

2025 IEEE Photonics Conference (IPC)

Proceedings

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**2025 SBFoton International Optics and Photonics Conference (SBFoton IOPC)
São Pedro, São Paulo, Brazil / September 21th - 24th 2025**

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2025 SBFoton International Optics and Photonics Conference (SBFoton IOPC)
São Pedro, São Paulo, Brazil
21-24 September 2025

Conference Program

Promotion



Support



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Chair: Lino Misoguti (IFSC-USP / SP)
Co-Chair: Emerson Cristiano Barbano (UFPR / PR)

Topic Leaders

Biophotonics

Cristina Kurachi (IFSC-USP / SP)

Luciano Bachmann (FFCLRP / SP)

Integrated Photonics and Optoelectronics

Natália Bereta Tomazio (IF-USP / SP)

Maria Jose Pontes (UFES / ES)

Lasers

Edilson Lucena Falcão Filho (UFPE / PE)

Ricardo Rego Bordalo Correia (UFRGS / RS)

Optics and Instrumentation

Wagner de Rossi (IPEN / SP)

Maria José Bell (UFJF / MG)

Optical Communication

Karcus Day Rosário Assis (UFBA / BA)

Darli Augusto de Arruda Mello (UNICAMP / SP)

Sensors, Image and Illumination

João Batista Rosolem (CPQD / SP)

José Luís Fabris (UTFPR / PR)

Photonics and Quantum Technologies

Thiago Pedro Mayer Alegre (UNICAMP / SP)

Yara Galvão Gobato (UFSCar / SP)

Agri-photonics

Gustavo Nicolodelli (UFSC / SC)

Anderson Rodrigues Lima Caires (UFMS / MS)

Denise Maria Zezell (IPEN / SP)

Herculano da Silva Martinho (UFABC / SP)

Simone Telles (SBFoton / SP)

SBFoton Committee

Conference Venue



Hotel Fazenda Fonte Colina Verde

With 44 years of tradition, Hotel Fonte Colina Verde is perfect for those looking for an attractive program for the whole family. With a 200,000 m² structure and more than 153 apartments, we offer differentiated service, typical country cuisine, a passionate farm atmosphere, and lots of fun for all ages.

Social Events

Sunday, 21 September

20:30 – 22:00 Cocktail

Tuesday, 23 September

20:00 – 22:00 Conference Dinner

Plenary Talks

	Title	Speaker	Chair
Sunday 19:30-20:30	From basic research with atoms and molecules to the applications of light in life science: the trajectory of CEPOF and its innovations	Vanderlei Salvador Bagnato (IFSC-USP/SP/Brazil)	
Monday Biophotonics 08:30-09:15	Translational Clinical Biophotonics	Jürgen Popp (Friedrich Schiller University of Jena/German)	Newton Cesário Frateschi
Monday Lasers 09:15-10:00	High Power, watt-class diode lasers – Overview of recent progress	Daniel Renner (IEEE Photonics Society/USA)	Newton Cesário Frateschi
Monday Photonics and quantum technologies 13:30-14:15	Integrated photonics for light-matter interaction in the second quantum revolution	Gustavo Wiederhecker (UNICAMP/SP/Brazil)	Thiago Pedro Mayer Alegre
Monday Integrated photonics and optoelectronics 14:15-15:00	Optical metrology for characterization of nanostructures	Silvania F Pereira (Delft University of Technology/Netherlands)	Thiago Pedro Mayer Alegre
Tuesday Optics and instrumentation 08:30-09:15	Photonics on Mars – the SuperCam instrument	Ivair Gontijo (NASA/USA)	Nilson Dias Vieira Junior
Tuesday Agri-photonics and sustainability	Laser-induced breakdown spectroscopy:	Timur Labutin (Lomonosov Moscow University/Russia)	Nilson Dias Vieira Junior

09:15-10:00	Expanding from extreme environments to Routine Natural Sample Analysis		
Tuesday Talk 13:30-14:00	The CPQD's Role in the Photonics Ecosystem and a Sifóton Overview	Rafael Figueiredo (CPQD/SP/Brazil)	Erik Fujiwara
Wednesday Optical communication 08:30-09:15	Optical wireless technologies: Unlocking multi-terabit wireless connectivity	Paulo Pereira Monteiro (University of Aveiro/Portugal)	Alexandre de Almeida Prado Pohl
Wednesday Sensor, image and illumination 09:15-10:00	Waveguides with different architectures based on GeO ₂ and TeO ₂ using Si technology and fs laser irradiation: a review	Luciana Reyes Pires Kassab (FATEC/SP/Brazil)	Alexandre de Almeida Prado Pohl
Wednesday Talk 13:30-14:00	Emerging Photonic Trends in the Data Center & AI Infrastructure	Rodrigo Vicentini (Keysight/Brazil)	Alexandre de Almeida Prado Pohl

Oral Presentations

Monday Morning

10:30-11:50: Biophotonics, Session 1 (PL) (Chair: Herculano da Silva Martinho)

10:30-10:50	Invited Talk 1	Hugh James Byrne (Dublin Institute of Technology)	No title
10:50-11:05	1571170927	Daniella L. Peres, Daniela Teixeira da Silva, Joaquim C. Felipe, Luciana Corrêa, Leandro L. de Matos, Thiago Martini Pereira, Denise Maria Zezell	Discriminating Oral Squamous Cell Carcinoma via μ FTIR Spectroscopy Imaging and Tree-Based Models
11:05-11:20	1571172356	Daniella L. Peres, Daniela Teixeira da Silva, Joaquim C. Felipe, Luciana Corrêa, Leandro L. de Matos, Mário Olímpio de	Impact of Sampling Strategies on the Classification of micro-FTIR Hyperspectral Data

