Vanlin Sathya | Curriculum Vitae

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Research Interest

My recent research interests lie in design, analysis, and implementation of wireless network algorithms. I am particularly interested in LTE Wi-Fi Coexistence in unlicensed spectrum, Device-to-Device (D2D) networking, Interference Management in 5G network, Internet of Things (IoT), LTE Wi-Fi Aggregation (LWA), Handover and Placement of Femto (small cells) in LTE, Full Duplex in 5G cellular communication, Data offloading, Bandwidth aggregation and routing between Wi-Fi and cellular, M2M congestion and scheduling issues. My primary research goal is to design and develop a next generation wireless network architectures so that they are energy efficient, low latency, scalable, and to address increasing demand for bandwidth, quality, reliable communications, and connectivity.

Current Employment

- **Post-doctoral Scholar in Computer Science and Engineering** — **USA**
  The University of Chicago — *November 2016– Present*
  Coexistence of small-cell LTE-U and Wi-Fi networks in unlicensed bands at 5 GHz is a topic of active interest, primarily driven by industry groups affiliated with the two (cellular and Wi-Fi) segments. While there is a body of analytical work exploring coexistence of LTE-U and Wi-Fi, our focus in this project is on real-time deployment aspects of such coexisting networks, a topic which has seen little traction in the existing literature. As per the scope of this project, I am responsible for setting up the 5G real-time LTE Wi-Fi coexistence National Instrument based test-bed and to study, analyze, design and propose algorithm to the issue faced in real-time coexistence.

  Advisors: Prof. Monisha Ghosh (Univ. of Chicago) & Prof. Sumit Roy (Univ. of Washington)

Education

- **Ph.D. in Computer Science and Engineering (2011-2016)**
  Indian Institute of Technology (IIT) Hyderabad, India
  Thesis Title: On Improving Data Rates of Indoor Users in LTE Cellular Networks
  Advisor: Dr. Bheemarjuna Reddy Tamma

- **Master of Engineering (M.E) in Mobile and Pervasive Computing (2009-2011)**
  Anna University, Chennai, T.N, India
  Thesis Title: Smart Sensor to Locate Fire-Fighters using WSN

- **Bachelor of Engineering (B.E) in Computer Science and Engineering (2005-2009)**
  Anna University, Chennai, T.N, India
  Project Title: Implementing QoS for various Internet Services.

Skills/Attributes

- Good experience in C, C++ and MATLab
- Hands on experience in National Instruments Labview SDR
- Substantial understanding of TCP/IP protocol stack and Wireless networking protocols
- Expertise in various wireless network technologies such as Cellular Networks, Wireless LANs, Wireless Sensor Networks
- Knowledge of WWAN standards (UMTS, HSPA, LTE, WiMAX) and WLAN standards.
- Knowledge of linear optimization (LP, ILP, MILP, NLP, MINLP) and GAMS optimization tool.
- Published dozen research articles in reputed journals and conferences such as IEEE ToN, IEEE TCCN, Elsevier JNCA, Elsevier COMCOM, IEEE ICC, IEEE GLOBECOM, IEEE ICNC, IEEE WCNC, IEEE VTC, and IEEE Wimob.
- Understanding of radio access technologies such as TDMA, FDMA, MIMO, OFDM, OFDMA, and CDMA.
- Strong analytical skills and ability to work independently as well as with a team
- Managed dozen of interns, undergraduate and graduate students towards publication.
- Mentoring undergraduate and graduate students in prototype design projects and in publishing research papers

Post-Doc Research on 5G Wireless Network

Analytical Modeling of Wi-Fi and LTE-LAA Coexistence: Throughput and Impact of Energy Detection Threshold:...

Description: With both small-cell LTE and Wi-Fi networks available as alternatives for deployment in unlicensed bands (notably 5 GHz), the investigation into their coexistence is a topic of active interest, primarily driven by industry groups. 3GPP has recently standardized LTE-LAA that seeks to make LTE more co-existence friendly with Wi-Fi by incorporating similar sensing and back-off features. Nonetheless, the results presented by industry groups offer little consensus on important issues like respective network parameter settings that promote "fair access" as required by 3GPP. Answers to such key system deployment aspects, in turn, require credible analytical models, on which there has been a little progress to date. Accordingly, in one of the first works of its kind, we develop a new framework for estimating the throughput of Wi-Fi and LTE-LAA in coexistence scenarios via suitable modifications to the celebrated Bianchi model. The impact of various network parameters such as energy detection threshold on Wi-Fi and LTE-LAA coexistence is explored as a byproduct and corroborated via a National Instrument experimental test bed that validates the results for LTE-LAA access priority classes 1 and 3.

On the Fairness of Wi-Fi and LTE-LAA Coexistence:..

Description: With both small-cell LTE and 802.11 networks now available as alternatives for deployment in unlicensed bands at 5 GHz, investigation into their coexistence is a topic of great interest. ETSI Rel.14 has standardized LTE LAA that seeks to make LTE more coexistence friendly with Wi-Fi by incorporating listen before talk (LBT). However, the fairness of Wi-Fi and LTE-LAA sharing is a topic that has not been adequately explored. In this work, we first investigate the 3GPP definition of fair coexistence via new analytical models. By tuning the LTE-LAA parameters, we exemplify scenarios when the 3GPP notion of fairness is achieved and conversely, when not achieved. The formal notions of access and proportional fairness is then considered for these scenarios to compare and contrast with the 3GPP definition.

