NEGIN ALEMAZKOOR

Postdoctoral Research Associate

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ACADEMIC APPOINTMENTS

Postdoctoral Research Associate

School of Industrial Engineering at Purdue University

Sep 2019– present   West Lafayette, IN

- **Research Topic:** Uncertainty-informed Evaluation of Tropical Cyclone Impacts to the U.S. Power System under Different Climate Change Scenarios.
- **Advisors:** Roshanak Nateghi & Mazdak Tootkaboni.

EDUCATION

Ph.D. in Civil Engineering

University of Illinois at Urbana–Champaign

2014– 2019   Urbana, IL

- **Program:** Sustainable and Resilient Infrastructure Systems.
- **Minor:** Statistics.
- **Dissertation Topic:** Polynomial Approximations for Fast Predictive Analysis of Infrastructure Systems: Applications to Power and Transportation Systems.
- **Advisor:** Hadi Meidani.

M.Sc. in Civil Engineering

Texas A&M University

2012– 2014   College Station, TX

- **Program:** Transportation Engineering.
- **Thesis Topic:** Using Empirical Data to Find the Best Measurement for Travel Time Reliability.
- **Advisor:** Mark Burris.

B.Sc. in Civil Engineering

Sharif University of Technology

2007– 2011   Tehran, Iran

- **Thesis Topic:** Safety Estimation for Urban Intersections.
- **Advisor:** Habibollah Nassiri.

RESEARCH INTERESTS

- Uncertainty quantification,
- Data-driven scientific computing,
- Big data analytics,

with applications in

- Intelligent transportation systems,
- Smart and resilient infrastructure systems.

JOURNAL PUBLICATIONS

Under review or preparation:

1. **Alemazkoor, N.** & Nateghi, R. Impact of Climate Change on Weather-induced power outages. To be submitted to Nature Climate Change. [1]
2. **Alemazkoor, N.** & Meidani, H. A Multi-fidelity Approach for Traffic Estimation Using Data from Multiple Sources. To be submitted to IEEE Transactions on Intelligent Transportation Systems. [1]
3. **Alemazkoor, N.** & Meidani, H. Surrogate-based Probabilistic Voltage Sensitivity Analysis and Control for Distribution Networks with Distributed Generators. Submitted to IEEE Transactions on Power Systems (revision under review).[1]
4. **Alemazkoor, N.** & Meidani, H. A Computationally Fast Online Model for Accurate Prediction of Post-disaster Traffic Condition. Submitted to Computer Aided Civil and Infrastructure Engineering. [1]

Peer-reviewed publications:

5. **Alemazkoor, N.** & Meidani, H. Efficient Collection of Connected Vehicles Data with Precision Guarantees. IEEE Transactions on Intelligent Transportation Systems. link.
6. Nabian, M. A., **Alemazkoor, N.**, & Meidani, H. (2019). Predicting Near-Term Train Schedule Performance and Delay Using Bi-Level Random Forests. Transportation Research Record, 2673(5) 564–573. link.
7. **Alemazkoor, N.** & Meidani, H. (2018). A Preconditioning Approach for Improved Estimation of Sparse Polynomial Chaos Expansions. Computer Methods in Applied Mechanics and Engineering, 342,474-489. link.
8. **Alemazkoor, N.** & Meidani, H. (2018). A Near-optimal Sampling Strategy for Sparse Recovery of Polynomial Chaos Expansions. Journal of Computational Physics, 371, 137-151. link.
9. **Alemazkoor, N.** & Meidani, H. (2017). Divide and Conquer: an Incremental Sparsity Promoting Compressive Sampling Approach for Polynomial Chaos Expansions. Computer Methods in Applied Mechanics and Engineering, 318, pp. 937-956. link.
10. **Alemazkoor, N.**, Ruppert, C.J. & Meidani. H. (2017). Survival Analysis at Multiple Scales for Track Geometry Deterioration Modeling. Journal of Rail and Rapid Transit, 232(3), 842–850. link.
11. **Alemazkoor, N.**, Burris, M. W., & Danda, S. R. (2015). Using Empirical Data to Find the Best Measure of Travel Time Reliability. Transportation Research Record: Journal of the Transportation Research Board, (2530), 93-100. link.
12. Burris, M., **Alemazkoor, N.**, Benz, R., & Wood, N. S. (2014). The Impact of HOT Lanes on Carpools. Research in Transportation Economics, 44, 43-51. link.
13. **Alemazkoor, N.**, & Burris, M. (2014). Examining Potential Travel Time Savings Benefits Due to Toll Rates That Vary by Lane. Journal of Transportation Technologies, 4. link.