		Menezes, Thiago Martini Pereira, Denise Maria Zezell	
11:20-11:35	1571171399	Danielle Laskowski, Sido Feilstrecker Junior, Vinicius P. Anjos, Kevin S Costa, Thiago Neves Machado, Jorge Lenz, Emilson Ribeiro Viana, Rafael Eleodoro de Goes, Wido Herwig Schreiner, Arandi G. Bezerra, Jr.	Laser Ablation in Liquids as a Versatile Approach for the Synthesis of Hybrid Nanoparticles with Plasmonic and Magneto-Plasmonic SERS Applications
11:35-11:50	1571168008	Vinicius P. Anjos, Maria Renata V. B. Freire, Raffaele Stasi, Daniela de Fátima Teixeira da Silva, Denise M. Zezell	Chemometric Evaluation of Ampicillin Stability using FTIR Spectroscopy and Multivariate Techniques

10:30-11:50: Integrated Photonics and Optoelectronics, Session 1 (Room 1)

(Chair: Lino Misoguti)

10:30-10:50	Invited Talk 2	Cleber Renato Mendonça (IFSC-USP-São Carlos).	Ultrafast laser processing for novel photonic system
10:50-11:05	1571171272	Gustavo H. Magro, Maria Carolina Volpato, Eduardo Oliveira Bastos, Luis A. M. Barea, Pierre-Louis de Assis, Newton Cesário Frateschi	Hybrid integration of two- dimensional dichalcogenides for low power saturable absorption in photonic integrated circuits
11:05-11:20	1571170013	Frida L. Flores Rivera, Grethell Georgina Pérez Sánchez, Yolotzin Medina, Rodolfo López- Romero, Leandra I. de Abreu, Ivan A. Aldaya	Erbium and ytterbium co- doped calcium-zinc and sodium-zinc phosphate glasses as high-gain media for integrated photonics
11:20-11:35	1571171107	Vinicius Pereira Pinto, Jose Luis Clabel Huaman, Cleber Renato Mendonca, Gabriel de Oliveira Campos	Incorporation of BaTiO ₃ : Er/Yb Nanoparticles into Polymeric Resins for Two-Photon Polymerization
11:35-11:50	1571172758	Ana Carolina Borges, Abel Quispe, Alejandro Sierra, Stephany	Influence of Silicon Substrate Type and HF Concentration on the

Torres, Andrea Balan,
Walter Salcedo

Optical and
Morphological Properties
of Porous Silicon
Microcavities

**10:30-11:50: Agri-photonics and Sustainability, Session 1 (Room 2) (Chair:
Anderson Rodrigues Lima Caires)**

10:30-10:50	Invited Talk 3	Giorgio Saverio Senesi (National Council Research (CNR) – Italy)	Laser-induced Breakdown Spectroscopy: A fast in-situ technique applied to identify and discriminate grains and seeds of different nature and detect plant viruses
10:50-11:05	1571172396	Luís Carlos Leva Borduchi , Helga Maria Darezzo, Daniele Souza, Debora Marcondes Bastos Pereira Milori.	Integrating LIBS and Machine Learning to Identify <i>Aphelenchoides besseyi</i> Infection in Asymptomatic Soybean Leaves
11:05-11:20	1571161158	Helga Maria Darezzo , Luís Carlos Leva Borduchi, , Raphael Antonio Caface, Debora Marcondes Bastos Pereira Milori.	Detection of <i>Escherichia coli</i> in Tomatoes Using Laser-Induced Breakdown Spectroscopy and Machine Learning
11:20-11:35	1571171275	Luís Carlos Leva Borduchi , Helga Maria Darezzo, Debora Marcondes Bastos Pereira Milori, Ladislau Martin-Neto.	Total Carbon and Nutrient Quantification in Brazilian Soils Using LIBS Technique with One-Point Calibration
11:35-11:50	1571172368	Daniele Souza, Kleydson Stenio, Vicente S. Mattos , Luís Carlos Leva Borduchi, Arthur Lopes Marques Lara, Aida Magalhães, Debora Marcondes Bastos Pereira Milori.	Automated Nutritional Diagnosis in Plants Using DP-LIBS and LIBSsa Software

Monday Afternoon

15:30-16:35: Optics and Instrumentation, Session 1 (PL) (Chair: Lino Misoguti)

15:30-15:50	Invited Talk 4	Daniel Varela Magalhães (IFSC-USP-São Carlos)	Atomic standards of time and frequency and timekeeping applications
15:50-16:05	1571171102	Lucas G. Woiblet , Nick J. Schilder, Bernardo Dias da Costa, Pedro Vinicius Pinto Nascimento, Gustavo Nunes Martins, Gustavo Wiederhecker, Thiago Alegre	Reliable and Affordable Interferometric Wavemeter
16:05-16:20	1571172420	Julio Gallinaro Maranhão , Patricia Aparecida Ana	A Modular Open-Source Platform for Laboratory Automation in Spectroscopic Applications
16:20-16:35	1571172144	Renato Moysés Mafra , Lino Misoguti	Polarization-Resolved Heterodyne Z-Scan for nonlinear refractive index discrimination using ultrafast-high-repetition laser pulses

15:30-16:35: Lasers, Session 1 (Room 1) (Chair: Ricardo Rego Bordalo Correa)

15:30-15:50	Invited Talk 5	Claire Marie Cisowski (University of Glasgow, UK)	Skyrmions as topological light fields
15:50-16:05	1571167015	Juan Coronel , Eisa AlNeyadi, Aaasha Alteneiji, Predrag Sekulic, Guillaume Matras, Felix Vega	IR Spectral Beam Combining: Implementation and Performance Analysis
16:05-16:20	1571170599	Felipe Maia Prado , Jessica Dipold, Nicklauss Wetter	ReLU-like Nonlinear Activation from an Nd:YVO Random Laser
16:20-16:35	1571170735	Paulo Jorge de Moraes , Rubens Cavalcante da Silva, Wagner de Rossi, Claudio C. Mota	Adaptive Optics Systems: Lagrange-Based Woofer-Tweeter Control

15:30-16:35: Optical Communication, Session 1 (Room 2) (Chair: Arismar Cerqueira Sodré Junior)