Analysis of CSAT performance in Wi-Fi and LTE-U Coexistence:...................................

Description: In this work, we study energy-based Carrier Sense Adaptive Transmission (CSAT) for use with LTE-U and investigate the performance in Wi-Fi/LTE-U coexistence using theoretical analysis and experimental verification using NI USRPs. According to the LTE-U forum specification, if an LTE-U base station (BS) finds a vacant channel, it can transmit for up to 20 ms and turn OFF its transmission for only 1 ms, resulting in a maximum duty cycle of 95%. In a dense deployment of LTE-U and Wi-Fi, it is very likely that a Wi-Fi access point will wish to use the same channel. It will start transmission by trying to transmit association packets (using carrier sense multiple access with collision avoidance(CSMA/CA)) through the 1 ms LTE-U OFF duration. Since this duration is vey small, it leads to increased association packet drops and thus delays the Wi-Fi association process. Once LTE-U, using CSAT, detects Wi-Fi, it should scale back the duty cycle to 50%. We demonstrate in this work, using an experimental platform as well as theoretical analysis, that if LTE-U is using a 95% duty cycle, energy based CSAT will take a much longer time to scale back the duty cycle due to the beacon drops and delays in the reception. Hence, in order to maintain association fairness with Wi-Fi, we propose that a LTE-U BS should not transmit at maximum duty cycles (95%),even if the channel is sensed to be vacant.

Energy detection based sensing of multiple Wi-Fi BSSs for LTE-U CSAT:.........................

Description: In this work, we develop an algorithm, based only on energy detection, to detect the number of Wi-Fi basic service sets (BSSs) operating on the same channel. Such an algorithm can be used by an LTE-U base station to scale back its duty cycle when coexisting with Wi-Fi on the same channel. According to the LTE-U specification, an LTE-U BS scales back its duty cycle from 50% to 33% when it senses that the number of co-channel Wi-Fi BSSs has increased from one to two. There are two ways that this detection can be done: (a) decoding based, where the LTE-U BS decodes the Wi-Fi packet header to determine the unique Wi-Fi basic service set identification (BSSID) and (b) energy based, where only received energy levels are used to determine the number of Wi-Fi BSSs. The former approach requires an LTE-U BS to implement a Wi-Fi decoder and hence increases complexity, whereas the latter is easier to implement, requiring only an energy detector and appropriate detection thresholds to distinguish between one and two Wi-Fi APs. We analyze the latter approach and experimentally verify the feasibility of an energy detector to reliably distinguish between one and two Wi-Fi APs. In order to do so, we first experimentally determine appropriate detection thresholds using comprehensive measurements in realistic environments, both line-of-sight (LOS) and non-LOS (NLOS). These thresholds are then used to perform hypothesis based detection to devise an efficient algorithm that predicts the presence of one or two Wi-Fi BSSs. The performance of the proposed algorithm is evaluated, both theoretically and experimentally, by utilizing two metrics (a) probability of detection (P_D) and (b) probability of false alarm (P_{FA}). We show that using a threshold of -42 dBm delivers greater than 80% P_D and less the 5% P_{FA} which we verify both theoretically and experimentally. Hence, energy based detection is a low-complexity means of determining number of Wi-Fi BSSs to help LTE-U scale back its duty cycle appropriately.

Auto-correlation based sensing of multiple Wi-FiBSSs for LTE-U CSAT:..........................

Description: LTE-U (LTE-Unlicensed) is designed to coexist with Wi-Fi in the unlicensed band by balancing its duty cycle according to the number of coexisting Wi-Fi access points (APs) it detects. For example, a LTE-U base-station will reduce its duty cycle from 50% to 33% when it senses an increase in the number of co-channel Wi-Fi basic service sets (BSSs) from one to two. But the problem of detecting how many Wi-Fi BSS' are operating on the channel in real-time, without decoding the Wi-Fi header, still remains. In this paper, we present a novel algorithm that solves the problem by using an auto-correlation (AC) function on the Wi-Fi preamble and setting appropriate detection thresholds to infer the number of Wi-FiBSSs operating on the channel. Performing auto-correlation on the Wi-Fi preamble is a much simpler operation than decoding the entire Wi-Fi packet, which is what would be needed ifone were to decode the MAC header to identify the BSS. We implement and experimentally validate the proposed AC detector rand demonstrate that there is a differentiable pattern of AC events between one and two Wi-Fi APs. From the collected AC events, we determine a suitable threshold for a reliable detection of Wi-Fi APs. We show that using an AC threshold of N_E= 0.8, we can achieve a probability of detection (P_D) of 0.9 with a probability of false alarm (P_{FA}) of less than 0.02. Finally, we demonstrate that the performance of the proposed AC detector is superior in terms of P_D and P_{FA} compared with the energy detector (ED).

Impact of changing energy detection thresholds on fair coexistence of Wi-Fi and LTE in the

unlicensed spectrum:..

