



Curriculum Vitae

Dr. Farhan Mumtaz

Assistant Research Professor

Department of Electrical and Computer Engineering

Missouri University of Science and Technology

G24A Emerson Electric Hall, 16th Street, Rolla,

MO 65409-0040, USA.

Email: mfmawan@mst.edu; mfmawan@yahoo.com

Web: <https://ece.mst.edu/people/faculty-directory/farhanmumtaz/>

(Ph: +1-573-647-3681)

Status: Permanent Resident of United States

EDUCATION

Ph.D. in Information and Communication Engineering

Wuhan University of Technology, China

Sep 2018 – Nov 2021

english.whut.edu.cn

M. Phil in Electronics

Quaid-i-Azam University Islamabad, Pakistan

Jan 2016 – Jul 2018

www.qau.edu.pk

M.Sc. Electronics

Preston University Kohat, (Islamabad Campus), Pakistan

Jul 2013- Jun 2015

www.preston.edu.pk

MBA Management Sciences

Sarhad University of Science and Information Technology, Peshawar

Jan 2007 – Sep 2009

www.suit.edu.pk

B.Sc. Mathematics & Physics

University of Punjab, Lahore, Pakistan

Jul 2004 – Dec 2006

www.pu.edu.pk

PROFESSIONAL EXPERIENCE

Jan-2023 to Present :

Assistant Research Professor,

Department of Electrical and Computer Engineering, Missouri University of Science and Technology, Rolla, MO 65409, USA.

As an Assistant Research Professor at Missouri S&T, I lead and manage cutting-edge research projects focused on optical fiber sensors, laser machining, and advanced materials. My responsibilities include directing complex experiments and developing technologies such as Fabry-Perot interferometers, fiber Bragg gratings, and photonic crystal fibers, which have advanced our capabilities in distributed temperature sensing and multi-analyte detection. I have authored numerous high-impact publications in prestigious journals such as *ACS Applied Materials & Interfaces*, *IEEE Transactions*, *Optics Express*, *Optics Letters*, and *Measurement*, and presented my findings at leading conferences including SPIE and AISTech. Our research is supported by notable agencies like the U.S. Department of Energy and the U.S. Army Research Laboratory, for which I oversee grant administration and ensure compliance with funding requirements. Collaboration is a cornerstone of my work, involving partnerships with academic, industrial, and governmental entities to drive innovative solutions. Additionally, I mentor graduate students and postdoctoral researchers, guiding their professional development and contributions to our research projects. My role also includes advancing experimental techniques such as ultra-fast annealing and femtosecond laser

inscription to enhance sensor performance and stability. I actively participate in departmental activities, including meetings and committees, contributing to curriculum development and supporting the academic community. By staying abreast of emerging technologies, I ensure that our research remains at the forefront of the field.

Dec-2021 to Dec-2022:

Post Doc. Research Associate,

Department of Electrical and Computer Engineering, Missouri University of Science and Technology, Rolla, MO 65409, USA.

During my tenure as a Postdoctoral Research Associate at the Department of Electrical and Computer Engineering, Missouri University of Science and Technology, I played a pivotal role in addressing complex industrial challenges through the development and implementation of advanced optical sensor technologies. My work focused on designing and deploying innovative fiber optic sensors to tackle specific issues in demanding environments, particularly within the steel manufacturing industry.

I spearheaded the refinement of fiber optic sensors to withstand the harsh conditions prevalent in steel production. This involved the successful implementation of scattering-based Rayleigh and Brillouin sensors, which significantly enhanced our ability to monitor temperature and strain in extreme environments. Additionally, I advanced the application of sapphire Fiber Bragg Gratings (FBGs), optimizing them for real-time temperature and strain measurements, which improved operational efficiency and safety in steel manufacturing processes.

In response to the need for effective chemical detection, I developed miniature optical sensors based on metal-organic frameworks (MOFs). These sensors demonstrated superior sensitivity and selectivity, addressing critical requirements for chemical monitoring in industrial settings. My work not only resolved key challenges faced by the steel industry but also contributed to the broader field of optical sensing by pushing the boundaries of sensor design and performance.

Through these efforts, I successfully bridged the gap between cutting-edge research and practical industrial applications, providing solutions that enhanced both the efficiency and safety of steel production environments.