[1] Preprints are available and will be provided upon request.

CONFERENCE PAPERS

1. **Alemazkoor, N.**, Meidani H.(2019). Efficient Stochastic Analysis of Power Distribution Systems Using Polynomial Models. International Conference on Smart Infrastructure and Construction (ICSIC) Driving data-informed decision-making (pp. 387-394). link.
2. **Alemazkoor, N.**, Wang, S., & Meidani, H. (2018). A Recursive Data-driven Model for Traffic Flow Predictions for Locations with Faulty Sensors. 21st International Conference on Intelligent Transportation Systems (ITSC), pp. 1646-1651. link.
3. **Alemazkoor, N.**, & Hawkins, H. (2014). Examining Impacts of Increasing Speed Limit on Speed Distribution: Case Study. In Transportation Research Board 93rd Annual Meeting (No. 14-3335). link.

AWARDS

Rising star in Computational and Data Science

- One of 30 early career women to attend 2019 Rising Stars in Computational and Data Science Workshop at University of Texas Austin. link.

Rising star in Civil Engineering

- One of 20 early career women to attend 2017 Rising Stars in Civil Engineering Workshop at MIT. link.

Excellent teacher

- Ranked as Excellent by the center for teaching excellence for **four semesters**.
- Required rating: Higher than 4.5 out of 5.

Runner up for 2018 INFORMS Railway Application Section problem solving competition

- Competition subject: Accurate prediction of train delays. link.

2017 Chester P. Siess award

- Presented to an outstanding graduate student selected by CEE faculties at UIUC.

Full travel award for Uncertainty Quantification and Data-Driven Modeling workshop

- Hosted by USCAM and ICES at University of Texas Austin in 2017. link.

Winner of 2015 INFORMS Railway Application Section problem solving competition

- Competition subject: Accurate modeling of rail defects deterioration. link.

2013 Zachary Graduate Fellowship

- Presented to an outstanding graduate student selected by CEE faculties at Texas A&M University.

Winner of the 2013 Texas ITE Traffic Bowl

- Competition subject: Tests students' knowledge on transportation related topics.