15:30-15:50	Invited Talk 6	Paulo Sergio de Brito (Instituto Superior Técnico de Lisboa, Portugal)	Quantum Technology: The pathway for intrinsic secure
15:50-16:05	1571171459	Gabriel Bozelli , Ana Laura Graças, João Pedro Gosmin, Artur Alfe, Leandra I. de Abreu, Ivan Aldaya	NSGA-II-based multi- objective optimization of neural networks for nonlinear compensation in digital coherent interconnects
16:05-16:20	1571171240	Ivan A. Aldaya , Pedro Henrique dos Santos Almeida, Robson Assis Colares, Darli Mello	Mitigation of Nonlinear Distortion in Unrepeated Interconnects Employing Clustering Algorithms
16:20-16:35	1571170036	Humberto V. Q. Melo , Pedro Henrique dos Santos Almeida, Robson A. Colares, Darli A. A. Mello	PAM-4-based Cost Function for CD Estimation in Kramers- Kronig SSB-PAM-4 Systems

Tuesday Morning

10:30-11:55: Biophotonics, Session 2 (PL) (Chair: Lilia Coronato Courrol)

10:30-10:50	Invited Talk 8	Peter Gardner (Manchester University, UK)	Separating pussycats and tigers: Risk stratification of prostate cancer using infrared QCL imaging
10:50-11:10	Invited Talk 10	Hilde Harb Buzza (Faculdade de Física, PUC-Chile)	Optimizing the Photodynamic Effect with Photosynthetic Microalgae
11:10-11:25	1571172762	Erika Toneth Ponce Ayala , Layla Pires, Camila Aparecida Antunes, Michelle Barreto Requena, Vanderlei Salvador Bagnato, Sebastião Pratavieira	Evaluation of ALA-Mediated Sonodynamic, Photodynamic, and Sonophotodynamic Therapies in a Murine Model of Early-Stage Cutaneous Melanoma
11:25-11:40	1571172415	Alfredo Hernández Mendoza , Josué Daniel Rivera Fernández, Karen Roa Tort, Macaria Hernández Chávez, Diego Adrián Fabila Bustos	Low-cost driver for pulsed blue laser diode systems for telangiectasias treatment
11:40-11:55	1571171236	Cynthia S. A. Caires , Amanda F. Pires, Leandro O. Araujo, Anderson Caires, Samuel L. Oliveira	NIR-Triggered Photothermal Antimicrobial Strategy Using PCPDTBT Nanoparticles

10:30-11:55: Photonics and Quantum Technologies, Session 1 (Room 1) (Chair: Márcio Peron Franco de Godoy)

10:30-10:50	Invited Talk 7	Thiago Pedro Mayer Alegre (UNICAMP-Campinas)	Advances in Optomechanical Platforms for Quantum Photonics and Transduction
10:50-11:10	Invited Talk 7b	Celso Villas Boas (UFSCar)	Fundamental Light Interference to Quantum Communication: New Interpretation and Applications
11:10-11:25	1571171268	Luís Gustavo Maciel Riveros , Marvyn Inga, João B. Rosolem,	Evaluating Quantum Randomness: Random-Walk-Based

11:25-11:40	1571173964	Eduardo Mobilon, Tiago Sutili, and Rafaél C. Figueiredo Maria Carolina França Volpato , Kalebe Estevam, Marcelo I. Davanco, Pierre-Louis de Assis	Characterization of Quantum-Random Number Generators Broadband photonic structures to achieve high coupling efficiencies and Purcell factors with dark and interlayer excitons in 2D materials
11:40-11:55	1571172784	Bruno Santos de Souza , Franciele Renata Henrique, Tiago Bonicelli Gambarotto, Marcio Daldin Teodoro, Paulo H. D. Ferreira, Filippo Giovanni Ghiglieno, Celso J. Villas Boas	Statistical Analysis of the Experimental Reconstruction of Photon Distribution for Attenuated Lasers

10:30-11:50: Sensors, Image and Illumination, Session 1 (Room 2) (Chair: Cleber Renato Mendonça)

10:30-10:50	Invited Talk 9	Marcelo Nalin (IQ-UNESP-Araraquara)	Rare Earths Containing Garnets Single Crystals for Magneto-Optical and Luminescent Sensors
10:50-11:05	1571172754	Eduardo A. V. Souza , Tales de Vargas Lisbôa, Eric Fujiwara, Axel Spickenheuer, Cristiano M. B. Cordeiro	Non-Invasive Investigation of Humidity in Natural Fibers Using Specklegram Analysis
11:05-11:20	1571155856	Matheus Bulhões Barbosa , Rodrigo Moreira Bacurau, Alex Dante	High-Resolution Microcontroller-Based Interrogator for Fiber Bragg Grating Arrays
11:20-11:35	1571172726	Jacilene Martins Medeiros, Antônio A. de Godoy von Zuben, Renato Goulart Jasinovicus, Luís Alberto Mijam Barêa, Arlindo Neto Montagnoli, José Alexandre Diniz, Giuseppe Antonio Cirino	Direct laser writing of binary Fresnel Zone Plates for low-cost Shack-Hartmann wavefront sensors
11:35-11:50	1571166107	Yungui Ma, Yifan Shao	Pixelated Bayer spectral router based on meta-atom arrays

Tuesday Afternoon

14:00-15:20: Lasers, Session 2 (PL) (Chair: **Lúcia Akemi Miyazato Saito**)

14:00-14:20	Invited Talk 11	Henrique Guimarães Rosa (Machenzie-São Paulo)	Thickness-dependent second harmonic generation in mechanically exfoliated 3R-niobium disulfide: An experimental and theoretical study
14:20-14:35	1571172807	Felipe Maia Prado , Sidney Leal da Silva, Niklaus Wetter	AND, OR, and XNOR Optical Logic Gates via Pixel-Wise Modulation with Spatial Light Modulators and 4f System
14:35-14:50	1571170663	Elbis S. Cardoso , Ricardo E. Samad, Claudio C. Motta	Comparative Analysis of Transverse Mode Instability in Single-Clad and Double-Clad Fibers
14:50-15:05	1571171277	Elbis S. Cardoso , Ricardo E. Samad, Claudio C. Motta	Theoretical Investigation of Transverse Mode Instability in Yb-DCFs Due to Thermally-Induced Modal Coupling
15:05-15:20	1571172414	Marlon Medeiros Correia , Tomas P. V. Andrade, Flávio Cruz	Stimulated Brillouin Scattering Fiber Ring Laser Synthesizing 10.9 GHz Low-Noise Microwave Continuous Wave Signal