Sep-2018 to Nov-2021:

Research Assistant,

National Engineering Laboratory for Fiber Optic Sensing Technology, Department of Information Engineering, Wuhan University of Technology, Wuhan 430070, China.

During my tenure as a Research Assistant at the National Engineering Laboratory for Fiber Optic Sensing Technology, Wuhan University of Technology, I pursued a Ph.D. program under the mentorship of Professor Yutang Dai, focusing on advanced optical sensing engineering and technology. My research encompassed a broad range of optical sensing applications, including temperature and strain sensors capable of operating in extreme conditions above 1300°C, as well as chemical, biosensors, and hydrogen gas sensors.

I led several significant projects, supported by the National Natural Science Foundation of China (NSFC), which included:

- **High-Temperature Sensing:** Developed and optimized single-mode sapphire fiber sensors for accurate high-temperature measurements, pushing the boundaries of conventional sensing technologies.
- **Enhanced Sensitivity:** Utilized femtosecond laser technology to improve the sensitivity and performance of coated Fiber Bragg

Gratings (FBGs), advancing the field of high-precision optical sensors.

- **Hydrogen Gas Detection:** Pioneered the design and implementation of fiber optic hydrogen sensors, contributing to the development of innovative solutions for hydrogen monitoring.
- **Multicore Fiber Sensors:** Designed and developed multicore fiber-based sensors specifically for hydrogen detection, addressing critical needs in industrial and safety applications.

My Ph.D. research was fully funded by the Ministry of Commerce of the People's Republic of China (MOFCOM), underscoring the importance and impact of the projects undertaken. Through these research endeavors, I made substantial contributions to the advancement of optical sensing technologies and their application in challenging environments.

Dec-2014 to Oct-2015:

Senior Manager,

Department of Service
Solution Sales, Huawei
Technologies (Pvt) Ltd,
Islamabad 44000, Pakistan.

With a background encompassing Telenor and PTCL projects, I have been actively involved in managing SOPs pertaining to LTC methodology. This role necessitates early engagement in developing service solutions that harmonize with the unique business requirements of our clients. Additionally, I have provided support for Huawei service solution portfolio for Telenor and PTCL key accounts. Working closely with Product, Commercial, and Account teams, emphasis has been placed on leading contract and commercial negotiations with customers, contributing to various aspects such as RFP evaluation, scope definition, costing, and pricing. Furthermore, collaboration with Finance, Legal, and Contract departments has been crucial in drafting essential documents such as Statements of Work (SoW), Bill of Quantities (BOQs), Statements of Compliance (SoCs), Proposals, and payment terms. Building and maintaining robust relationships with key customers and partner management has been paramount. Moreover, responsibilities include the development of professional service project roll-out schedules and the optimization of resource allocation to ensure competitive cost baselines are met effectively.

Jun-2012 to Nov-2014:

Project Manager,

Department of Delivery
Service & Rollout, Huawei
Technologies (Pvt) Ltd,
Islamabad 44000, Pakistan.

Engaged in various Access/CDMA/LTE projects, I've focused on delivering projects in MSAG/DSLAM and CDMA Network Products. Additionally, I managed power-related projects involving SWAP with Fast Charging Batteries (FCB/ACB), addressing power shortages efficiently. As Head of FAC team PTCL Customer Group, I oversaw Final Acceptances Certification (FAC) for projects spanning CDMA, Access, MMBB, Switching, Metro Network, Core Network, and Transmission domains. Responsibilities included managing pre-requisites, project completion, and risk management. Over 40 Project FACs were successfully delivered in domains such as CDMA, NGN, OFAN, and DSLAM. As Head and Delivery Manager of Terminal Projects, I coordinated major equipment delivery and achieved revenue KPIs through SAP acceptance. Providing comprehensive reports summarizing SAP acceptance and mitigation plans for management, I ensured project success and client satisfaction.

Jan-2007 to May-2012:
Plan Control Manager,
Department of Delivery
Service & Rollout, Huawei
Technologies (Pvt) Ltd,
Islamabad 44000, Pakistan.

Assisted the Project Director in adhering to project plans (PAT & PAC) for timely delivery, while maintaining key relationships and ensuring customer satisfaction through effective subcontractor management. Coordinated with regional offices for expense control and managed daily activities and expenses of regional staff. Facilitated daily communication with Project Managers and subcontractors, updating internal reports on progress and risks. Tracked key project milestones, demonstrated proficiency in planning and control, and provided leadership during critical circumstances. Produced weekly and monthly reports for management, coordinated project progress meetings, and presented project statuses to internal and customer stakeholders.