PRESENTATIONS

1. **Alemazkoor, N.**, & Meidani. H. "Efficient Uncertainty-Aware Management of Power Distribution Systems Using Polynomial Models". Engineering Mechanics Institute Conference, California, June 2019.
2. **Alemazkoor, N.**, "Fast Computational Tools for Smart Infrastructure Systems". 2019 Rising Stars in Computational and Data Science Workshop, Austin, Texas, April 2019.
3. **Alemazkoor, N.**, & Meidani. H. "Efficient Collection of Connected Vehicle Data". 2018 INFORMS Annual Meeting, Phoenix, Arizona, November 2018.
4. **Alemazkoor, N.**, & Meidani. H. "Efficient Stochastic Analysis of Infrastructure Systems Using Compressive Sampling". Engineering Mechanics Institute Conference, Boston, Massachusetts, May 2018.
5. **Alemazkoor, N.**, "Uncertainty Management for Complex Civil Engineering Systems". 2018 CEE Rising Stars Workshop, MIT, Boston, Massachusetts, October 2017.
6. **Alemazkoor, N.**, & Meidani. H. "Improving Compressive Sampling of Polynomial Chaos Expansions Using Adaptive Basis Selection and Near-optimal Sampling Strategies". Uncertainty Quantification and Data-Driven Modeling Workshop, Austin, Texas, March 2017.
7. **Alemazkoor, N.**, & Meidani. H. "An Incremental Compressive Sampling Approach for Sparser Recovery of Polynomial Chaos Expansion". SIAM Conference on Computational Science & Engineering, Atlanta, Georgia, Feb. 2017.
8. **Alemazkoor, N.**, & Meidani. H. "Near-Optimal Sampling Approach for Estimating Sparse Polynomial Chaos". SIAM Conference on Computational Science & Engineering, Atlanta, Georgia, Feb. 2017.
9. **Alemazkoor, N.**, Ruppert, C.J. & Meidani, H. "Survival Analysis for Track Geometry Deterioration Modeling". In INFRORMS Annual Meeting, Philadelphia, Nov. 2015.
10. **Alemazkoor, N.**, & Meidani. H. "Fully Data-Driven Deterioration Models for Infrastructures". First Sustainable and Resilient Infrastructure Systems Student Summit, Urbana, IL, April 23, 2015.
11. **Alemazkoor, N.**, & Meidani. H. "Data-Driven Deterioration Models for Pavements". Kent Seminar Series, Urbana, IL, Sep. 2015.
12. **Alemazkoor, N.**, Burris, M. W., & Danda, S. R. "Using Empirical Data to Find the Best Measure of Travel Time Reliability". In Transportation Research Board 94rd Annual Meeting, Washington, DC, Jan. 2015.
13. **Alemazkoor, N.**, & Hawkins, H. "Examining Impacts of Increasing Speed Limit on Speed Distribution: Case Study". In Transportation Research Board 93rd Annual Meeting, Washington, DC, Jan. 2014.

TEACHING

CEE201 System Engineering and Economics

- Undergrad course with 120 students (TA for 5 semesters).
- Average teaching effectiveness: 4.5/5.

CEE598 Uncertainty Quantification

- Grad course with 15 students (TA for 2 semesters).
- Average teaching effectiveness: 4.6/5.

CEE310 Transportation Engineering

- Undergrad course with 50 students (TA for 1 semester).
- Participated in redesigning the course to make the course more interactive. See the developed visualisation tools.

CEE460 Steel Structure I

- Undergrad course with 50 students (TA for 1 semester).

Mentoring

- Mentored two students enrolled in Research Experience for Undergraduate Students.
- Mentored two grad students.

GRANT WRITING

Participated in writing:

- Data-driven Predictive Modeling of Track Geometry Defects Progression, Association of American Railroads (AAR) Technology Outreach Program; 31,000, 2016.
- Predictive Modeling for Data-scarce Tracks using Track Classification , Association of American Railroads (AAR) Technology Outreach Program; 31,000, 2015.
- A Multi-Agent Framework for Modeling Interdependent Infrastructures as Complex Adaptive Systems to Enable Collaborative Resilience Analysis, NSF; 250,000, 2015.

VOLUNTEER SERVICES

Reviewer for:

- IEEE Transactions on Power Systems,
- Journal of Transportation Engineering,
- Journal of Building Engineering,
- IEEE Intelligent Transportation Society Conference.

Member of:

- CEE Graduate Student Advisory Committee at UIUC,
- Society for Industrial and Applied Mathematics (SIAM),
- American Society of Civil Engineers (ASCE),
- Women in Transportation Society (WTS).
- Institute of Transportation Engineers (ITE),
- American Railway Engineering and Maintenance-of-way Association (AREMA).

REFERENCES

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December 1, 2019

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Department of Civil, Architectural and Environmental Engineering
The University of Texas at Austin

Dear Members of the Search Committee,

I am writing to express my strong interest in your advertisement for a tenure-track Assistant Professor position in Urban-Natural Systems Modeling. I am currently a Postdoctoral Research Associate in the School of Industrial Engineering at Purdue University. I received my PhD in Civil Engineering with a minor in statistics from the University of Illinois at Urbana-Champaign. I was selected as one of the twenty female graduate students and postdocs to attend 2017 CEE Rising Stars workshop at MIT. In 2019, I was also selected as one of the Rising Stars in Computational and Data Science and was invited to attend the Rising Stars Workshop hosted by University of Texas Austin and Sandia National Laboratory. I believe my interdisciplinary research, which primarily focuses on Uncertainty Quantification and Machine Learning with applications in Smart, Interconnected, and Resilient Infrastructure Systems, perfectly aligns with this position.

