SOUMYABRATA TALUKDER

Ph: (+1) 515-290-2044 ◇ Email: talukder@iastate.edu ◇ Website: talukder88.github.io

CAREER OBJECTIVE

A dedicated, self-motivated and spontaneous **Ph.D. student majoring in Electrical Engineering, with more than 8 years of past professional experience in project management and leadership** in the energy and infrastructure sectors, intrigued and inclined towards the areas of **machine-learning, data-analytics, numerical optimization and formal methods** with power systems and energy market as the current application domain.

EDUCATION

Iowa State University, IA, USA — *Aug 2017 - present*
Doctor of Philosophy (in progress) — CGPA: 4.00/4.00
Department of Electrical and Computer Engineering

Jadavpur University, Kolkata, India — *Jun 2005 - Apr 2009*
Bachelor of Engineering (2^{nd} ranker, 1^{st} class with honors) — CGPA: 9.08/10.00
Department of Electrical Engineering

GRADUATE COURSES TAKEN

EE-525X	Data Analytics	**EE-526X**	Deep Learning
ME-592X	Machine Learning for CPS	**EE-571**	Convex Optimization
STAT-554	Stochastic Processes	**EE-577**	Linear Systems
EE-576	Digital Feedback Control	**EE-578**	Nonlinear Systems
EE-554	Power System Dynamics	**COMS-507X**	Applied Formal Methods

ACCEPTED/SUBMITTED RESEARCH PUBLICATIONS

1. **S. Talukder**, R. Kumar, *An Enhancement in Sum-of-Squares Optimization based Region of Attraction Estimation for Power Systems* - accepted in IEEE PES General Meeting 2019 (link).

2. **S. Talukder**, M. Ibrahim, R. Kumar, *Resilience Indices for Power/Cyberphysical Systems* - accepted in IEEE Transactions on Systems, Man and Cybernetics: Systems (link).

3. **S. Talukder**, R. Kumar, *Online Early Prediction of Long-term Voltage Instability using a Hybrid Deep Neural Network* - submitted in IEEE Electric Power and Energy Conference 2020.

SKILLS

Research	Big-data analytics and machine-learning for power systems, Large-scale coalition games for energy-storages, Resilience of complex systems, Semidefinite programming, Polynomial optimization, Steady-state and dynamic analysis of power-grid.
Technical software	Tensor Flow, PyTorch, Keras, Scikit-learn, SQL, R, MATLAB, Nuxmv, Spin, Z3, AADL, PSSE, PSLF, PSCAD, PSAT.
General tool	MS Office, MS Project, MS Visio, Latex.
Programming language	Python, Java, C, C++.
Operating system	Linux (both Fedora and Debian distributions), Windows.
Managerial	Managing scope, time, cost and quality of projects, leadership, stakeholder management, progress monitoring and reporting.

ACADEMIC RESEARCH EXPERIENCE

Iowa State University, IA, USA *Fall 2018 - present*

Research assistant at ESSeNCE lab, supervised by Dr. Ratnesh Kumar

- **Stability Guaranteed Deep Reinforcement-learning** (current research area): Recently, the wide-area control schemes are shown to be more effective than their decentralized counterparts, under emergency condition of a large power-grid. However, computing real-time centralized stabilizing control utilizing the wide-area measurements using the conventional optimization-based techniques may not be practical due to their computational complexity, especially when the control needs to enact within a very short duration. This motivates us to explore the possibility to design a deep-reinforcement learning based centralized controller that can also guarantee stability.
- **Power Systems Anomaly Detection using Deep Neural-networks**: A novel *long-short-term-memory* (LSTM) based deep-neural-network (DNN) is proposed for early prediction of *long-term voltage instability*, ensuing a large disturbance in a power-grid. The proposed DNN is capable to utilize both the pre-fault SCADA snapshot and a short-prefix of the post-fault time-series of PMU measurements for prediction, showing substantial improvement in its noise-robustness over the state-of-the-art.
- **Sum-of-squares Optimization**: An algorithmic enhancement of the traditional *sum-of-squares optimization* based *region-of-attraction* (ROA) estimation for power systems is proposed, showing significant reduction in the overall computation time. The approach is further extended to compute the volume of the estimated ROA as a sub-level set of a *Lyapunov* function, which provides a metric to quantify the transient stability of a power system in polynomial time computational complexity.
- **Resilience**: A physical-topology guided notion of resilience for power systems is quantified as a six dimensional normalized vector, which is the probabilistic average of such vectors corresponding to the individual credible fault-sequences. A new way of computing *transient stability margin* and *critical clearance time* using sum-of-squares optimization is proposed. Also a novel approach to compute *relay margin* by solving an iterative *quadratic-constraint-quadratic-program* is introduced.