CURRENT RESEARCH THRUST AREAS

- Fiber optic sensors
- Novel micro/nano materials, structures, devices and sensors
- Micro-machining, processing, and characterization of Optical Design
- Harsh environment Sensing and instrumentation
- Fiber optic SPR, Chemical and Bio-Sensors

HONORS AND AWARDS

- 2021** : SPIE – Student Chapter, COMSOL Multi-Physics Trainer Award at Quaid-i-Azam University, Islamabad
- 2019** : IEEE, Best Poster Award ICOCN 2019
- 2018** : MOFCOM Fully Funded PhD Scholarship Award
- 2017** : Keynote Speech: Belt Along the Road Countries at BICC, Beijing China
- 2015** : Long Term Service Excellence Award
- 2015** : Excellent Delivery Project Manager
- 2014** : Excellent Team Lead for SAP/FA
- 2011** : Best Emerging Leader
- 2010** : Excellent Plan Control Manager

EDITORIAL BOARD MEMEBER AND REVIEWER

- **IEEE Senior member**
- **SPIE member** (Optics society)
- **Guest Editor:** Coating Mdpi
- **Reviewer of journals:** Optics Letter, Optics Express, Optics Material Express, IEEE Photonics, IEEE sensor journal, Springer Nature, Applied Physics B, mdpi Applied sciences, mdpi Axioms, mdpi Energies, mdpi Mathematics, Optical fiber technology, mdpi Photonics, mdpi Sensors.

PUBLICATIONS

JOURNAL PAPERS (* indicates corresponding author)

2024

1. **Farhan Mumtaz***, Bohong Zhang, Narasimman Subramaniam, Mohammad Roman, Peter Holtmann, Abhishek Prakash Hungund, Ryan O'Malley, Thomas Spudich, Michael Davis, Rex E. Gerald II, and Jie Huang*, "A miniature optical fiber Fabry-Perot interferometer based on a single crystal metal-organic framework for the detection and quantification of benzene and ethanol at low concentrations in nitrogen gas" *ACS Applied Materials & Interfaces*, Accepted on Feb 13, 2024.
2. **Farhan Mumtaz***, Bohong Zhang, Jeffrey D. Smith, Ronald J. O'Malley, Rex E. Gerald II and Jie Huang*, Ultra-Fast Annealing Improves SNR and Long-term stability of a Highly Multiplexed Line-by-Line FBG Array Inscribed by Femtosecond Laser in a Coreless Fiber for Extreme-Temperature Applications, *IEEE Transactions on Instrumentation and Measurement*, Accepted on Jan 15, 2024
3. Bohong Zhang†, **Farhan Mumtaz†**, Muhammad Roman, Dinesh Reddy Alla, Rex E. Gerald II, and Jie Huang, "Miniaturized fluorescence pH sensor with assembly free ball lens on a tapered multimode optical fiber," *Opt. Express* 32, 4228-4241, 2024
4. Abdul Muqet, Muhammad Aqueel Ashraf, and **Farhan Mumtaz***, "Spatially tuned photonic crystal fiber sensor mimics visible and near-infrared regimes for wide-range multi-analyte detection." *Measurement*, pp: 114272, Feb 06, 2024, <https://doi.org/10.1016/j.measurement.2024.114272>
5. Dinesh Reddy Alla, Deva Prasad Neelakandan, **Farhan Mumtaz**, Rex E. Gerald II, Laura Bartlett, Ronald J. O'Malley, Jeffrey D. Smith, Jie Huang, "Cascaded Sapphire Fiber Bragg Gratings Inscribed by Femtosecond Laser for Molten Steel Studies," in *IEEE Transactions on Instrumentation and Measurement*, vol. 73, pp. 1-8, 2024, Art no. 7000608, doi: 10.1109/TIM.2023.3335530
6. Wang, Yun, Yutang Dai, **Farhan Mumtaz**, and Kaiyan Luo. "Advanced techniques in quartz wafer precision processing: Stealth dicing based on filament-induced laser machining." *Optics & Laser Technology* 171 (2024): 110474.