Over the course of my doctoral studies and my postdoctoral appointment, I have performed high-profile and interdisciplinary research that integrates applied math, computational science, statistics, operations research and engineering. My research concerns solving challenges pertaining to the smart and resilient infrastructure systems. Specifically, my research focuses on developing new machine learning and data analytic methodologies that alleviate the computational cost associated with the sensing and sensemaking required for analysis of the smart infrastructure systems. Some of the methodologies that I have developed address 1) efficient event-triggering data collection, 2) fusing multi-fidelity data from different sources, 3) online adjustment of predictive models, and 4) replacing computationally expensive simulations with fast metamodels. As an assistant professor, I will continue to conduct interdisciplinary research to develop computing- and data-centric as well as uncertainty-informed approaches to improve efficiency, reliability, and resilience of smart and interconnected infrastructure systems with a focus on interdependent transportation and power systems.

During my graduate training at University of Illinois, I have served as a teaching assistant for undergraduate and graduate courses for nine semesters. My dedication to teaching and teaching effectiveness have been reflected into my teaching evaluations, based on which I have been recognized for teaching excellence in four semesters. I am looking forward to teaching opportunities at both graduate and undergraduate levels in the Department of Civil, Architectural and Environmental Engineering.

I am very enthusiastic about beginning a career in academia. I believe my collaborative approach, research background and experience, and interdisciplinary philosophy of teaching and research would strengthen and complement the University of Texas at Austin's existing capacity to support the goals of this hiring, to address complex and emerging issues in resilient urban systems, and to train the next generation of civil engineers and scientists. Toward this end, I will exploit computing resources provided by the Texas Advanced Computing Center, and closely collaborate with the faculty in the Department of Electrical & Computer Engineering, and Department of Computer Science. I am also very excited about the collaboration opportunities with various research centers across the campus including Energy Institute, Center for Transportation Research, Center for Energy and Environmental Resources, IGERT Sustainable Grids, and Institute for Computational Engineering and Sciences.

Please find enclosed my curriculum vitae, a brief summary of my past and ongoing research and future research plans, and a statement of teaching philosophy. At your convenience, I would be honored to further discuss the value I would bring to your program and the university.

Sincerely
Negin Alemazkoor

Research Statement

Negin Alemazkoor

Overview: The overarching objective of my research is to develop sensing and computing methodologies for fast and reliable analysis of smart and interconnected infrastructure systems under uncertainty.

Past Research: Robust predictive analysis of infrastructure systems should incorporate significant uncertainty in behavior of these systems. However, considering computational complexity of simulation tools for infrastructure systems, evaluating the propagation of inputs uncertainty and performing a probabilistic system analysis can be computationally intractable.

Advanced uncertainty quantification techniques mainly consider replacing such complex simulations with analytical metamodels (see Fig. 1). Polynomial Chaos Expansion (PCE) is one of the most widely used metamodels, where the governing physical equation is projected into truncated polynomial chaos coordinates. Such stochastic projection results in computationally fast approximation of the governing system, that is amenable to numerical calculation and can be exploited in system optimization and control.

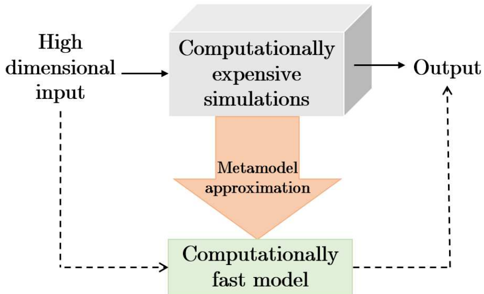

Figure 1: Replacing simulations with computationally fast models.