14:00-15:20: Optical Communication, Session 2 (Room 1) (Chair: **Darli Mello**)

14:00-14:20	Invited Talk 12	Filippo Giovanni Ghiglieno (UFSCar-São Carlos)	From Snell to quantum cryptography: the optical fiber that connects the world
14:20-14:35	1571165647	Gabriel Leonardo da Silva, Amanda de Farias Ribeiro, Enzo Dantas da Silva , João Gabriel Marques de Carvalho, Flavio A. M. Marques, Alexandre A. C. Cotta, Jefferson E. Tsuchida, Diego C. Fuzatto, Leomar S. Marques, Walter Margulis, Jonas H. Osório	Optical fiber transverse displacement sensor based on a 3D-printed structure and specklegram analysis

14:35-14:50	1571171198	Renan V. B. Carvalho, Diego, Pinheiro, Henrique Alves Dinarte da Silva, Raul Almeida Jr, Carmelo Basto-Filho	A Methodology to Comprehend the Features Importance in Hybrid RSA Using ML
14:50-15:05	1571169364	Pedro Henrique dos Santos Almeida, Robson Assis Colares Darli Mello	Power Autocorrelation- based CD Estimation in IMDD Systems with Transmitter Precompensation
15:05-15:20	1571169734	Lucca Zogbi, Lucca A. Santos, Felipe Pinto, Arismar Cerqueira Sodré Jr	R-PoF System for B5G Smart Farming Applications

14:00-15:20: Integrated Photonics and Optoelectronics, Session 2 (Room 2)
(Chair: João Batista Rosolem)

14:00-14:20	Invited Talk 13	Evandro Conforti (Unicamp-Campinas)	Photonic Integrated Circuits: Basic Challenges and Promises
14:20-14:35	1571172407	Carlos Alvarado, Marcos A. R. Franco, Paulos de Tarso Neves Jr, Alexandre Pohl	Influence of the Electrode Size in the Design of Polymer-based Phase Electro-Optic Modulators
14:35-14:50	1571172751	Tomaz Catunda, Antonio Ricardo Zanatta, Thiago Augusto Lodi, Leonardo Albino, Marcelo Nalin	Structural and Spectroscopic Properties of Nd doped YAG microsize Single Crystals
14:50-15:05	1571170047	Miguel Nienstedt, Luca O. Trinchao, Eduardo S. Gonçalves, Luiz Peres, Miguel Diniz, Paulo F. J. de Siqueira, Nathalia B. Tomazio, Thiago Alegre, Gustavo Widerhecker	Dynamics of Dual- Pumped Kerr Frequency Combs
15:05-15:20	1571167724	Giovana Bonano Carlos, Herculano Martinho, Carla Carolina Bandeira, André Mourão Batista	Diphenylalanine micro/nanotubes self- assembly control: geometric confinement, electric field and recrystallization effects

Wednesday Morning

10:30-11:50: Agri-photonics and Sustainability, Session 2 (PL) (Chair: Ladislau Martin Neto)

10:30-10:50	Invited Talk 14	Anderson Rodrigues Lima Caires (UFMS-Campo Grande)	Application of Chlorophyll Fluorescence in Agriphotonics
10:50-11:05	1571172409	Vinícius G. Rufino , Bianca B. Barreto, Yina J. Onofre, Tiago S. do Espirito Santo, Letícia P. Dantas, Otávio R. de Paula, Debora M. B. P. Milori	Fluorescence Image Processing and Machine Learning Models for Early Detection of Water Stress
11:05-11:20	1571171848	Tiago S. do Espirito Santo , Bianca B. Barreto, Yina J. Onofre, Vinícius G. Rufino, Kaique C. Pereira, Otávio R. de Paula, Letícia P. Dantas, Rafael Galbieri, Debora M. B. P. Milori	Laser-Induced Fluorescence Spectroscopy on Cotton Leaves for Early Detection of Nematode Infection
11:20-11:35	1571169856	Bianca Batista Barreto , Letícia P. Dantas, Otávio R. de Paula, Vinícius G. Rufino, Rafael Galbieri, Paulino R. Villas-Boas, Debora M. B. P. Milori	Early Diagnosis of Nematode Attack in Cotton Plants Using Photonic Techniques
11:35-11:50	1571172142	Raphael Antônio Caface , Helga Maria Darezzo, Arthur L. M. Lara, Daniela Souza, Debora M. B. P. Milori	Pb calibration using DP-LIBS in tomato cultivation

10:30-11:50: Optics and Instrumentation, Session 2 (Room 1) (Chair: Sérgio Celaschi)

10:30-10:50	Invited Talk 15	Miguel Angel Venegas (Molecular Vista Inc)	Understanding Chemical Characterization at the Nanoscale: Towards the development of a numerical Photo-induced Force Microscope (n-PifM), a virtual PifM, for Image and spectroscopy calculations
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10:50-11:05	1571165320	Gabriel de Freitas , Henrique Patriota Alves, Joaquim F. Martins- Filho	Design of Oxide/Metal/Hydride Plasmonic Devices Based on D-shaped Optical Fibers for H2 Sensing
11:05-11:20	1571158559	Murilo Neco Saraiva , Cleber R. Mendonça	Random Forest for chalcogenide glasses: A data-driven method for predicting the nonlinear refractive index
11:20-11:35	1571171335	Ricardo Rego Bordalo Correia , André L. D. Valentina, Amanda K. Fritsch, Antônio Z. Khoury	Second Harmonic Generation of Beams with Stochastic Structures
11:35-11:50	1571171345	Yina Julieth Onofre , Vinícius G. Rufino, Bianca B. Barreto, Tiago S. do Espirito Santo, Kaique C. Pereira, Gabriel L. de Moura, Rafael Galbieri, Debora M. B. P. Milori	Development of a Fluorescence Imaging Platform for Greenhouse Applications

10:30-12:05: Optical Communication, Session 3 (Room 2) (Chair: Jonas Henrique Osório)