2023

7. **Farhan Mumtaz***, Hanok Tekle, Bohong Zhang, Jeffrey D. Smith, Ronald J. O'Malley and Jie Huang*, "Highly-Cascaded First-order Sapphire Optical Fiber Bragg Gratings Fabricated by Femtosecond Laser" *Optics Letters*, 2023. <https://doi.org/10.1364/OL.495138>.
8. **Farhan Mumtaz***, Hanok Tekle, Bohong Zhang, Jeffrey D. Smith, Ronald J. O'Malley and Rex Gerald II Jie Huang*, "Boosting SNR of Cascaded FBGs in Sapphire Fiber through Rapid Heat Treatment" *Optics Letters*, Oct, 2023: DOI: 10.1364/OL.506053.
9. **Farhan Mumtaz***, Bohong Zhang, Ronald J. O'Malley and Jie Huang*, "Large-Scale Cascading of First-Order FBG Array in Highly Multimode Coreless Fiber using Femtosecond Laser for Distributed Thermal Sensing" *Optics Express*, Aug, 2023, DOI: 10.1364/OE.494092.

10. **Farhan Mumtaz***, Dinesh Reddy Alla, Muhammad Roman, Bohong Zhang, Jeffrey D. Smith, Rex E. Gerald II, Ronald J. O'Malley and Jie Huang* , "Thermally robust and highly stable method for splicing silica glass fiber to crystalline sapphire fiber" *Applied optics*, vol. 62, no. 5, pp. 1392-1398, vol. no. 2023.
11. **Farhan Mumtaz***, Detection of Critical Cancer Cells in Human Organs using Dual Demodulation Photonic Crystal Fiber: Numerical Study, *Results in Optics* (2023), doi: <https://doi.org/10.1016/j.rio.2023.100493>
12. **Farhan Mumtaz***, Bohong Zhang, Muhammad Roman, Muhammad Aqueel Ashraf, Yutang Dai "Computational study: Windmill-shaped multi-channel SPR sensor for simultaneous detection of multi-analyte" *Measurement*, vol. 207, pp. 112386, Feb-2023.
13. **Farhan Mumtaz***, Muhammad Roman, Bohong Zhang, and Jie Huang. "Assembly-free ultra-sensitive miniaturized strain sensor based on an asymmetric optical fiber taper." *Measurement*, vol. 211, pp: 112655, 2023.
14. Anjum, Nasir Mahmood, **Farhan Mumtaz***, and Muhammad Aqueel Ashraf. "Design and analysis of Gold-nanowires based multi-channel SPR sensor." *Results in Optics* vol. 11, pp: 100397, 2023.
15. Wang, You, **Farhan Mumtaz***, and Yutang Dai. "Hydrogen gas sensor based on seven-core fiber interference and Pt-WO₃ film." *Materials Letters* pp: 134245, 2023.
16. Wang, You, Yun Wang, Yutang Dai, and **Farhan Mumtaz**. "Ultrasonic nitrogen jet-assisted femtosecond laser processing of quartz chips." *Optical Materials Express*, vol. 13, no. 2, pp: 348-356, 2023.
17. Wang, You, **Farhan Mumtaz**, and Yutang Dai. "Micromachining of SiO₂ single crystal wafer using femtosecond laser." *Journal of Laser Applications* vol. 35, no. 2, pp: 022004, 2023.
18. Lashari, Ghulam Abbas, **Farhan Mumtaz**, Zhou Ai, and Yutang Dai. "Recent Advancements and Future Challenges in Hybrid Optical Fiber Interferometers." *Optik*, pp : 170860, 2023.
19. Wang, Yun, Yutang Dai, **Farhan Mumtaz**, Yuwei Yang, and Kaiyan Luo. "A combined tri-dimensional fiber Bragg grating accelerometer for multi-directional measurements." *Optical Fiber Technology* (2023): 103360.