I have developed novel dimension-reduction[1], new design-of-experiment[2], and effective preconditioning[3] approaches that result in more accurate PCE approximation. The methodologies developed in these studies have a wide range of applications. I have successfully applied the dimension-reduction technique to develop metamodels to quantify the impact of renewable distributed power generations on a future smart power distribution network[4].

Besides developing methodologies for advanced uncertainty quantification, I have also worked on several applications of big data. In particular, I have proposed a multi-fidelity approach for traffic estimation when data is from multiple sources[5] (e.g., GPS, connected vehicles, and loop detectors). I have worked on real world connected vehicle data to develop an online approach for efficient event-triggering data collection[6]. I have also proposed an online traffic flow prediction model that is capable of adjusting the predictions after a disaster[7]. Additionally, I have developed a data-driven probabilistic model for track geometry defects deterioration, which won the first prize in 2015 INFORMS Railway Application Section problem solving competition[8].

Future Research: As an assistant professor, I will expand my research to develop methodologies for ingesting streaming data from sensors and fusing them with complex system simulations toward efficient analysis, operation, and control of infrastructure systems. In particular, I will focus on the following areas.

1. Big data for smart and interconnected infrastructure systems

Integrated sensor systems are essential for smart infrastructure systems. Ideally, sensors data can be used for system monitoring and to develop models for prediction, control, and reliability analysis of smart infrastructure systems (see Fig. 2).

Continuous collection of detailed sensors data, however, can lead to data explosion, overburdening communication and storage system, thereby hampering sensemaking from the data. Moreover, data from different sensors may have different fidelities and resolutions. Therefore, integrating data from multiple sources may not be straightforward. My research intends to address these challenges. More specifically, my research aims to 1) investigate efficient algorithms for data collection with the goal of reducing data volume while keeping the data value, 2) evaluate the optimal locations for high-fidelity sensors, 3) use high-fidelity sparse data to improve the accuracy of low-fidelity data 4) exploit data from multiple sources to identify faulty sensors in an online fashion, and 5) use sensors data for online data-driven and stochastic modeling of infrastructure systems.

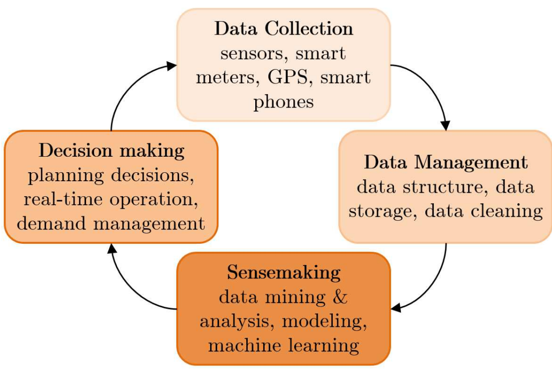

Figure 2: Data analysis toward smart infrastructure systems.

As a demonstrative example, I intend to develop algorithms for efficient collection of connected vehicles data that lead to accurate travel time estimation and prediction. Once sensemaking is facilitated through efficient data collection, fault detection, and model development approaches, the resulting data-driven models can be used for optimal infrastructure management, which is discussed next.

2. Metamodels for fast optimization and control of smart infrastructure systems

Optimal operation of infrastructure systems directly affects welfare of the society. However, achieving the optimal operation can be very challenging given the large size of the systems and the various inherit sources of uncertainty. Although stakeholders usually employ high-fidelity simulation tools to support their decisions, they rarely do so for optimization due to the computational complexity of these simulations. In fact, they mostly make simplifying assumptions, ignore the uncertainty within the system, or use low-fidelity simulation tools to alleviate the computational cost of decision making. These can easily result in sub-optimal decisions.