10:30-10:50	Invited Talk 16	Brian Pinheiro da Silva (SENAI)	An Overview of Free- Space Optical Links in Brazilian Quantum Network
10:50-11:05	1571170003	Ana Júlia N. Francisco , Plinio S. Dester, Otávio Mendonça, Rafael A. Penchel, Leandra I. de Abreu, Ivan A. Aldaya	Multi-criteria evaluation of Bi-LSTM Recurrent Neural Network for Nonlinearity Compensation in Digital Coherent Optical Systems
11:05-11:20	1571169635	João Pedro Gosmin , Raphael Vico, Grethell G. P. Sánchez, Rafael A. Penchel, Ivan A. Aldaya, Leandra I. de Abreu	Anomaly detection in fiber-based distributed acoustic sensing systems employing autoencoders
11:20-11:35	1571171214	Carine Mineto, Luis G. M. Riveros , Jhonathan B. de Souza, Weskley	Analysis of Optical Propagation Delay as a

		Maurício, Tiago Sutili, Júlia A. S. Maciel, Maykon Silva, Rafael C. Figueiredo	Limiting Factor in 5G OpenRAN Fronthaul
11:35-11:50	1571169048	Eduardo Lima , Lara M. Souza, Arismar C. Sodré Junior	Tunable Optical Frequency Comb Generation Applied to DWDM and 5G Networks
11:50-12:05	1571171222	Bruno Pereira de Souza Rocha, Pablo R. N. Marciano, Maxwell E. Monteiro, Maria J. Pontes, Marcelo Segatto	Analysis of n-th Order Fully-Optical FIR Filters for Chromatic Dispersion Compensation

Wednesday Afternoon

14:00-15:35: Sensors, Image and Illumination, Session 2 (PL) (Chair: Erik Fujiwara)

14:00-14:20	Invited Talk 17	Marcelo Eduardo Vieira Segatto (UFES, ES)	Optical Fiber Sensors and Applications
14:20-14:35	1571172150	Júlia C. X. de Lima , Lidia O Rosa; Audrey Seda, Cristiano MB Cordeiro, Eric Fujiwara	Electrostatic-driven soft device with embedded optical fiber displacement sensor
14:35-14:50	1571172744	Laila El Haddad , Luis Barêa	Dissipative Optical Sensor based on a Photonic Molecule with U-Shaped Feedback Waveguide
14:50-15:05	1571166295	Sergio Celaschi ; Henrique De Canavarro Alencar; Alexandre Augusto De Melo	Continuously monitoring the Biological Oxygen Demand of effluents by optically determining
15:05-15:20	1571171398	Luiz Peres , Luca O. Trinchao, Eduardo S Gonçalves, Miguel Nienstedt, Paulo F. J. de Siqueira, Nathalia B Tomazio, Thiago Alegre, Gustavo Wiederhecker	Characterizing Supermode Overlaps in Coupled Microresonators through Kerr and Thermal
15:20-15:35	1571158333	Bruno Trefilio Magalhães , Ana Luiza Costa Silva, Marcio Godoy	Light-stimulated atmosphere-dependent neuromorphic device

14:00-15:35: Biophotonics, Session 3 (Room 1) (Chair: Luciano Bachmann)

14:00-14:20	Invited Talk 18	Kássio Michell Gomes de Lima (UFRGN-Natal)	Use of multivariate classification algorithms with variable selection applied to biospectroscopy
14:20-14:35	1571172488	Eduardo Ignacio Castellón Castillo ; Diego Adrián Fabila Bustos; Rodrigo Mercado Pimentel; Macaria Hernández Chávez	EasyBrainGen: An Easy-To-Use Automated Workflow for Generating 3D Brain Models from MRI Based on FastSurfer

14:35-14:50	1571171279	Barbara Regina Melo Ribeiro; Fernanda Luiza Menezes; Luisa Helena Carmo Araújo; Danielle Cristina Teles Ferreira; Sara Santos Bernardes; Ana Maria de Paula	Nonlinear microscopy imaging and automated analysis allow evaluation of changes in collagen fibers in melanoma
14:50-15:05	1571169061	Murilo S Sampaio; Luismar Barbosa da Cruz, Jr; Kaio Bernardo Barros; Luciano Bachmann	Evaluating Skin Tone Classifications through Simulated Optical Properties
15:05-15:20	1571173799	Maria L F Vicente; Houssam Hajjoul; Francisco Eduardo Gontijo Guimarães	Singlet oxygen generation by a single soot nanoparticle: a two-photon confocal microscopy quantification
15:20-15:35	1571162948	Luismar Barbosa da Cruz, Jr; Marlon Rodrigues Garcia; Lilian Tan Moriyama; Vanderlei Bagnato; Sebastião Pratavieira	Impact of Occupational Activities on Fingerprint

14:00-15:35: Lasers, Session 3 (Room 2) (Chair: Paulo Henrique Dias Ferreira)

14:00-14:20	Invited Talk 19	Nilson Dias Vieira Junior (IPEN-São Paulo)	Implementation of an ultra-high-intensity laser multiuser facility in Brazil
14:20-14:35	1571161149	Otávio Augusto Capeloto; Vitor Santaella Zanuto; Leandro Herculano da Silva; Nelson Guilherme Castelli Astrath; Luis Carlos Malacarne; Gustavo Vinicius Bassi Lukasiewicz	Nanosecond Thermoelastic Waves Detection in Optical Material by Pulsed Thermal Mirror and Thermal Lens Methods
14:35-14:50	1571167688	Giovanni Budroni, Nt; André F.V. Fonseca; Ana Flávia Nogueira; Jonathas Siqueira	Effect of Quantum Dot Passivation on Hybrid Perovskite Photoconductivity Probed by Optical Pump-Terahertz Probe

14:50-15:05	1571169711	Sergio Castrillon Salazar; Henrique Guimarães Rossa; David Steinberg; Matheus G Bonando; Suelene Silva Piva; Cecília de Carvalho C. C e Silva; Juan Zapata; Lúcia Akemi Miyazato Saito	Blade-coated graphene oxide onto D-shaped fiber as a saturable absorber for femtosecond pulse generation
15:05-15:20	1571171231	Ricardo E. da Silva; Cristiano MB Cordeiro	Laser-Assisted Deposition of Carbon Nanotubes in Optical Fibers with Multiparameter Control
15:20-15:35	1571172785	Felipe Maia Prado; Sidney Leal da Silva; Niklaus Wetter	High-SSIM Reconstruction of Computer-Generated Off-Axis Holograms Using Neural Networks