2022

20. **Farhan Mumtaz***, Ghulam Yaseen, Muhammad Roman, Ghulam Abbas lashari, Muhammad Aqueel Ashraf, Muhammad Arshad Fiaz, and Yutang Dai "Numerical analysis of highly non-linear and ultra-sensitive modified core of photonic crystal fiber sensor for detection of liquid analytes" *Journal of the Optical Society of America B* Accepted 28-Nov-2022, <https://doi.org/10.1364/JOSAB.478468>.
21. Muhammad Roman, Hanok Tekle, Dinesh Reddy Alla, **Farhan Mumtaz**, Jeffrey D. Smith, Laura Bartlett, Ronald J. O'Malley, Rex E. Gerald II, and Jie Huang "Temperature Monitoring in the Refractory Lining of a Continuous Casting Tundish Using Distributed Optical Fiber Sensors" in *IEEE Transactions on Instrumentation and Measurement*, 2022, doi: 10.1109/TIM.2022.3225033.
22. Lashari, Ghulam Abbas, **Farhan Mumtaz**, and Sohail Ahmed. "Strain sensing with parallel air-cavity Fabry-Perot interferometers based on Vernier Effect." *Optical Fiber Technology* 74 (2022): 103117.

23. **Farhan Mumtaz***, Muhammad Roman, Bohong Zhang, Lashari Ghulam Abbas, Yutang Dai, Muhammad Aqueel Ashraf, Muhammad Arshad Fiaz, and Amit Kumar. "MXene (Ti3C2Tx) coated highly-sensitive D-shaped photonic crystal fiber based SPR-biosensor." *Photonics and Nanostructures-Fundamentals and Applications* (2022): 101090.
24. **Farhan Mumtaz***, Muhammad Roman, Bohong Zhang, Lashari Ghulam Abbas, Muhammad Aqueel Ashraf, Yutang Dai and Jie Huang*, "Highly Sensitive Strain Sensor by Utilizing a Tunable Air Reflector and the Vernier Effect." *Sensors* 22, no. 19 (2022): 7557.
25. **Farhan Mumtaz***, Muhammad Roman, Bohong Zhang, Lashari Ghulam Abbas, Muhammad Aqueel Ashraf, Muhammad Arshad Fiaz, Yutang Dai, and Jie Huang*, "A simple optical fiber SPR sensor with ultra-high sensitivity for dual-parameter measurement" *IEEE Photonics Journal*, vol: 14, no.22, pp:1-7, 2022.
26. Abbas, Lashari G., **Farhan Mumtaz***, Rashda Parveen, Yutang Dai*, and Muhammad A. Ashraf "An Efficacious Hybrid Interferometer Based on a Vernier-like Effect for Dual Parameter Sensing." *OPTIK*, vol: 264, pp: 169422, 2022.
27. Abbas, Lashari G., **Farhan Mumtaz***, Yutang Dai*, Rashda Parveen, and Muhammad A. Ashraf. "Vernier Effect Based Temperature Sensor Revealed Ultra-Sensitivity with High-Detection Resolution." *Progress In Electromagnetics Research C* vol:118, pp: 147-158, 2022.

2021

28. **Farhan Mumtaz**, Y. Dai*, H. Wenbin, L. G. Abbas, R. Parveen, M. A. Ashraf, "A weakly coupled multi-core fibre-based Michelson interferometer composed of an in-fibre couple" *Opto-Electronics Review*, vol. 29, no. 04, pp: 117-125, 2021.
29. L. G. Abbas, Z. Ai, **Farhan Mumtaz**, A. Muhammad, Y. Dai and R. Parveen, "Temperature and Strain sensing with Hybrid Interferometer," in *IEEE Sensors Journal*, vol. 21, no. 23, pp: 26785 – 26792, Dec 2021.
30. Abbas, Lashari G., **Farhan Mumtaz***, Yutang Dai*, Ai Zhou, Wenbin Hu, and Muhammad A. Ashraf. "Highly Sensitive Polymer Based Fabry-Perot Interferometer for Temperature Sensing." *Progress In Electromagnetics Research Letters* vol. 97, pp: 87-94, 2021.
31. **Farhan, Mumtaz ***, Hongfeng Lin, Yutang Dai, Wenbin Hu, Muhammad A. Ashraf, Lashari G. Abbas, Shu Cheng, and Pu Cheng. "Simultaneous Measurement of Temperature and Strain Using Multi-Core Fiber with In-Line Cascaded Symmetrical Ellipsoidal Fiber Balls-Based Mach-Zehnder Interferometer Structure." *Progress in Electromagnetics Research C*, vol, 112, pp: 21-37, 2021.
32. **Farhan Mumtaz ***, Yutang Dai*, Muhammad Aqueel Ashraf, and Wenbin Hu. "A Star Wheel Design of Single Crystal Sapphire Optical Fiber Promoting Single Mode Operation in the Infrared Regime." *Progress In Electromagnetics Research C*, vol. 107 pp: 219-231, 2021.
33. Jie, Yang, LilianAsimwe Leonidas*, **Farhan Mumtaz**, and Munsif Ali. "Ship Detection and Tracking in Inland Waterways Using Improved YOLOv3 and Deep SORT." *Symmetry*, vol. 13, no. 2, pp: 308, 2021.