To ease the computational burden while avoiding sub-optimal decisions, my research aims to couple the simulation observations with data-driven metamodels, that are analytical approximations of the objective function. Specifically, the developed metamodels are differentiable and provide a functional representation of the system complex response, which can be exploited in robust and reliability-based optimization with minimal computational costs. Challenge is formulating a precise metamodel with limited computational budget. To tackle this challenge, my research intends to 1) fuse multi-fidelity simulations and sensor data to formulate the metamodel, and 2) develop problem-specific design-of-experiment approaches to select the training samples for metamodels. Once matamodel-based optimization is facilitated, sensor-data and metamodels can be integrated in adaptive decision making frameworks, where the metamodel, feasible region, distribution of uncertain variables constantly get updated with minimal computational cost (see Fig. 3).

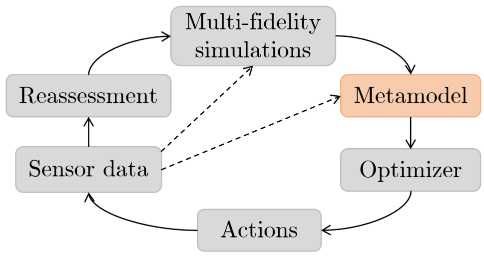

Figure 3: Metamodels for adaptive decision making.

As an illustrative example, I aim to use metamodel-based frameworks for short-term power flow optimization and real-time voltage control under uncertainty in power generation and consumption, as a result of renewable energy sources and new forms of consumption such as electric vehicles. Besides facilitating optimal system operation and planning under normal conditions, metamodels can also be applied to assess reliability and resilience of infrastructure in case of natural disasters.

3. Metamodels for uncertainty-informed reliability and resilience assessment

Infrastructure systems are unavoidably subject to different types of hazards, including climate-induced disasters. Hazard reliability analysis is necessary to mitigate risk and improve preparedness and response time in case of a disaster. Given several sources of uncertainty, such as intensity and duration of disasters, fragility of different system components, and failure propagation scheme, evaluating reliability of infrastructure systems using stochastic simulations can be computationally cumbersome and intractable.

I will exploit dimension reduction and metamodel-based approaches for fast reliability analysis (see. Fig.4). Specifically, I will use metamodels to 1) facilitate fast evaluation of system reliability measures (e.g., connectivity, percentage of unserved demand, etc.), 2) perform computationally fast sensitivity analysis to identify components that are critical to the reliability of the infrastructure system, and 3) identify optimal preventive actions given the sensitivity analysis results. I am also interested in exploring predictive understanding of the dynamic and collective resilience of infrastructure systems. Toward this end, I will use innovative data sources such as taxis, GPS, smart meters, and social media to quantify the recovery time of different infrastructure systems across cities with past natural disasters. I will then fuse real world data with simulations and use probabilistic statistical learning to identify the main topological and cyber-physical characteristics of infrastructure systems that impact their recovery time.

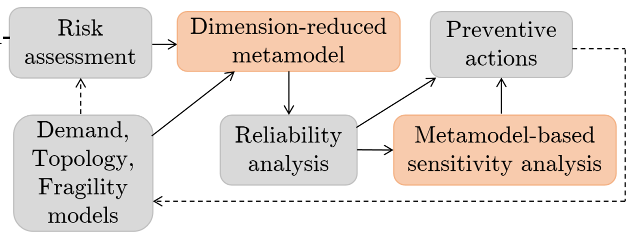

Figure 4: Metamodel-based reliability assessment of infrastructure systems.

4. System identification for interdependent infrastructure systems

Developing computational models for analyzing, optimizing and control of individual infrastructure systems paves the way for the ultimate goal, which is managing interconnected infrastructure systems in a system of systems framework. With development of technology, infrastructure systems increasingly become more complex and mutually dependent (see Fig.5).