Poster Presentations

Monday 22 Porter Session 1 (16:35 – 18:00)

Biophotonics

Poster number	Manuscript number	Title	Authors
1	1571172790	Thermal Analysis of Skin-Mimicking Phantoms Under Low Intensity Laser	Julia Cristina da Silva Oliveira ; Murilo S Sampaio; Kaio Bernardo Barros; Carlos Eduardo Girasol; Luciano Bachmann; Luismar Barbosa da Cruz, Jr
2	1571171409	Ex Vivo Thermal Response of Artificially Pigmented Porcine Skin under Photobiomodulation Protocols	Isabel Cristina Tinós ; Macsiel Nunes Lima Neves; Julia Cristina da Silva Oliveira; Lilian Tan Moriyama; Luismar Barbosa da Cruz, Jr; Marlon Rodrigues Garcia
3	1571172737	Curcumin and Berberine-Functionalized Selenium Nanoparticles: Synthesis, Characterization, and Biomedical Applications	Geovanna N Barnabé ; Isabela Lopes; Marcia Franzolin; Bianca Moraes; Susana Barreto; Lilia Coronato Courrol
4	1571170773	Development of a Compact LED Driver and Python-Based Graphical Control Interface for Lens-Free Holographic Microscopy	Marlon Rodrigues Garcia ; Camila de Paula D'almeida; Cesar Yudi Kuramoto; Felipe Alvarenga Carvalho; Sebastião Pratavieira
5	1571169042	Optics in Pulse Oximetry: Correlation with Oxygen Saturation Accuracy	Kaio Bernardo Barros ; Jocássia Silva Pinheiro; Murilo S Sampaio; Luismar B. Cruz Junior; Fernando Fagundes Ferreira; Anibal Basile-Filho; Rinaldo Guirro; Luciano Bachmann
6	1571172429	Spatial Dependence of OCT-Based Measurements of Stratum Corneum Thickness and External Ridge Width on Human Digital Core	Macsiel Nunes Lima Neves ; Luismar Barbosa da Cruz, Jr; Sebastião Pratavieira; Marlon Rodrigues Garcia
7	1571171799	Identifying Inflammatory Signatures in Heart	Raffaele Stasi ; Daniela De Fátima Teixeira Da Silva;

- Tissue via FTIR and Linear Discriminant Mapping
- Vinicius P Anjos; Emiliano Medei; Denise M Zzell
- Deyanira Lopez Salazar;** Josue Daniel Rivera Fernandez; Macaria Hernández Chávez; Carolina Guzmán Arriaga; Karen Roa Tort; Diego Adrián Fabila Bustos
- 8 1571172759 Artificial Intelligence-Based System for the Diagnosis of Hepatic Steatosis
- 9 1571172753 UVC decontamination of circulating preservation solution aimed at kidney transplantation improvement
- 10 1571172428 Prototype of a hybrid biosignal acquisition system integrating and optical electrode and fNIRS-based oximeter
- 11 1571171418 FTIR spectroscopy reveals systemic changes in apical periodontitis
- 12 1571164969 Alveolar bone imaging with optical coherence tomography plus optical clearing agents: a pilot study for osteoporosis diagnosis
- 13 1571155519 Effects of GABA-Synthesized AgCuNPs and SeNPs on Sunflower Seed Development
- 14 1571172459 Crosslinking of gelatin films with Riboflavin and ultraviolet radiation: a pilot study
- 15 1571169724 Radiative Transport Phenomenon in Turbid Media
- 16 1571165699 Salivary ATR-FTIR Signatures for Obstructive Sleep Apnea: A Qualitative Review of
- Loraine Carolina Goenaga Mafud;** Jose D Vollet Filho; Natalia Inada; Cristina Kurachi; Vanderlei Bagnato
- Amish Jocksan J Sierra islas,** Sr; Josue Daniel Rivera Fernandez; Luis Felipe de Jesus Hernandez Quintanar
- Giovana dos Santos Toledo;** Sara Maria Santos Dias da Silva; Paula Marinho; Maryane Rezende; Rayana Khoury; Luis Felipe Chagas e Silva de Carvalho
- Marcos Humberto Santos;** Marcella D. Zatta; Patricia Aparecida Ana
- Isabela Lopes; Charef Kazi Tani; Christophe Couteau; Lilia Coronato Courrol
- Patrícia da Silva Souza;** Sonia Maria Malmonge; Nasser Ali Daghashtanli; Patricia Aparecida Ana
- Bruno Henrique Garcia Malvestio;** Murilo S Sampaio; Luciano Bachmann
- Valeria Mendes;** Vinicius P Anjos; Daniela de Fátima Teixeira da Silva; Denise M Zzell

Biomarkers and
Methodological Validation

- | | | | |
|----|------------|--|--|
| 17 | 1571171250 | Diagnostic potential of FTIR spectroscopy in saliva: challenges in group differentiation | <p>Sara Maria Santos Dias da Silva; Giovana dos Santos Toledo; Sara J Michalopoulos; Julia Nani Bittencourt Gouvea; Thiago Martini Pereira, Sr.; Luis Felipe Chagas e Silva de Carvalho</p> |
| 18 | 1571172800 | UV-C Light Decontamination System Integrated with Organ Perfusion Machine for Transplantation | <p>Loraine Carolina Goenaga Mafud; Jose D Vollet Filho; Daniel J Chianfrone; Washington L Coimbra; Natalia Inada; Cristina Kurachi; Vanderlei Bagnato</p> |
| 19 | 1571172748 | Evaluation of Optical Clearing Agents and Mechanical Compression on Light Penetration in Skin Using Optical Coherence Tomography | <p>Jailda Nonato Dos Santos Oliveira; Camila Ramos Silva; Marcus Paulo Raele; Marcos Antonio Hortellani; Martha Ribeiro; Denise M Zzell; Marcello Magri Amaral</p> |