2020

34. **Farhan Mumtaz**, Pu Cheng, Chi Li, Shu Cheng, Cheng Du, Minghong Yang, Yutang Dai*, and Wenbin Hu*. "A design of taper-like etched multicore fiber refractive index-insensitive a temperature highly sensitive Mach-Zehnder interferometer." *IEEE Sensors Journal* vol. 20, no. 13, pp: 7074-7081, 2020.

35. **Farhan Mumtaz**, Yutang Dai*, and Muhammad Aqueel Ashraf. "Inter-cross de-modulated refractive index and temperature sensor by an etched Multi-core fiber of a MZI structure." *Journal of Lightwave Technology*, vol. 38, no. 24 pp: 6948-6953, 2020.
36. **Farhan Mumtaz** *, Muhammad Aqueel Ashraf, Yutang Dai*, and Wenbin Hu. "Numerical solution of strongly guided modes propagating in sapphire crystal fibers (α -Al₂O₃) for UV, VIS/IR wave-guiding." *Results in Physics*, vol. 18, pp: 103311, 2020.
37. **Farhan Mumtaz**, Muhammad Aqueel Ashraf, and Yutang Dai*. "Numerical approach to approximate the electromagnetic scattering from random PEC cylinder placed below in dielectric half-space." *Optik*, vol. 206, pp: 163751, 2020.
38. Cheng, Pu, Minghong Yang, Wenbin Hu*, Donglai Guo, Cheng Du, Xiaoqiao Luo, and **Farhan Mumtaz**. "Refractive index interferometer based on SMF-MMF-TMCF-SMF structure with low temperature sensitivity." *Optical Fiber Technology*, vol. 57 pp: 102233, 2020.
39. Guo, Donglai, Lijun Wu, Hongxing Yu, Ai Zhou, Qinyou Li, **Farhan Mumtaz**, Cheng Du, and Wenbin Hu*. "Tapered multicore fiber interferometer for refractive index sensing with graphene enhancement." *Applied Optics*, vol. 59, no. 13 pp: 3927-3932, 2020.
40. Hu, Wenbin*, Chi Li, Shu Cheng, **Farhan Mumtaz**, Cheng Du, and Minghong Yang. "Etched multicore fiber Bragg gratings for refractive index sensing with temperature in-line compensation." *OSA Continuum*, vol. 3, no. 4, pp: 1058-1067, 2020.
41. Lin, Hongfeng, Fufei Liu, Yutang Dai*, and **Farhan Mumtaz**. "Relative humidity sensor based on FISM-SMS fiber structure coated with PVA film." *Optik*, vol. 207 pp: 164320, 2020.