Description: The exponential increase in the number of mobile devices in use today has led to a commensurate increase in the demands on both cellular and Wi-Fi infrastructure, thus requiring that both licensed (cellular) and unlicensed (Wi-Fi) spectrum be utilized as efficiently as possible. One solution being actively pursued by industry is for cellular systems to use the unlicensed spectrum in addition to the licensed spectrum, which would require fair coexistence with Wi-Fi in the unlicensed spectrum. As per the IEEE 802.11 standard, Wi-Fi uses an energy detection (ED) threshold of -62 dBm when Long Term Evolution-Licensed Assisted Access (LTE-LAA) and/or Long Term Evolution Un-Licensed (LTE-U) nodes are deployed close by, whereas the LTE-LAA specification recommends that LTE- LAA detect Wi-Fi at -72 dBm. In our work, we evaluate the effect of this asymmetry in the ED threshold on coexistence between the two systems. We develop a coexistence simulator in ns-3 and vary both the Wi-Fi and LTE energy detection thresholds and demonstrate that lowering the Wi-Fi ED threshold from -62 dBm improves performance for both Wi-Fi and LTE-LAA. Prior work has mostly focused on determining the ED threshold that should be used by LTE-LAA/LTE-U. As far as we are aware, this is the first result that demonstrates that lowering the Wi-Fi ED threshold improves performance for both systems. The conclusion is that if Wi-Fi treats LTE-LAA/LTE-U as it would an overlapping Wi-Fi, coexistence performance improves compared to the current assumption that Wi-Fi treats LTE-LAA/LTE-U as noise.

Doctoral Research on 4G Wireless Network

On Placement and Dynamic Power Control of Femtocells in LTE HetNets:.......................

Description: Optimal placement of Femtos ensures good signal strength/throughput. However, placing Femtos inside a building leads to power leakage at the edges/corners of the building. This degrades the performance of High Interference Zone User Equipments (HIZUEs) in HIZone around the building area because both Macros and Femtos typically operate on the same frequency in LTE HetNets. Setting Femto's transmit power levels at optimum based on occupancy of HIZUEs in HIZone could solve this problem. In this work, we propose an efficient Femto placement and power control algorithm by employing the following two optimization models:

1. Minimize Number of Femtos (MinNF) model.
2. Optimal Femto Power (OptFP) model.

On improving SINR in LTE HetNets with D2D Relays:..

Description: To guarantee minimum SINR to both Indoor UEs (IUEs) and HIZUEs in the HIZone, we apply the concept of Device-to-Device (D2D) communication where in free/idle IUEs act like UE-relays for serving the downlink traffic of HIZUEs via Femtos deployed inside the buildings. We first formulate a D2D MILP model which establishes D2D pairs between free/idle IUEs and HIZUEs and also guarantees certain $SINR_{TH}$ for both IUEs and HIZUEs. As D2D MILP model takes more computation time, it is not usable in real-world scenarios for establishing D2D pairs on the fly. Hence, we propose a two-step D2D heuristic algorithm for establishing D2D based relay pairs. In step one (called as hDPRA), it efficiently chooses potential D2D based relay pairs and allocates radio resources to them. In step two (called as hDPA), a Linear Programming (LP) model is formulated for power control of D2D links. We have evaluated the performance of the proposed D2D heuristic algorithm for different scenarios (i.e., 500 topologies) by varying densities of IUEs and HIZUEs. From our evaluation, we find that the proposed D2D heuristic algorithm maintains almost the same SINR as that of Full Power Femto Scheme (i.e., each Femto transmits at its peak power) for IUEs and also guarantees a certain minimum $SINR_{TH}$ for HIZUEs. In comparison to the OptFP model, it improves SINR of IUEs by 40%. However, the degradation in SINR of IUEs is only 1.6% when compared to the Full Power Femto Scheme. We also observe that the minimum $SINR_TH$ (-2 dB) is maintained for all HIZUEs in the HIZone. We also observe that the running time for D2D heuristic algorithm showed an average decrease of up to 87% when compared to D2D MILP model.

A Novel Resource Allocation and Power Control Mechanism for Hybrid Access Femtocells

(HAFs): ....

Description: HAFs are favoured by the operators because they provide the paid subscriber group (SG) users certain QoS and then try to maximize the system capacity by serving near-by non-subscriber group (NSG) users in a best-effort manner. To reap in the benefits of HAFs, the operators need to employ effective resource sharing and scheduling mechanisms to contain co-tier and cross-tier interference arising out of reuse one in the HetNet system. Towards this, we propose the following solutions:

1. An Optimal Placement of hybrid access Femtos (OPF) algorithm which ensures a certain $SINR_TH$ inside the building and a certain $SINR_TH$ in the HIZone of the building.
2. A decentralized Dynamic Bandwidth Allocation (BWA) mechanism which divides the available HAF bandwidth between the two sets of user groups: SG and NSG.
3. A dynamic Optimal Power Control (OPC) mechanism which reduces the transmit power of HAFs whenever the users in the HIZone cannot be served by the HAFs. In such a case, HIZone users connect to an MBS instead. Since the OPC problem is hard to solve in polynomial time, we also present a Sub-Optimal Power Control (SOPC) mechanism.
4. An Enhanced Priority (EP) scheduling mechanism which employs two schedulers which are based on the Proportional Fair (PF) and the Priority Set (PS) scheduling mechanisms. While one scheduler maintains fairness among the SG users, the other one fairly schedules radio resources among the NSG users.

EP scheduling mechanism performs better than the legacy PF and PS scheduling mechanisms by prioritizing the SG users over the NSG users and maintains fairness (Jain's fairness index of 0.99) within each group.

Decoupled access for the downlink and uplink in LTE Femtocell Networks:..........

