

CONTACT INFORMATION	Iowa State University Electrical and Computer Engineering 1132 Coover Hall, Ames, IA-50011, USA	Mobile: (515)-708-5208 amar@iastate.edu amarsagars@outlook.com
RESEARCH INTERESTS	Power Grid Stability - Analysis, Monitoring & Mitigation; Transmission & Distribution PMU Applications; Static & Dynamic Simulation including Transmission - Distribution Interaction; Integration of DERs; Machine Learning Applications in Power System; Cyber-Physical Security of Power Systems by Merging Models & Measurements; Cyber-Physical Real-Time Test-Beds.	
EDUCATION	Iowa State University, Ames, Iowa, USA Ph.D. Student, Electrical Engineering (Aug 2013 - Dec 2018) - <i>GPA: 3.97/4.00</i> <ul style="list-style-type: none"> Advisor: Dr. Venkataramana Ajjarapu (<i>Fellow, IEEE</i>) Thesis : Online Monitoring & Mitigation of Short Term and Long Term Voltage Instability using Synchrophasors Indian Institute of Technology-Madras (IIT-M), Chennai, India B.Tech. & M.Tech. in Electrical Engineering with specialization in Power Systems and Power Electronics; Minor in Operations Research, (Aug 2006-May 2011) - <i>GPA: 9.11/10.00</i> <ul style="list-style-type: none"> Thesis : Design and Implementation of a Synchronous DC-DC Converter with Soft Switching - Received the Bhagyalakshmi and Krishna Ayengar Award for the best Institute wide Masters project in Energy Efficiency 	
JOURNAL PUBLICATIONS	Amarsagar Reddy R.M. ; Ajjarapu, V., "Sensitivity based Thevenin Index with Systematic Inclusion of Reactive Power Limits," in <i>IEEE Transactions on Power Systems</i> , vol. 33, no. 1, pp. 932-942, Jan. 2018.	
JOURNAL PUBLICATIONS - SUBMITTED & IN PREPARATION	Amarsagar Reddy R.M. ; Ajjarapu, V., "PMU based Monitoring and Mitigation of Delayed Voltage Recovery using Admittances," <i>Under review in IEEE Transactions on Power Systems</i> . Amarsagar Reddy R.M. ; A. Singhal and V. Ajjarapu, "Differentiating Long Term Voltage Instability Due to Distribution & Transmission Networks Using μ PMUs & PMUs," <i>to be submitted in IEEE Transactions on Smart Grid Special Edition on μPMUs</i> . Amarsagar Reddy R.M. ; R. Venkatraman and V. Ajjarapu, "Monitoring & Mitigation of Delayed Voltage Recovery using μ PMU based Reduced Distribution System Model," <i>to be submitted in IEEE Transactions on Smart Grid Special Edition on μPMUs</i> .	
SELECTED CONFERENCE PUBLICATIONS	Amarsagar Reddy R.M. ; A. Singhal and V. Ajjarapu, "Identifying Long Term Voltage Stability Caused by Distribution Systems vs Transmission Systems", <i>PESGM 2018</i> , Aug 2018. Amarsagar Reddy R.M. ; et. al., "PMU based real-time short term voltage stability monitoring - Analysis and Implementation on a real-time test bed," in <i>NAPS 2014</i> , Sep. 2014.	
RESEARCH EXPERIENCE	Graduate Research Assistant, Iowa State University, Aug 2013 - Present <i>Long-term Voltage Stability Assessment by Merging Synchrophasor Data & System Models.</i> <ul style="list-style-type: none"> Derived a Sensitivity based Thevenin Index (STI) calculated using wide area measurements that can be used to validate the local index and detect noisy/malicious data. Incorporated generator reactive limits in the STI extending Thevenin methods to predict both saddle-node & limit-induced bifurcations in real-time - tested on matpower-3120 system. Extended the Thevenin methodology into distribution systems including the unbalance in topology and loads - enables the estimation of critical regions in distribution systems. <i>Short-term Voltage Stability Monitoring & Control using Synchrophasors.</i> <ul style="list-style-type: none"> Analyzed and simplified the WECC Composite Load (CMLD) model utilizing the physics of the load behavior during Fault Induced Delayed Voltage Recovery (FIDVR). Derived FIDVR recovery time from the simplified model and estimated load control using offline learning to ensure recovery within a specified time. The method, based on load admittance, can reliably detect, quantify and mitigate FIDVR, even in presence of oscillations. Extended the methodology using μPMU measurements and distribution topology to localize motor stalling and utilize Q-support from the DERs to mitigate distribution FIDVR. 	