CONFERENCE PAPERS

42. **Farhan Mumtaz** *,Tekle, H., Zhang, B., Smith, J.D., O'Malley, R.J., Gerald II, R.E. and Huang, J., 2024, June. Highly cascaded first-order fiber Bragg gratings in highly multimode optical fibers for distributed temperature sensing under harsh environment conditions. In *Optical Waveguide and Laser Sensors III* (Vol. 13044, pp. 45-52). SPIE.
43. **Farhan Mumtaz** *,Tekle, H., Zhang, B., Smith, J.D., O'Malley, R.J., Gerald II, R.E. and Huang, J., 2024, June. Distributed sapphire fiber sensors for steel-making industrial applications. In *Optical Waveguide and Laser Sensors III* (Vol. 13044, pp. 7-13). SPIE. (Invited Talk).
44. Inalegwu, O.C., Saha, R.K., Mekala, Y.R., **Farhan Mumtaz**, O'Malley, R.J., Gerald II, R.E. and Huang, J., 2024, June. Distributed fiber optic sensors for applications in electric arc furnaces. In *Optical Waveguide and Laser Sensors III* (Vol. 13044, pp. 25-35). SPIE.
45. Mekala, Y.R., Saha, R.K., Inalegwu, O.C., Roman, M., **Farhan Mumtaz**, Gerald, R., Smith, J.D., Huang, J. and O'Malley, R.J., 2024. Enhanced Bottom Anode Monitoring in DC Electric Arc Furnaces using Fiber Optic Sensors. <https://imis.aist.org/store/detail.aspx?id=PR-388-235>
46. Mekala, Y.R., Saha, R.K., Inalegwu, O.C., Roman, **Farhan Mumtaz**, II, R.E.G., Smith, J.D., Huang, J. and O'Malley, R.J., 2024. Improved Monitoring of the Water-Cooled Upper Shell of an Electric Arc Furnace Using Fiber-Optic Sensors. In *AISTech 2024—Proceedings of the Iron & Steel Technology Conference*. DOI: 10.33313/388/053
47. Inalegwu, O.C., Mekala, Y.R., Saha, R.K., **Farhan Mumtaz**, Alla, D.R., Neelakandan, D.P., Smith, J.D., O'Malley, R.J., Gerald, R. and Huang, J., 2024. Femtosecond Laser-Inscribed Fiber Bragg Grating Sensors: Enabling Distributed High-Temperature Measurements and Strain Monitoring in Steelmaking and Foundry Applications. DOI: 10.33313/388/239

48. Zhang, B., Tekle, H., O'Malley, R.J., Smith, J.D., **Farhan Mumtaz**, Gerald II, R.E. and Huang, J., 2024, June. Development of an immersion fiber optic Raman probe for real-time analysis of molten materials. In *Optical Waveguide and Laser Sensors III* (Vol. 13044, pp. 14-18). SPIE.
49. Zhang, Bohong, Abhishek Prakash Hungund, Ronald J. O'Malley, Laura Bartlett, **Farhan Mumtaz**, Rex E. Gerald II, and Jie Huang. "Enhancing aluminum casting efficiency through real-time optical fiber sensor monitoring at the metal-mold interface." In *Optical Waveguide and Laser Sensors III*, vol. 13044, pp. 19-24. SPIE, 2024.
50. Inalegwu, O.C., Roman, M., **Farhan Mumtaz**, Zhang, B., Nambisan, A. and Huang, J., 2024, June. Optical fiber specklegram sensor for water leak detection and localization. In *Optical Waveguide and Laser Sensors III* (Vol. 13044, pp. 53-59). SPIE.
51. Dey, K., Saha, R.K., Narasimman, S., Zhang, B., **Farhan Mumtaz**, O'Malley, R.J., Smith, J.D., Gerald, R.E. and Huang, J., 2024, May. Releasing Residual Stress in Metal-Coated Fibers Through Heat Treatment Process for Distributed High-Temperature Sensing Applications. In *CLEO: Applications and Technology* (pp. JTh2A-156). Optica Publishing Group.
52. Bohong Zhang, Hanok Tekle, Ronald J. O'Malley, Todd Sander, Jeffrey D. Smith, Laura Bartlett, **Farhan Mumtaz**, Rex E. Gerald II, Jie Huang, "The Study of the Behavior of CaO-SiO₂-Al₂O₃-Na₂O-Based Mold Flux at 1400 ° C by a Fiber-Optic Raman Sensor", **2023 AISTech Conference Proceedings** At: Detroit USA , DOI: 10.33313/387/135
53. Bohong Zhang, Hanok Tekle, Ronald J. O'Malley, Todd Sander, Jeffrey D. Smith, Laura Bartlett, **Farhan Mumtaz**, Rex E. Gerald II, Jie Huang, "Fiber-Optic Raman Probe for On-line EAF Slag Analysis" **2023 AISTech Conference Proceedings** At: Detroit USA, DOI: 10.33313/387/069
54. Bohong Zhang, **Farhan Mumtaz**, Muhammad Roman, Dinesh Alla, Rex E Gerald, Jie Huang, "Development of a fluorescent-based miniaturized fiber optic pH sensor" **Proceedings Volume 12532, Optical Waveguide and Laser Sensors II**; 125320X (2023), SPIE Defense + Commercial Sensing, 2023, Orlando, Florida, United States, <https://doi.org/10.1117/12.2663886>
55. Ryan O'Malley, Bohong Zhang, **Farhan Mumtaz**, Thomas Spudich, Rex Gerald, Jie Huang, "Modifiable porous silica microsphere optical sensor for chemical detection" **Proceedings Volume 12532, Optical Waveguide and Laser Sensors II**; 125320T (2023), SPIE Defense + Commercial Sensing, 2023, Orlando, Florida, United States, <https://doi.org/10.1117/12.2664094>
56. **Farhan, Mumtaz**, Yutang Dai*, Wenbin Hu*, Muhammad Aqueel Ashraf, Shu Cheng, and Pu Cheng. "Thermo-coupled Temperature Sensors by seven-core MCF Structures." In 2020 IEEE Sensors, pp. 1-4. IEEE, 2020, Rotterdam, Netherlands.
57. Lin, Hongfeng, Yanyan Xu, **Farhan Mumtaz**, Yutang Dai*, and Ai Zhou. "Cascaded Fabry-Pérot Interferometers with Vernier Effect for Gas Pressure Measurement." In 2019 18th International Conference on Optical Communications and Networks (ICOON), pp. 1-3. IEEE, 2019, Huangshan, China.