Agri-Photonics

- | Poster number | Manuscript number | Title | Authors |
|---------------|-------------------|--|---|
| 20 | 1571169843 | Plant Stress Detection Using Photonic Techniques and Machine Learning | <p>Bianca Batista Barreto; Letícia Piazzentin Dantas; Otávio Rodrigues De Paula; Vinícius G Rufino; Francisco Aparecido Rodrigues; Debora M. Bastos Pereira Milori</p> |
| 21 | 1571172782 | Label-Free Detection of Nitrate and Reactive Species in Plasma-Activated Water Using SERS on Gold Thin Films | <p>Isabela Machado Horta; Nilton Francelosi Azevedo Neto; Felipe De Souza Miranda; Rodrigo Sávio Pessoa</p> |
| 22 | 1571172667 | Change of Light Absorption and Scattering Due to Interactions Between Nanoparticles in Black Carbon Clusters | <p>Ana F Gomes; Maria L F Vicente; Francisco Eduardo Gontijo Guimarães</p> |
| 23 | 1571169018 | Laser-Induced Breakdown Spectroscopy and Chemometric Tools for Soil Fertility | <p>Andre T Maoze, Sr; Gustavo Pontes; Alessandra de Souza Teixeira; Arcangelo Loss; Bruno Marangoni; Gustavo Nicolodelli</p> |

		Classification and Carbon Calibration	
24	1571165432	Laser Induced Breakdown Spectroscopy for evaluation of nutrients and adulterants in roasted and ground coffee	Alessandra de Souza Teixeira ; Gustavo Pontes; Ricardo Schneider; Cleverson Busso; Otniel Freitas Silva; Andressa Moreira De Souza; Gustavo Nicolodelli Aline Bastos de Paiva ; Leomar S. Marques; Ariel Porto Da Silva; Bruno Carvalho Magalhães; Edgar Marques Paoletti Oliveira; Gabriela De Castro Lourenço; João Vítor Da Silva Santos; Júlia Mazoni Lopes; Nathan Bernardini De Loyolla; Nycolas Borges Da Silva; Lilian Ferreira De Sousa; Bruno Henrique Sardinha De Souza; Jefferson Tsuchida; Joaquim Paulo Da Silva; Joyce Dória; Tatiana Cardoso E Bufalo
25	1571172710	Dronissil: Universal device for attachment to drones, unmanned aerial vehicles, and flying robots for autonomous operations of pest insect detection, identification, and elimination in crops	Maria Jose Valenzuela Bell ; Virgílio De Carvalho Dos Anjos
26	1571172786	Applications of optical techniques for food quality analysis: milk, cheese and coffee	Luís Carlos Leva Borduchi ; Helga Maria Darezzo; Debora M. Bastos Pereira Milori
27	1571172397	OPC-LIBS for Quantification of Cd and Pb in Tomatoes: A Sustainable Approach to Food Safety Monitoring	Bianca Batista Barreto ; Vinícius G Rufino; Letícia Piazzentin Dantas; Tiago Santiago do Espirito Santo; Yina Julieth Onofre; Rafael Galbieri; Debora M. Bastos Pereira Milori
28	1571172661	Early Discrimination of Plant Stress Responses Using Laser-Induced Fluorescence Spectroscopy: A Case Study in Cotton	Lucas Raimundo Bento ; Vitor Silveira Freitas; Steffen A. Schweizer; Patrícia P. A. Oliveira; José Pezzopane; Alberto C. De C. Bernardi;
29	1571172122	Carbon K-edge XANES Reveals Functional Chemistry Driving Soil Carbon Sequestration in Well-Managed Pasture	

			Debora M. Bastos Pereira Milori; Ladislau Martin-Neto
30	1571166542	Formation and Growth of Silver Nanoparticles: Effects of Light Intensity and Reaction Time in a Bio-Based Synthesis Using Açaí Seed Extract	Lilia Coronato Courrol; Thaina De Sousa
31	1571170601	Predicting Soil Carbon with NIRS in Brazilian soils	Vitor Silveira Freitas; Lucas Raimundo Bento; Daniele Souza; Vicente S Mattos; Debora M. Bastos Pereira Milori; Ladislau Martin-Neto
32	1571166739	Comparison of Soil Samples with Different Clay, Sand, and Silt Contents Using Speckle Interferometry	Felipe Maia Prado; Gustavo Di Chiacchio Faulin; Luis Eduardo Rissato Zamariolli; Pedro Henrique Miho de Souza; Niklaus Wetter; Sidney Leal da Silva
33	1571170739	Numerical Design of a Photonic Crystal Hydrogel Humidity Sensor for Agricultural Applications	Licinius Dimitri Sá de Alcantara

Sensors, Images and Illumination

Poster number	Manuscript number	Title	Authors
34	1571172718	Agar Optical Fibers Prepared by Dip Coating: Optical Characterization and Degradation Analysis	Lidia O Rosa; Francisco X. R. Neto; Eric Fujiwara; Cristiano MB Cordeiro
35	1571165709	Development of a Low-Cost Fabrication Process for PIN Photodiode Detectors	Luis da Silva Zambom; Ronaldo D Mansano; Henrique Chaves Gulino
36	1571171261	Distributed Acoustic Sensing and Convolution Neural Networks for Leak Detection in Low-Pressure Gas Pipelines	Rodolfo Pinheiro Cruz; Felipe Maia; Sérgio Barcelos; Luis E. Ynoquio Herrera; Ana M. Frattini Fileti
37	1571172121	Improving Light Shelf Performance by the Optimization of Tilt Angle	Beatriz Miranda Viana; Daniela Pawelski Amaro Marins; Maria José Pontes; José Leandro Félix Salles; Jussara Fardin; Marcelo E. Vieira Segatto; Helder Rocha