Description: Once the placement of Femtos is done optimally in enterprise environments, operators need to ensure that traffic load is evenly distributed among neighboring Femtos for improving QoS of indoor UEs and efficiently utilizing the network resources. In a typical indoor environment, the uplink traffic load would more or less be the same across all Femtos in the entire building, but the downlink traffic load varies from one cell to the other depending on the number of UEs being served by a Femto and their traffic demands. In traditional cellular networks, the uplink access and downlink access of UEs are coupled to the same (Femto) cell. Suppose a Femto is fully loaded when compared to its neighboring Femtos, the traditional offloading or load balancing algorithms will try offloading some of the UEs for both their uplink and downlink access from the loaded cell to one of less loaded neighboring cells (i.e., target cell) provided that these UEs could get connected to the chosen target cell. This type of offloading is a forced handover to reduce traffic imbalance and it is not based on better signal strength from the target cell. But, the offloaded UEs are connected for both their uplink and downlink access to the same target cell. Since UEs are most likely separated by walls and floors from their connected cells in enterprise environments, these offloaded UEs now have to transmit with higher transmit power in the uplink and thereby affects their battery lives.
In order to reduce the battery drain for the offloaded UEs while maintaining their QoS, one could use the Decoupled uplink and Downlink (DuD) access method i.e., the uplink of UE is connected to the closest Femto while the downlink is connected to a less loaded neighboring Femto. Our extensive experimentation results in MATLAB based simulator show that decoupled access system achieves 56% energy savings when compared to the traditional coupled access system for LTE Femtocell networks.

Handover and SINR optimized Femto deployment in enterprise environments:..........

Description: Another problem in enterprise buildings having Femtos is frequent handovers, that happen when IUEs move from one room/floor to another room/floor inside the building. This leads to degradation of network performance in terms of increased signaling overhead and low throughputs. In order to reduce this kind of unnecessary handovers in enterprise buildings, Femtos should be placed optimally with handover constraints. Hence, we obtain the optimal coordinates from the joint placement and power control model (OptCTSINR) by adding handover constraints. Such optimized deployment of Femtos reduces the number of handovers while guaranteeing good SINR to all IUEs. Compared to the optimal without handover constraints (OptWHO) model, our proposed OptHO model reduces 30% of the unnecessary handovers in enterprise buildings.

Enhanced distributed resource allocation and interference management in LTE Femtocell Networks:

Description: Recently telecom industry is considering dense deployment of small cells in outdoor environments. In these dense deployments, Femtos/Picos are deployed arbitrarily. Though the capacity of network increases through frequency reuse one at Femtos, it could lead to co-tier interference and cause higher interference for cell edge UEs. This problem is more severe due to dense placement of Femtos arbitrarily. Existing co-tier interference management techniques in literature do not solve this problem completely. Hence, in this work, we propose a Variable Radius (VR) algorithm which dynamically increases or decreases the cell edge/non-cell edge region of Femtos and efficiently allocates the radio resources among cell edge/non-cell edge region of Femtos so that the co-tier interference between neighboring Femtos can be avoided. We implemented the proposed VR algorithm on top of the PF scheduling algorithm in NS-3 simulator. In an experiment having 90 UEs, the proposed technique, VR + PF, achieved 29% and 38% improvement in average throughput for static and mobile scenarios, respectively when compared to the classic PF algorithm without any inter-cell interference management.

Energy-efficient Femto deployment in LTE Networks:

Description: In this work, we focus on reducing the battery power consumption of indoor UEs (i.e., uplink transmit power) while guaranteeing both the uplink SINR threshold ($USINR_{TH}$) and the downlink SINR threshold ($DSINR_{TH}$). We achieve this by placing the Femtos optimally, taking into account wall attenuation factor and co-tier and cross-tier interference among Macros and Femtos. A two-step optimization model has been formulated: in step one, we formulate a Mixed Integer Programming (MIP) model which yields the optimal locations of the Femtos and meets $DSINR_{TH}$ and $USNR_{TH}$ while also minimizing Femto count and the uplink transmission power. In step two, we formulate a Linear Programming (LP) problem with the aim of guaranteeing $USINR_{TH}$ and minimizing the total uplink power, after placing the Femtos in the optimal positions obtained from the step one. When compared to the center K-means placement scheme, the proposed optimal placement scheme obtained by solving the above two-step optimization model registers a significant, 47%, reduction in the uplink energy consumption.

Phantom Cell Architecture for LTE and its Application in Vehicular IoT Environments:

Description: Proliferation of Internet of Things (IoT) devices (smart wearables/vehicles, etc.) in the near future, would raise the capacity and bandwidth demands from the cellular infrastructure manifold. Deploying small cells is an effective solution to cope with the problem. This work focuses on a special kind of small eNBs, termed as Phantom eNBs. Phantom eNB acts as a supplement to the current radio access network (RAN) in the LTE infrastructure. It handles the data plane while a Macro eNB holds the control plane. Definitions of control and data plane, along with the modifications needed in the protocol stack are explained in this paper. Communication mechanisms are developed for Phantom and Macro eNB to communicate over the X2 interface between them. NS-3 simulations are performed for handover scenarios of Vehicular IoT environment, consolidating the architecture and network topology designed for Phantom based Heterogeneous Networks (HetNets). Network throughput improvements of 80% and 14% are observed in comparison to the Macro-only RAN and existing small cell solutions (Femto cells), respectively.