STUDENT SUPERVISED AS CO-SUPERVISOR

1. Abdul Muqet (MPhil Student of Electronic Dep. at Quaid-i-Azam University, Islamabad)
2. Ghulam Yaseen (MPhil Student of Electronic Dep. at Quaid-i-Azam University, Islamabad)
3. Nasir Anjum (PhD Student of Electronic Dep. at Quaid-i-Azam University, Islamabad)

FUNDING SUPPORT

1. U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy Award No. DE-EE0009119.
2. U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under the Advanced Manufacturing Office Award No. DE-EE0009392.
3. U.S. Army Research Laboratory under Cooperative Agreement Number W911NF-21-2-0280.
4. National Science Foundation of China, NSFC, Grant Number: 51975442.
5. National Science Foundation of China, NSFC, Grant Number: 61475121.
6. Major Technique Innovation Program of Hubei Province of China, Grant 2018AAA016.
7. National Key Research and Development Program of China, Grant 2017YFB0405501.

TRAININGS

1. BOTDR & BOTDRA by OZOPTCS, Canada
2. Glass Process GPX-3400 by ThorLabs, USA
3. COMSOL Multi-physics by Wuhan University of Technology, China
4. Rsoft Beam Propagation Module by Wuhan, China
5. Application of Project Management in MS Project by Project Management Institute, Islamabad
6. Huawei i-PMP process by Huawei Pakistan
7. ERP based on Oracle by Huawei Pakistan
8. Software Acquisition Process/ Practice of Information System by STI, Islamabad
9. SAP by PTCL HQrs Islamabad
10. i - Site & i - Coding Training by Huawei Pakistan
11. BCG Training by Huawei Pakistan
12. MR-SMR process by Huawei Pakistan
13. ETM Handover process by Huawei Pakistan
14. Quality Management Training (CT/SACA) by Huawei Pakistan

ADVANCE SKILLS

1. COMSOL Multiphysics
2. Rsoft BPM
3. Femto-Second Laser micro-machining
4. Glass process system GPX-3400

5. Rayleigh OFDR system
6. Brillion-OTDR/A system

REFERENCES

1. Dr. Huang Jie (Roy A. Wilkens Endowed Associate Professor)
Department of Electrical and Computer Engineering
Missouri University of Science and Technology
214 Emerson Electric Co. Hall, 301 W. 16th St. Rolla, MO 65409-0040, USA
Email: jieh@mst.edu
Telephone Number: +1 (573) 341-4836
2. Dr. Gerald, Rex E. (Research Professor)
Department of Electrical and Computer Engineering
Missouri University of Science and Technology
214 Emerson Electric Co. Hall, 301 W. 16th St. Rolla, MO 65409-0040, USA
Email: geraldr@mst.edu
Telephone Number: +1 (573) 341-4836
3. Dr. Yutang Dai (Full Professor)
National Engineering Laboratory for Fiber Optic Sensing, Wuhan University of Technology, China.
Email: daiyt6688@whut.edu.cn
Telephone Number: +8613545379066
4. Dr. Muhammad Aqueel Ashraf (Associate Professor)
Department of Electronics, Quaid-i-Azam University Islamabad, Pakistan
Email: aqueel@qau.edu.pk
Telephone Number: +925190643083