Development of the Real-Time Cyber-Physical Test-Bed.

- Implemented the WECC CMLD model in Modelica and imported it into Opal-RT for real-time simulation and control of the FIDVR phenomenon using OpenPDC.

Power Flow based on Polar Holomorphic Embedding.

- Developed and efficiently implemented holomorphic power flow using voltage magnitude and phase angle as the embedding variables with execution time similar to runpf() in matpower.

Ongoing Collaborations.

- Prof. Umesh Vaidya, Iowa State University - Koopman linear operator framework for analysis of the power system DAE and control strategies to mitigate voltage stability.
- Prof. Decebal Mocanu, Eindhoven University of Technology - Sparse Neural Networks to represent and learn power flow solutions under changing topology.

NSF, DOE & Power System Engineering Research Center (PSERC) Proposal Writing.

- Led successful proposals by coordinating with several faculty in different research disciplines (total \$500k); Further supported successful proposals (total \$ 2M).

Masters Graduate Project, IIT-M, Chennai, India (Aug 2010 - July 2011)

Design and Implementation of a Synchronous Soft Switched DC-DC Converter

- Improving efficiency of a Buck converter for low power applications by utilizing Synchronous Soft Switching to reduce losses - hardware implementation improved efficiency upto 6%

SELECT HONORS AND AWARDS

- Awarded **3rd Prize** for the Best Graduate Poster at the 2016 IEEE PES General Meeting
- Awarded **2nd Prize** for the Best Paper at the 2015 North American Power Symposium
- Awarded **Institute Merit Prize** at IIT-M for the best Academic Achievement in Power Systems & Power Electronics during 7th and 8th Semester

RELEVANT SKILLS

Languages: MATLAB, Python, C, C++, C#, Mathematica, R, Embedded C, Modelica
Software: PSSE, PSLF, OpenPDC, RTDS, Opal-RT, Simulink, OpenDSS, GridLab-D
ML Libraries: Tensorflow, Keras, PyTorch

RELEVANT GRADUATE COURSEWORK

- | | | |
|----------------------------|-----------------------------------|-----------------------------|
| • Power System Dynamics | • Cyber Security in Power Systems | • Applied Linear Algebra |
| • Steady State Analysis | • Statistical Methods I | • Convex Optimization |
| • Wind Energy Technologies | • Non-Linear Systems | • Exploratory Data Analysis |
| • Power System Planning | • Harmonic Analysis | • Data Analytics (audit) |
| • Power System Reliability | | |

PROFESSIONAL WORK EXPERIENCE

Summer Intern, GE Grid Solutions, Redmond,WA (June 2015 - Aug 2015)

- Implemented signal processing and data analytics methods (Non-linear PCA, Dynamic Mode Decomposition & Koopman Analysis) on real PMU data for generator model validation.
- Patent application for the proposed methodology and it is now part of commercial WAMS.

Edison Engineer, General Electric, India (July 2011 - July 2013)

Responsible for the firmware development and testing of GE's Global Trip Unit (GTU) and Ground Fault Circuit Interrupter (GFCI) with Self-Test.

- Developed firmware fix to solve electromagnetic interference caused by hardware issues.

Devised and validated a voltage stability index based on local PMU measurements.

- Setup Hardware-in-Loop test-bed with OPAL-RT & GE PMU for studying dynamic stability.

OTHER ACTIVITIES AND INTERESTS

- Member of the IEEE PES Student Chapter at Iowa State University
- Active Member of Sankalp - a volunteering student organization at Iowa State University

REFERENCES

Venkataramana Ajjarapu:

- Professor, Department of Electrical Engineering
- Iowa State University
- vajjarapu@iastate.edu

James D. McCalley:

- Professor, Department of Electrical Engineering
- Iowa State University
- jdm@iastate.edu

Jay Giri:

- Director, Power Systems Technology Initiatives
- GE Grid Solutions
- jay.giri@ge.com