On Improving Capacity of Small Cells with Full-duplex and D2D Communications:

Description: The recent developments in full duplex (FD) communication promise doubling the capacity of cellular networks using self interference cancellation (SIC) techniques. Dense deployment of FD small cells with device-to-device (D2D) communication links could achieve the expected capacity of the future cellular networks (5G). In this work, we consider joint scheduling and dynamic power control mechanism for FD small cell networks with D2D links. We formulate an optimal user selection and dynamic power control algorithm (O-PCA) as a non-linear programming (NLP) optimization problem.

Publications

Journal Papers: Refereed [* → corresponding author]

1. Kalpana Naidu, Hemanth Kumar Gai, Amgothu Ravikumar, and **V. Sathya**, *Optimal Resource Allocation Based on Particle Swarm Optimization*, in Springer Volume, October 2019.
2. A. Ramamurthy, **V. Sathya***, Shrestha Ghosh, Antony Franklin, and Bheemarjuna Reddy Tamma, *Dynamic Power Control and Scheduling in Full Duplex Cellular Network with D2D*, in Springer Wireless Personal Communications (WPC), October 2018.
3. Srikant Manas Kala, **V. Sathya**, M Pavan Kumar Reddy, Betty Lala and Bheemarjuna Reddy Tamma, *A Socio-inspired CALM Approach to Channel Assignment Performance Prediction and WMN Capacity Estimation*, in Elsevier Journal of Network and Computer Applications (JNCA), October 2018.
4. Morteza Mehronush, Sumit Roy, **V. Sathya**, and, Monisha Ghosh, *On the Fairness of Wi-Fi and LTE-LAA Coexistence*, in IEEE Transactions on Cognitive Communications and Networking (TCCN), August 2018.
5. Morteza Mehronush, **V. Sathya**, Sumit Roy, and Monisha Ghosh , Analytical Modeling of Wi-Fi and LTE-LAA Coexistence: Throughput and Impact of Energy Detection Threshold, *in IEEE/ACM Transactions on Networking (ToN)*, July 2018.
6. S. Gosh, **V. Sathya***, A. Ramamurthy, B. R. Tamma, A novel resource allocation and power control mechanism for hybrid access femtocells, accepted in *Elsevier Computer Communication (COMCOM)*, May 2017.
7. Sreekanth, T.V. Pasca, **V. Sathya***, and K. Kuchi, Enabling Edge Computing and IoT in Dense Futuristic Networks using cellular, accepted in *IEEE Consumer Electronics Magazine*, September 2016. [**Top 10 most popular articles: 6^{th} position**]
8. **V. Sathya***, V. Venkatesh, R. Ramji, A. Ramamurthy, B. R. Tamma, Handover and SINR optimized deployment of LTE femtocells in enterprise environments, accepted in *Springer Wireless Personal Communications (WPC)*, vol. 88, pp. 619-643, June 2016.
9. **V. Sathya***, A. Ramamurthy, S. Kumar, B. R. Tamma, On improving SINR in LTE hetnets with D2D relays, accepted in *Elsevier Computer Communications (COMCOM)*, vol. 83, pp. 27-44, June 2016.
10. **V. Sathya***, A. Ramamurthy, M. Tahalani, B. R. Tamma, On femto placement and decoupled access for downlink and uplink in enterprise environements, *accepted in EAI Endorsed Transactions on Future Internet*, November 2015.
11. H. Lokhandwala, **V. Sathya***, B. R. Tamma, Phantom Cell Architecture for LTE and its Application in Vehicular IoT Environments, accepted in *EAI Endorsed Transactions on Future Internet*, July 2015.

Journal Papers: Under Review

1. **V. Sathya***, Morteza Mehronush, Monisha Ghosh and Sumit Roy, Wi-Fi/LTE-U Coexistence: Real-time Association Issues and Solutions, *submitted to IEEE Network Magazine*.
2. **V. Sathya***, Shrestha Ghosh, Arun Ramamurthy, and Bheemarjuna Reddy Tamma, Small Cell Planning: Resource Management and Interference Mitigation Mechanisms in LTE HetNets, *submitted to Elsevier Physical Communication*.

Conferences: Refereed Papers

1. **V. Sathya**, Adam Dziedzic, Monisha Ghosh and Sanjay Krshnan, Machine Learning based detection of multiple Wi-Fi BSSs for LTE-U CSAT, *in Proc. of IEEE ICNC Conference track on Machine Learning for Communications and Networking (MLCN)*, February 2020, Big-Island, Hawaii, USA.
2. Srikanth Manas Kala, **V. Sathya**, Suhel Sajjan Magdum, and Bheemarjuna Reddy Tamma, *ODiN: Enhancing Resilience of Disaster Networks through Regression Inspired Optimized Routing*, in Proc. of IEEE Advanced Network and Telecommunications Systems (ANTS), December 2019, Goa, India.
3. Gaurav Garg, Venkatarami Reddy, **V. Sathya**, Antony Franklin A, and Bheemarjuna Reddy Tamma, An SLA-Aware Network Function Selection Algorithm for SFCs, *in Proc. of IEEE 5G World Forum*, 30 September to 2 October 2019, Dresden, Germany.
4. **V. Sathya**, Morteza Mehronush, Monisha Ghosh and Sumit Roy, Auto-correlation based sensing of multiple Wi-Fi BSSs for LTE-U CSAT, *in Proc. of IEEE Vehicular Technology Conference (VTC) Conference track*

on Spectrum Sharing, Spectrum Management, and Cognitive Radio, September 2019, Honolulu, Hawaii, USA.