For example, with ever increasing penetration of electric vehicles, transportation and power infrastructure systems are becoming more interdependent. Accounting for these interdependencies is crucial to maintain efficiency, reliability, and resilience of infrastructure systems. However, due to the large size of infrastructure systems, most studies regarding interdependent infrastructure systems are established based on simplifying assumption, hence compromising the accuracy. My research aims to facilitate accurate quantitative analysis for interdependent infrastructure system. Toward this end, I will study 1) quantification of hidden and evident infrastructure interdependencies, 2) optimal representation of interdependencies in infrastructure flow models, 3) intelligent identification of redundancies in infrastructure flow models, 4) performing topology-based model reduction, and finally 5) developing computationally fast metamodels for interdependent infrastructure flow models. The developed metamodels will then be used for understanding and quantifying cascading failures, reliability and resilience of whole system as well as analyzing planning decisions regarding interdependent infrastructure systems.

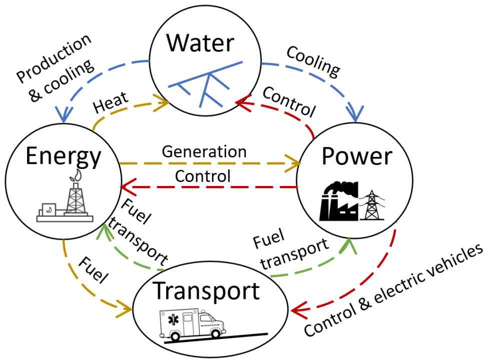

Figure 5: Interdependent infrastructure systems.

Contribution to the University of Texas at Austin:

I will establish "Smart, Interconnected, and Resilient Infrastructure Systems" lab in the Department of Civil, Architectural and Environmental Engineering. My lab will closely collaborate with the faculty and researchers in the Department of Electrical & Computer Engineering, and Department of Computer Science as well as various research centers across the campus including the Energy Institute, Center for Transportation Research, Center for Energy and Environmental Resources, IGERT Sustainable Grids, and Institute for Computational Engineering and Sciences. I will also be actively looking for research funding opportunities from different agencies including NSF programs (e.g., S&CC, CRISP, CIS, CDS&E, ECI, and NHERI), FHWA, FRA, DOTs, DOE, state agencies and professional research foundations. My work will provide graduate and undergraduate students with new and exciting multi-disciplinary research and classroom opportunities, and generate valued collaborations across the university.

References

1. **Alemazkoor, N.** & Meidani, H. (2017). Divide and Conquer: an Incremental Sparsity Promoting Compressive Sampling Approach for Polynomial Chaos Expansions. Computer Methods in Applied Mechanics and Engineering, 318, pp. 937-956. link.
2. **Alemazkoor, N.** & Meidani, H. (2018). A Near-optimal Sampling Strategy for Sparse Recovery of Polynomial Chaos Expansions. Journal of Computational Physics, 371, 137-151. link.
3. **Alemazkoor, N.** & Meidani, H. (2018). A Preconditioning Approach for Improved Estimation of Sparse Polynomial Chaos Expansions. Computer Methods in Applied Mechanics and Engineering, 342,474-489. link.
4. **Alemazkoor, N.** & Meidani, H. Surrogate-based Probabilistic Voltage Sensitivity Analysis and Control for Distribution Networks with Distributed Generators. Submitted to IEEE Transactions on Power Systems (revision under review).
5. **Alemazkoor, N.** & Meidani, H. Real-time Traffic Estimation Using Heterogeneous Data with Different Fidelities. To be submitted.
6. **Alemazkoor, N.** & Meidani, H. Efficient Collection of Connected Vehicles Data with Precision Guarantees. IEEE Transactions on Intelligent Transportation Systems. link.
7. **Alemazkoor, N.** & Meidani, H. A Computationally Fast Online Model for Accurate Prediction of Post-disaster Traffic Condition. Submitted to Computer-Aided Civil and Infrastructure Engineering.
8. **Alemazkoor, N.**, Ruppert, C.J. & Meidani. H. (2017). Survival Analysis at Multiple Scales for Track Geometry Deterioration Modeling. Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit, 232(3), 842-850. link.

Teaching Statement

Negin Alemazkoor

One of the main motivations for me to pursue a career in academia is the opportunity to teach, advice, educate and inspire students at both graduate and undergraduate levels. In what follows, a summary of my teaching experiences and philosophy are included.