INDUSTRIAL EXPERIENCE

GE Grid Solutions, Noida, India (earlier Alstom Grid) *Jul 2009 - Nov 2012*

Project Engineer

- Led site installation and commissioning of *electrical balance of plant* for a 2 x 600 MW thermal power plant, together with a **400 kV generation switchyard including protection systems, SCADA, DCS and station auxiliary distribution**.
- Led engineering, procurement and construction of **6 new extra-high-voltage transmission substation** projects.
- Responsibilities included scheduling of overall project (including engineering, procurement, construction and handing over), resource, sales and cash-flow planning, monitoring scope, time, budget and quality, periodic reporting to the management, risk analysis and management, leading coordination among in-house engineering, procurement and construction teams, site construction monitoring and sub-contractor management, stake-holder management.

ITC Ltd., Bangalore, India *Dec 2012 - Jul 2017*

Assistant Manager - Projects

- Led design, procurement and construction of electro-mechanical services for two large-scale building projects including **high/medium voltage power distribution, solar PV integration, building management system** etc. The projects are IGBC LEED certified and the site spans over 9 acres of plot area and 0.6 million sqft. of built-up space.

- Took the role of a key coordinator among the interdependent disciplines (e.g. structural, interior, electro-mechanical etc.) of the overall project.
- Actively participated in the procurement process including tender preparation, finalization, bid evaluation and getting suppliers, contractors and consultants on-board.
- Other responsibilities included scheduling of overall project (including engineering, procurement, construction and handing over), resource and cash-flow planning, monitoring scope, time, budget and quality, periodic reporting to the management, risk analysis and management, site construction monitoring and contractor management, conflict resolution and stake-holder management.
- Supervised a team of six engineers who were responsible for electrical and mechanical and related works.

GE Global Research Center, NY, USA *May 2019 - Aug 2019*
Fellow Intern

- Worked with the formal methods team for the **Cyber Assured System Engineering** (CASE) project, led by DARPA. Proposed and developed an innovative graphical user interface that provides an intuitive and interactive *wizard* to set the mission-level cyber requirements as well as the cyber relations among the inter-dependent subcomponents involved in the mission.
- Got exposure to the state-of-the-art of cyber-security analysis and verification framework in the aviation industry, and also to GE's popular Bayesian Hybrid Modelling tool, which uses a Gaussian process based learning technique for modeling and testing of dynamic input-output systems.

CERTIFICATIONS

- *SQL for Data Science* by University of California, Davis through Coursera (link)
- *Advanced Relational Database and SQL* by Coursera Project Network through Coursera (link)

TEACHING EXPERIENCE

Iowa State University, IA, USA *Fall 2017 - Spr 2018*
Teaching assistant for EE-324 (Signals and Systems - II)

- Responsibilities included course-recitation, lab-proctoring and grading.

AWARDS AND ACCOLADES

1. Received **Impact Award** from General Electric Global Research Center, USA, in Jul 2019 for developing an innovative graphical user-interface that made usage of a software toolset substantially easier.
2. Received **Certificate of Appreciation** from the CEO of ABD, ITC Limited, India, in Jun 2017 for timely delivery of a constrained project.
3. Received **Barindra Memorial Medal** from Jadavpur University, India, in Dec 2009 for distinguished academic performance in **Power System Design and Planning** during Bachelor of Engineering program.
4. Received **SEEA scholarship** from West Bengal State Electrical Engineers Association, India, in Aug 2008 for consistent academic excellence during Bachelor of Engineering program.
5. Received **National Merit Scholarship** from Govt. of India in Aug 2005 for academic distinction prior undergraduate program.

EXTRA-CURRICULAR ACTIVITY

Voluntary promoter of sustainability and optimal usage of natural resources. A **certified trainer** of **Green Rating for Integrated Habitat Assessment (GRIHA)**.