5. Srikanth Manas Kala, **V. Sathya**, Suhel Sajjan Magdum, Tulja Vamshi Kiran Buyakar, Hatim Lokhandwala, and Bheemarjuna Reddy Tamma, *Designing infrastructure-less disaster networks by leveraging the AllJoyn framework*, in Proc. of ICDCN Workshop (EmeRTeS), Jan 2019, Bangalore, India.
6. **V. Sathya**, Morteza Mehronush, Monisha Ghosh and Sumit Roy, Energy detection based sensing of multiple Wi-Fi BSSs for LTE-U CSAT, *in Proc. of IEEE International Conference on Global Communications (GLOBECOM) Symposium on Cognitive Radio and Networks*, Dec 2018, Abu Dhabi, UAE.
7. **V. Sathya**, Morteza Mehronush, Monisha Ghosh and Sumit Roy, Analysis of CSAT performance in Wi-Fi and LTE-U Coexistence", *in Proc. of IEEE International Conference on Communications (ICC) Workshop on 5G Ultra Dense Networks*, May 2018, Kansas City, MO, USA.
8. **V. Sathya**, Morteza Mehronush, Monisha Ghosh and Sumit Roy, Association fairness in Wi-Fi and LTE-U coexistence, *in Proc. of IEEE Wireless Communications and Networking Conference (WCNC)*, April 2018, Barcelona, Spain.
9. Muhammad Iqbal Cholilur Rochman, **V. Sathya**, and Monisha Ghosh, Impact of changing energy detection thresholds on fair coexistence of Wi-Fi and LTE in the unlicensed spectrum, in Proc. of *IEEE Wireless Telecommunication Symposium (WTS)*, April 2017, Chicago, USA.
10. Deepa Martolia, **V. Sathya**, Anil Kumar Rangisetti, Bheemarjuna Reddy Tamma, and Antony Franklin, Enhancing Channel Quality of Victim Macro Users via Joint ABSF and Dynamic Power Control, in Proc. of *National Conference on Communication (NCC)*, March 2017, IIT Madras, Chennai, India.
11. Anand M. Baswade, **V. Sathya**, B. R. Tamma, A. Franklin, Unlicensed Carrier Selection and User Offloading in Dense LTE-U Networks, in Proc. of *IEEE International Conference on Global Communications (GLOBECOM)*, 2016.
12. M. K. Giluka, Sibgath Khan, **V. Sathya**, and A. Franklin, Leveraging Decoupling in Enabling Energy Aware D2D Communicaions, in Proc. of *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, November 2016, Bangalore, India.
13. Akilesh B, **V. Sathya**, Arun Ramamurthy, and B. R. Tamma, A Novel Scheduling Algorithm to Maximize the D2D Spatial Reuse in LTE Networks, in Proc. of *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, November 2016, Bangalore, India.
14. Arun Ramamurthy, **V. Sathya**, Shrestha Ghosh, and B. R. Tamma, On Improving Capacity of Full-Duplex Small Cells with D2D, Published in arXiv, June 2016.
15. M. K. Giluka, Sibgath, G. M. Krishna, T. Atif, **V. Sathya**, B. R. Tamma, On Handovers in Uplink/Downlink Decoupled LTE HetNets, in: *IEEE Wireless Communications and Networking Conference (WCNC)*, 2016.
16. Sreekanth, Thomas, **V. Sathya**, K. Kuchi, A Novel RACH Mechanism for Dense Cellular-IoT Deployments, in: *IEEE Wireless Communications and Networking Conference (WCNC)*, 2016.
17. **V. Sathya**, R. Anilkumar, A. Ramamurthy, B. R. Tamma, Maximizing Dual Cell Connectivity Opportunities in LTE Small Cells Deployment, in: *National Conference on Communication (NCC)*, 2016.
18. **V. Sathya**, A. Ramamurthy, B. R. Tamma, Joint placement and power control of LTE femto base stations in enterprise environments, in: *IEEE International Conference on Computing, Networking and Communications (ICNC)*, 2015, pp. 1029–1033.
19. A. Ramamurthy, **V. Sathya**, V. Venkatesh, R. Ramji, B. R. Tamma, Energy-efficient Femtocell Placement in LTE Networks, in: *IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT)*, 2015, pp. 1–6.
20. **V. Sathya**, A. Ramamurthy, B. R. Tamma, On placement and dynamic power control of femtocells in LTE hetnets, in: *IEEE International Conference on Global Communications (GLOBECOM)*, 2014, pp. 4394–4399.
21. M. Tahalani, **V. Sathya**, A. Ramamurthy, U. Suhas, M. K. Giluka, B. R. Tamma, Optimal placement of femto base stations in enterprise femtocell networks, in: *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, 2014, pp. 1–6.
22. H. Lokhandwala, **V. Sathya**, B. R. Tamma, Phantom cell realization in LTE and its performance analysis, in: *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, 2014, pp. 1–6.

23. M. K. Giluka, N. Rajoria, A. C. Kulkarni, **V. Sathya**, B. R. Tamma, Class based dynamic priority scheduling for uplink to support M2M communications in LTE, in: *IEEE World Forum on Internet of Things (WF-IoT) Conference*, 2014, pp. 313–317.[**Referred this work in AT&T patent**]
24. R. Chaganti, **V. Sathya**, S. Ahammed, R. Rex, B. R. Tamma, Efficient SON handover scheme for enterprise femtocell networks, in: *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, 2013, pp. 1–6.
25. **V. Sathya**, H. V. Gudivada, H. Narayanam, B. M. Krishna, B. R. Tamma, Enhanced distributed resource allocation and interference management in LTE femtocell networks, in: *IEEE International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob)*, 2013, pp. 553–558.
26. M. Tahalani, **V. Sathya**, U. Suhas, R. Chaganti, B. R. Tamma, Optimal femto placement in enterprise building, in: *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, 2013, pp. 1–3.

