their safety at IIT Madras