Shakir Showkat Sofi

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Education

September, 2020 – June, 2022 | **Skolkovo Institute of Science and Technology, Moscow, RU**
MSc Data Science **GPA :** 4.7/5 Advisor : Prof. Ivan Oseledets (Skoltech & RAS)
› **Thesis :** "Spatiotemporal forecasting with application to the weather forecast"
Matrix and tensor completion, Spatiotemporal forecasting, Data-driven weather forecast, ML/DL

August, 2015 – August, 2019 | **Islamic University Of Science And Technology, Srinagar, J&K, India**
Btech Electric Engineering **GPA :** 9.18/10 Advisor : Dr. Shahkar A. Nahvi (IUST & IIT-Delhi)
› **Thesis :** "Energy-Based Modeling of Dc-Dc Power Converters"
Dc-Dc power converters, Euler-Lagrangian modelling, Simulation

December, 2013 – November, 2014 | **Govt. Hr. Sec. School, B.K Pora, Srinagar, J&K, India**
Associate Degree **Percentage :** 83.6%
› Specialization in Science, Maths, and Informatics practices

Relevant coursework : Introduction to Artificial Intelligence and Data Science, Mathematical Methods in Engineering and Applied Science, Probability & Statistics, Optimization, Numerical Linear Algebra, Signal Processing and Advanced Control Systems, Power Electronics, Circuit Simulations, Machine Learning, Deep Learning, Geometrical Methods of Machine Learning, Models of Sequential Data, Tensor Decomposition and Tensor Networks in Artificial Intelligence.

Research Interests

My current research focuses on matrix and tensor decompositions for machine learning, time-series forecasting, space-time pattern mining, and deep sequence to sequence models for spatiotemporal predictive modelling with applications to temporally evolving geospatial systems (weather forecast, traffic forecast, etc.).

Experience

Summer 2021 | **Skolkovo Institute of Science and Technology and TENSOR FIELD, Moscow, RU**
Research Internship
› Data-driven weather forecasting
› Multivariate time series forecasting for long range Geo-spatial grid points.

Summer 2021 | **Global Quantum Network, QWorld, Virtual**
Quantum Computing Summer School
› Quantum Computing and Programming : Qiskit, QFT and Shor's Algorithm, etc.

August 2019 – June 2020 | **Jamkash Vehicleades Kashmir Pvt. Ltd, Maruati-Suzuki, Srinagar, J&K, India**
Electrical Engineer
› Worked in Logistic Electrical.

Summer 2018 | **Power Grid Corporation Of India Limited, J&K, India**
Field internship
› Transmission and distribution of electrical energy.
› Hydro power generation : Turbo-generators, Turbine, Water-dam, Steam generators, etc.
› Control room, Power station management, Transformer repairing.

Projects

Auto-regressive matrix and tensor completion for spatiotemporal imputation and predictions.

Implementation of spatiotemporal constrained matrix and tensor factorization based algorithms for imputation and forecasting of weather data. Basically, autoregressive constraints on temporal dimensions and smoothness constraints on spatial dimensions were imposed during learning process. The results showed that imposing constraints separately on the temporal and spatial dimensions of spatiotemporal weather data has significantly improved the forecasting and imputation performance.

Tensorizing dynamic model decomposition

Tensor train decomposition enabled fast, efficient and stable implementation of dynamic mode decomposition in the tensor framework. This work was successfully completed under the supervision of Dr. Ivan Oseledets. https://github.com/ShakirSofi/TensorizingDMD.git

Comparing integer and fractional order NN for tree-species classification

The main idea was to implement fractional-order back-propagation algorithms and compare that with integer-based neural networks for multi-spectral image classification.

Shaping filter response with fractional order models

We have employed fractional-order differential and integral operators to design frequency domain filters. The results showed that this technique is significantly better, offers greater simultaneous control over time and frequency responses, and is basically a generalization of integer-order filters. Presentation

Image segmentation with topological priors

We incorporated topological priors before and in the deep neural network training procedure for improving segmentation accuracy for fine-scale structures. The results demonstrated that incorporating topological information into the classical UNet model performed significantly better. Code

Energy-based modeling of Dc-Dc power converters

Undergraduate thesis research project under the guidance of Dr. S.A Nahvi. Development of models based on the Euler-Lagrangian framework, due to ease of energy-based (scalar) modeling rather than force-based (vector) based, was awarded an excellent mark.

State-space modeling of power converters

The basic idea was to develop and simulate the state-space mathematical models of Power electronics converters so that we can create new ones and improve the performance of existing converters.

Submitted Papers

MSCPES 2022 — Shakir Showkat Sofi, Mosaib Ul-Munieeb, Fazil Bashir, Muneeb Ul-Hassan and Shahkar Nahvi "Energy-Based High-fidelity Modelling of Power Converters ", 10^{th} *Workshop on Modeling and Simulation of Cyber-Physical Energy Systems, Milan, Italy.*

ArXiv-preprint — Sofi, Shakir Showkat and Nadezhda Alsahanova. "Image Segmentation with Topological Priors." https://doi.org/10.48550/arXiv.2205.06197

Skills

Programming and Writing : C, V.B, HTML, SQL, LaTeX, LyX, Ms Office.

Computational : Matlab, Mathematica, Octave, Python, Scikit-learn, Numpy, Pandas, Pytorch, Keras, Tensorly, Tensor Toolbox, etc.

Other : Arduino Uno, μP-8085, μC-8051, Atmel 328P.

Languages : English, Urdu, Kashmiri.

Memberships and Affilations

- American Association of Mechanical Engineers (ASME)
- International Association of Engineers (IAENG)
- World Academy of Science,Engineering and Technology (WASET)
- Institute of Research Engineers and Doctors (theIRED)

Teaching and Mentoring

Private tutoring | Srinagar, Jammu and Kashmir, India
- Private Tutor : Tutored 9 students in Differential Equations.
- Private and Group Tutor : Provided private tutoring for high school and college-level calculus course.

Certifications and Scholarships

Rank certificate	Among top two students in Bachelor's degree, at Islamic University of Science and Technology, 2015-EE
2015-2019	Merit-Cum Means Scholarship during Undergrad. by MHRD, Govt. of India.
2020	Graduate fellowship at National Taipei University, Taiwan.
2020	Graduate fellowship at Skolkovo Institute of Science and Technology, Moscow, RU

References

Dr. Ivan Oseledets
Full Professor, CDISE, Skolkovo Institute of Science and Technology
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Mr. Muzaffar Ahmad Sofi
Asst. Professor of Computer Science, J&K Higher Education
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