Conference: Under Review

1. Srikanth Manas Kala, Winston K.G. Seah, **V. Sathya**, Betty Lala and Bheemarjuna Reddy Tamma, Exploring the Statistical Relationship between Interference Estimates and Network Capacity, *submitted to IEEE International Conference on Communications (ICC) 2019*.

Short Papers and Posters

1. Adam Dziedzic, **V. Sathya**, Monisha Ghosh and Sanjay Krshnan, Detection of multiple Wi-Fi BSSs for LTE-U CSAT using Machine Learning Approach, Presented at Center for Unstoppable Computing (CERES) 2019, University of Chicago, USA.
2. Srikant Manas Kala, **V. Sathya**, M Pavan Kumar Reddy and Bheemarjuna Reddy Tamma, *iCALM : A Topology Agnostic Socio-inspired Channel Assignment Performance Prediction Metric for Mesh Networks*, in Proc. of ACM Mobile Computing and Networking (MobiCom), November 2018, New Delhi, India.
3. Srikanth Manas Kala, **V. Sathya** and Bheemarjuna Reddy Tamma, Exploring the Relationship between Socio-inspired CALM and Network Capacity through Regression Analysis, *in Proc. of IEEE 7th International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, September 2018, Bangalore, India. [**Best Poster Award**]
4. Yuva Kumar, **V. Sathya**, and Sreenath Ramanath, Enhancing Spectral Efficiency in LTE-D2D Networks, in Proc. of *IEEE 9th International Conference on COMmunication System and NETworkS (COMSNETs) poster*, January 2017, Bangalore, India.
5. **V. Sathya**, B. R. Tamma, Dynamic spectrum allocation in femto based lte network, in: *International Conference on Communication Systems and Networks (COMSNETS) poster*, 2013, pp. 1–2.
6. **V. Sathya**, Bala Murali Krishna K, B. R. Tamma, Efficient Interference Management Scheme for LTE Femtocell Networks, *Presented at ACM Mobile Ad Hoc Networking and Computing (Mobihoc)*, July-August 2013, Bangalore, India.

Book Chapter

- Kalpana Naidu, Hemanth Kumar Gai, Amgothu Ravikumar, and **V. Sathya**, *Optimal Resource Allocation Based on Particle Swarm Optimization*, in Springer Advances in Communications, Signal Processing, and VLSI, 2019.

Live Demos & Presentation

- **V. Sathya**, and Monisha Ghosh, *Association fairness in LTE Wi-Fi Coexistence*, in IEEE International Conference on Communications (ICC), May 2018, Paris, France (displayed at NI demo booth).
- **V. Sathya**, and Monisha Ghosh, *LTE Wi-Fi Coexistence: Impact of interference on real-time video streaming over Wi-Fi*, in IEEE Dynamic Spectrum Access Network (DySPAN), March 2017, Baltimore, USA.

Patent

- Sreekanth, Thomas, **V. Sathya**, K. Kuchi, B. R. Tamma, A Novel RACH Mechanism for Dense Cellular-IoT Deployments, *Provisional Filling: 06.11.2015*, Patent Pending (India).

Teaching Assistant and Research Guidance/Colloboration Experience

Lab Courses

- CS 3040 Computer Network, First Semester Jan 2012.
- CS 5070 Networked Wireless System, First Semester Jan 2013-2016.
- CS 3030 Operating System, Second Semester 2012-2014.
- ID 1061 Introduction to Computer Programming, First Semester Jan 2012.

Intern Research Guidance

- Shreshtha Ghosh, IIEST Shilpur, India (Currently pursuing MS in University of Saarland, Germany in collaboration with the Max Planck Institute for Computer Science).
- Milind Thilani, IIT Kharagpur, India (Now in Amazon, India).
- Varsha Venkat, Stony Brook University, (Now in Intuit, CA, USA).
- Rithi Ramji, University of Florida, (Now in Microsoft, Seattle, USA).
- Keshav Goel, NIT, India (Now in Amazon, India).
- Riddhi Rex, Anna University Chennai, India (Currently pursuing MS in Stony Brook University, USA).

Undergraduate Research Guidance

- Arun Ramamurthy, IIT Bombay (Now in TCS Innovation Lab, India).
- Harsha Vardhan Gudivada, IIT Hyderabad, Morgan Stanley, India.
- Hemanth Narayanam, IIT Hyderabad, (Now in Tenmiles, India).
- Touheed Anwar Atif, IIT Hyderabad, (Currently pursuing PhD in University of Michigan, USA).
- Akilesh Badrinarayannan, Adobe R&D (Currently pursuing MS in Montreal Institute For Learning Algorithms, Canada).
- Sandeep Kumar, IIT Hyderabad (Now in WiSig Networks, India).