Teaching experience: It is with a great excitement that I look forward to becoming a professor, given the teaching experiences that I have had in past five years. I have been fortunate enough to serve as a teaching assistant (TA) for nine semesters (for four different graduate and undergraduates courses), out of which I was assigned to be the head TA for four semesters. As the head TA, other than holding office hours, my responsibilities included holding weekly review sessions, designing homework and class projects, and helping with preparing course materials. My enthusiasm for teaching and effectiveness as an instructor were reflected in my students' positive evaluations of my teaching. Table 1 includes a summary of my teaching effectiveness evaluated by students. Table 2 shows some of the students' responses[1] to a question in evaluation forms that asks about instructor's major strengths. My main qualities that are repetitively mentioned in students' responses are being explanatory, organized, helpful, and patient.

Table 1: Summary of my teaching effectiveness

Semester	**Course**	**Teaching Effectiveness**	**Ranking**
Fall 2018	CEE 201 System engineering and economics	4.6	Excellent (link)
Spring 2018	CEE 201 System engineering and economics	4.8	Outstanding (link)
Spring 2017	CEE 598 Uncertainty quantification	4.7	Excellent (link)
Fall 2016	CEE 598 Uncertainty quantification	4.5	Excellent (link)

Table 2: Students' comments on my major strengths

	What are the major strengths of the instructor?
Student 1	"Very helpful and patient"
Student 2	"Really went out of her way to provide us extra help/review"
Student 3	"Best TA I have had"
Student 4	"Very organized; very willing to help and patient"
Student 5	"She always made sure everyone was following the class"
Student 6	"She was very explanatory and patient"

Teaching philosophy: Like my research, I follow an interdisciplinary approach in my teaching to help my students broaden their perspectives and develop problem-solving skills. My teaching philosophy is to create an engaging discussion-based environment that promotes enthusiasm, organized study, dynamic learning, and critical thinking. In order to draw my students into the thick of learning experience, I teach through demonstrations: by analyzing real-world data in class, by conducting mini-experiments, by running group debates, and even by playing games. To further immerse my students in course topics, I constantly challenge my students to share their opinions. I assure my students that I value their thoughts and I am excited to learn through them. However, creating an engaging, student-centered environment is not an easy task. Based on my teaching experiences, I have realized that some students are reluctant to actively participate in discussions because they do not feel empowered to interact with me or other students, or they have difficulties in communication. To overcome the barriers, I put a lot of effort into developing good relationships with students, creating a communication-friendly environment, and establishing appropriate expectations early in the course so that my students understand the importance of active learning in the class. Moreover, I strongly encourage collaboration through assigning group projects and presentations. It is my hope that students improve their collaboration skills in my class. This is in line with my goal to inspire growth in my students by giving them tools that can be applied in

[1]Original comments will be provided upon request

other domains of their life. Among these tools are collaboration and problem solving skills, tolerance for different ideas, open-mindedness, critical thinking and curiosity.

Teaching at the University of Texas at Austin: My experiences as teaching assistant in different courses together with my broad and interdisciplinary research make me an excellent fit as an instructor to teach several existing courses offered in the Department of Civil, Architectural and Environmental Engineering at both undergraduate and graduate levels, including but not limited to CE 301 Civil Engineering Systems, CE 311K Introduction to Computer Methods, CE 311S Probability and Statistics for Civil Engineers, CE 321 Transportation Systems, CE 367R Optimization Techniques for Transportation Engineers, CE 395R Decision and Risk Analysis, and CE 392T Transport Economics.

As a professor, I envision designing and developing the next generation of courses at both undergraduate and graduate levels, which focus on understanding and addressing complex infrastructure challenges in the context of modeling, analysis, operation, and management. These courses, which mainly focus on efficiency, reliability, and resilience of infrastructure systems, will bridge the gap between theory, modeling, and application, and infuse the principles and concepts from computer science, engineering, economics, and operations research, and provide students with meaningful real-world case studies.

Negin Alemazkoor
11/30/2019

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