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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	<b>Iowa State University, Ames, Iowa, USA</b> Ph.D. Student, Electrical Engineering (Aug 2013 - Dec 2018) - <i>GPA: 3.97/4.00</i> <ul style="list-style-type: none"> <li>• Advisor: Dr. Venkataramana Ajjarapu (<i>Fellow, IEEE</i>)</li> <li>• Thesis : Online Monitoring &amp; Mitigation of Short Term and Long Term Voltage Instability using Synchrophasors</li> </ul> <b>Indian Institute of Technology-Madras (IIT-M), Chennai, India</b> 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"> <li>• Thesis : Design and Implementation of a Synchronous DC-DC Converter with Soft Switching - Received the Bhagyalakshmi and Krishna Ayengar Award for the <b>best Institute wide Masters project in Energy Efficiency</b></li> </ul>	
JOURNAL PUBLICATIONS	<b>Amarsagar Reddy R.M.;</b> 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	<b>Amarsagar Reddy R.M.;</b> Ajjarapu, V., "PMU based Monitoring and Mitigation of Delayed Voltage Recovery using Admittances," <i>Under review in IEEE Transactions on Power Systems</i> . <b>Amarsagar Reddy R.M.;</b> A. Singhal and V. Ajjarapu, "Differentiating Long Term Voltage Instability Due to Distribution & Transmission Networks Using $\mu$ PMUs & PMUs," <i>to be submitted in IEEE Transactions on Smart Grid Special Edition on <math>\mu</math>PMUs</i> . <b>Amarsagar Reddy R.M.;</b> R. Venkatraman and V. Ajjarapu, "Monitoring & Mitigation of Delayed Voltage Recovery using $\mu$ PMU based Reduced Distribution System Model," <i>to be submitted in IEEE Transactions on Smart Grid Special Edition on <math>\mu</math>PMUs</i> .	
SELECTED CONFERENCE PUBLICATIONS	<b>Amarsagar Reddy R.M.;</b> A. Singhal and V. Ajjarapu, "Identifying Long Term Voltage Stability Caused by Distribution Systems vs Transmission Systems", <i>PESGM 2018</i> , Aug 2018. <b>Amarsagar Reddy R.M.;</b> 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	<b>Graduate Research Assistant, Iowa State University, Aug 2013 - Present</b> <i>Long-term Voltage Stability Assessment using Synchrophasors.</i> <ul style="list-style-type: none"> <li>• Derived a Sensitivity based Thevenin Index (STI) calculated using wide area measurements that can be used to validate the local index and protect the system from malicious data.</li> <li>• Incorporated generator reactive power limits into the real-time STI and so the STI can predict both saddle-node &amp; limit-induced bifurcations - tested this on matpower-3120 system.</li> <li>• Extended the Thevenin methodology into the distribution systems including the unbalance in topology and loads - enables the estimation of critical regions the in distribution system.</li> </ul> <i>Short-term Voltage Stability Monitoring &amp; Control using Synchrophasors.</i> <ul style="list-style-type: none"> <li>• Simplified the WECC Composite Load (CMLD) model using the load admittances from the physics of the load behavior during Fault Induced Delayed Voltage Recovery (FIDVR).</li> <li>• Derived the FIDVR recovery time from the simplified model and estimated load control using offline learning to ensure recovery within a specified time. The admittance based method can reliably detect, quantify and mitigate FIDVR, even in presence of oscillations.</li> <li>• Extended the methodology using <math>\mu</math>PMU measurements and distribution topology to localize the stalling motors and utilizing Q-support from the DERs to mitigate distribution FIDVR.</li> </ul>	

*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 **3<sup>rd</sup> Prize** for the Best Graduate Poster at the 2016 IEEE PES General Meeting
- Awarded **2<sup>nd</sup> 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 7<sup>th</sup> and 8<sup>th</sup> 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 analysis methods (Non-linear PCA, Dynamic Mode Decomposition & Koopman Analysis) on real PMU data for generator model validation.
- Patent application for the proposed methodology and 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 updates to solve electromagnetic interference caused due to hardware.

*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
- [vajjarap@iastate.edu](mailto:vajjarap@iastate.edu)

##### **James D. McCalley:**

- Professor, Department of Electrical Engineering
- Iowa State University
- [jdm@iastate.edu](mailto:jdm@iastate.edu)

##### **Jay Giri:**

- Director, Power Systems Technology Initiatives
- GE Grid Solutions
- [jay.giri@ge.com](mailto:jay.giri@ge.com)