Research Collaboration

- Dr. Morteza Mehrnoush, University of Washington, USA.
- Assistant Professor. Sanjay Krishnan, University of Chicago, USA.
- Associate Professor. Antony Franklin, IIT Hyderabad, India.
- Assistance Professor. Anil Kumar, IIIT Gwalior, India.
- Assistance Professor. Mukesh Kumar Giluka, IIIT Nagpur, India.
- Assistance Professor. Kalpana Naidu, NIT Warangal, India.
- Dr. Thomas Valerian Pasca, Qualcomm Technologies R & D, USA.
- Dr. Anand Baswade, Samsung R & D, India.
- Dr. Nitish Rajoria, Keio University, Japan.
- Dr. Ajay Pratap, Missouri University of Science and Technology, USA.
- Adam Dziedzic, University of Chicago, USA.
- Yuva Kumar, Keio University, Japan.
- Srikanth Manas Kala, Osaka University, Japan.
- Muhammad Iqbal Cholilur Rochman, University of Chicago, USA.
- Adam Dziedzic, University of Chicago, USA.
- Pavan Kumar Reddy, Qualcomm, India.
- Bala Murali krishna, Rutgers University, USA.
- Ramaraju Chaganti, IIT Hyderabad, India.
- Sreekanth Dama, Qualcomm Communications R & D, India.
- Bhupesh Raj, Rutgers University, USA.

Honors and Distinctions

1. **Post-doc Scholarship** from National Science Foundation (NSF) grant, (Nov 2016-Present).
2. Recipient of **Excellence in Academic** award for securing first rank in the Computer Science and Engineering Department at the Indian Institute of Technology Hyderabad, India (2012-2013).
3. Recipient of **Excellence in Research** award for exceptional research profile at Indian Institute of Technology Hyderabad, India (2013-2014).
4. **Recipient of Full Grant** from the Indian Institute of Technology Hyderabad for attending ICNC 2015 held at Anaheim, U.S.A.
5. **Travel Grant** to attend ACM Mobihoc 2013, Bangalore, India.
6. **Travel Grant** to attend COMSNETS 2013 & 2015, Bangalore, India.
7. **PhD Research Fellowship** from MHRD, Govt. of India, (2011-2016).
8. **Silver** medalist in masters (M.E: Mobile & Pervasive Computing 2011).

Extra Curricular Activities

1. University **Gold Medalist** in Weight Lifting and Power Lifting from (2008 to 2011).
2. Event Organizer in the college symposium, conferences, workshops and the college annual day functions.
3. Recipient of **Excellence in Sports** (weight lifting) award at the Indian Institute of Technology, Hyderabad (2013-14)
4. **PhD representative** in Student Gymkhana of Indian Institute of Technology, Hyderabad (2014-15).

Professional Activities

Reviewer for the following Conferences/Journals:

- IEEE Transactions on Wireless Communications
- IEEE/ACM Transactions on Networking
- IEEE Transactions on Communications
- IEEE Communication Letter
- IEEE Wireless Communication Letter
- IEEE Access
- Springer: Wireless Personal Communication
- Elsevier: Computer Communication
- IEEE ICC 2018
- NCC 2018, 2019 &, 2020
- IEEE VTC 2017
- IEEE ANTS 2014

Technical Program Committee (TPC) Member

- NCC 2018, 2019 & 2020
- Comsnet Poster 2019

Member

- IEEE
- IEEE Comsoc

Presentations given at National & International Conferences

- IEEE Global Communications Conference (IEEE Globecom 2018), Abu-dhabi, UAE, Dec 2018.
- IEEE Wireless Telecommunications Symposium (IEEE WTS 2017), Chicago, USA, April 2017.
- Demo on **LTE Wi-Fi Coexistence** in IEEE International Symposium on Dynamic Spectrum Access Networks (IEEE Dyspan 2017), Baltimore, USA, March 2017.

- IEEE Global Communications Conference (IEEE Globecom 2016), Washington DC, USA, December 2016.
- International Conference on Wireless Communication and Networking Conference (IEEE WCNC 2016), Doha, Qatar, April 2016.
- National Conference on Communication (IEEE NCC 2016), IIT Guwahati, India, March 2016.
- International Conference on Computing, Networking and Communications (IEEE ICNC 2015), Anaheim, USA, February 2015.
- International Conference on Advanced Networks and Telecommunications Systems (IEEE ANTS 2014), New Delhi, India, December 2014.
- International Conference on Communication, Systems and Networks (COMSNET 2012), Bangalore, India, December 2012.

Attended National & International Conferences

- IEEE ICNC 2020, Big-Island, Hawaii, USA, February 2020.
- IEEE VTC 2019, Honolulu, Hawaii, USA, September 2019.
- First POWDER-RENEW Mobile and Wireless Week, University of Utah campus, USA, September 2019.
- OpenAirInterface (OAI) North America Workshop, Nokia Bell Labs, NJ, USA, June 2019.
- IEEE Globecom 2018, Abu-dhabi, Dec 2018.
- IEEE VTC 2018, Chicago, USA, August 2018.
- IEEE ICC, Kansas City, USA, May 2018.
- IEEE WTS 2017, Chicago, USA, April 2017.
- IEEE Dyspan 2017, Baltimore, USA, March 2017.
- IEEE Globecom 2016, Washington DC, USA, December 2016.
- IEEE WCNC 2016, Doha, Qatar, April 2016.
- NCC 2016, IIT Guwahati, India, March 2016.
- IEEE ICNC 2015, Anaheim, USA, February 2015.
- ACM Mobihoc, Bangalore, India, August 2013.
- COMSNET 2012, Bangalore, India, December 2012.