			Mariana Chagas Alcantara dos Santos ; Bianca Yoshii; Jessica Guerreiro Santos Ramalho; Antônio Ivan Messias Soares Júnior; Valeria L da Silva
38	1571172766	Characterization of fiber bundles applied to visual inspection systems	
		Synthesis and characterization of rare-earth garnets for scintillators applications	Breno C Siqueira ; Thiago Augusto Lodi, Sr; Leonardo Albino; Marcelo Nalin
39	1571162332	Performance Evaluation of FBG Array Sensors in Underground Power Distribution Lines	
40	1571161365		Rivael S Penze ; Fabio R Bassan; Marvyn Inga; Joao B Rosolem
Lasers			
Poster number	Manuscript number	Title	Authors
41	1571161155	Population and Thermal Lensing Effect in Nd ³⁺ Doped Optical Materials	Gustavo Vinicius Bassi Lukasiewicz ; Otávio Augusto Capeloto; Vitor Santaella Zanuto; Mauro Luciano Baesso; Luis Carlos Malacarne; Nelson Guilherme Castelli Astrath
42	1571169925	Simulating Kramers Escape Dynamics under Forces in the Geometrical Optics Regime	Gunther Damaceno Barbosa ; Antonio A. R. Neves
43	1571165692	Optical characterization of laser beams for the design of a laser deposition head with variable optics	Bethina V Nicocelli ; Guilherme De Faveri; Joao B Rosolem; Luís Trabasso; Moisés Felipe Teixeira; Natalia Wendt Dreveck
44	1571169853	Fabrication and Characterization of an All-fiber 3 × 1 Pump Combiner	Thassia Lopes Correia dos Santos ; Davi Pontes Nacaratti; Mauricio Moderno Carvalho; Claudio C. Motta; Thoroh Souza
45	1571170844	Fabrication and Characterization of a 7x1 End-Pumped Fiber Combiner	Davi Pontes Nacaratti ; Thassia Lopes Correia dos Santos; Mauricio Moderno Carvalho; Thoroh Souza; Claudio C. Motta
46	1571172711	Enhancing Surface Finish of Additive	Renner Washington Mariano dos Santos ; Lucas Da Silva

Manufactured 316L
Stainless Steel via Laser
Surface Remelting

Jubini; Jonas Jakutis; Rafael
Humberto Mota De Siqueira;
Ana Beatriz Ramos Moreira
Abrahão

Tuesday 22
Porter Session 2 (15:30 – 17:30)

Integrated Photonics and Optoelectronic

Poster number	Manuscript number	Title	Authors
1	1571171334	Infrared Dataset Of Beach Sediment Samples and DFT Vibrational Calculations Impact of Atomic Layer Deposited Al ₂ O ₃ on the	Julian Rayo Alape
2	1571172319	Dielectric Modulation and Optical Behavior of Plasmonic Silver Nanowire Networks	Isabela Machado Horta; Nilton Francelosi Azevedo Neto; Claudio Zepeda; Rodrigo Sávio Pessoa
3	1571171390	Ultrafast Terahertz Dynamics of Ti3C2Tx MXene	Davi H. Soledade; Giovanni Budroni, Nt; Daniel Corrêa; Jonathas Siqueira
4	1571172747	Epoxy with silver nanoparticles: a simple and cheap method for in situ synthesis	Isabella D'andrea Lana da Silva; Paulo H. D. Ferreira; Filippo Giovanni Ghiglieno; Vinicius Tribuzi Rodrigues Pinheiro Gomes
5	1571171463	Investigation of the optical properties of Er ³⁺ -doped fluorindate glasses	Adriano Alemida da Silva; Tomaz Catunda; Francisco Eroni Paz Eroni; Nefe Jefferson De Brito E Silva
6	1571171211	Effect of Ag-doping on the photoluminescence of nanostructured ZnS material	Ana Laura Curcio; Thiago Ardana Chaim; Maria Inês Basso Bernardi; Fábio S. De Vicente; Adriano J. G. Otuka; Alexandre Mesquita
7	1571171249	Red shift in photoluminescence emissions of ZnO nanoparticles with Mg incorporation	Thiago Ardana Chaim; Maria Inês Basso Bernardi; Fábio S. De Vicente; Adriano J. G. Otuka; Alexandre Mesquita
8	1571156210	Material Surface Analysis based on SD-OCT	Vítor José Costa Rodrigues; Emmanuel Leite De Medeiros; Tiago Henrique Brandao; José Mariano Lima Garcia; Fábio D. Simões; Daniel M Pataca
9	1571168142	Self-Assembly of Monodisperse	Paloma Elias da Silva Pellegrini, Renata C. Nome,

		Polystyrene Photonic Crystals via Blade Coating	Francisco Orlandini, Silvia V. G. Nista, Hugo E. H. Figueroa, Stanislav Moshkalev
10	1571171326	Fluorescence Properties of Graphene Quantum Dots embedded in GPTS/TEOS-derived Organic/Silica Sol	Thiago Ardana Chaim; Fábio S. De Vicente; Adriano J. G. Otuka; Alexandre Mesquita
11	1571171088	Characterization of group velocity dispersion in fiber-based Mach-Zehnder interferometers	Gustavo Nunes Martins; Lucas G Woiblet; André G Primo; Gustavo Wiederhecker; Thiago Alegre
12	1571172755	The refractive index of ion doped laser materials	Davi S Oliveira; Tomaz Catunda
13	1571173949	Photoluminescence of CaTiO ₃ : Pr nanophosphor prepared by the polymeric precursors method	Melina Grandis; Thiago Ardana Chaim; Adriano J. G. Otuka; Fábio S. De Vicente; Alexandre Mesquita
14	1571172749	Multiplex SERS Detection of Cationic Dyes Using Thin Silver Films Deposited by Magnetron Sputtering	Nilton Francelosi Azevedo Neto; Isabela Machado Horta; Jade Helena Campos Augstroze; Rodrigo Sávio Pessoa
15	1571172732	Two-Photon Polymerization of Fe ₂ O ₃ /Resin Nanocomposites for Magneto-Responsive Microstructures	Daniel da Cruz Soares; José Luis Clabel Huaman; Cleber R. Mendonca
16	1571172419	MoS ₂ -doped polymeric microstructures fabricated by two-photon polymerization	Gabriel O Campos; Vinícius Pereira Pinto; Kelly T. de Paula; Cleber R. Mendonca
17	1571167190	Photoinduced Effects in As ₂ S ₃ and As ₂ Se ₃ Thin Films by Femtosecond Excitation	Orlando D Marbello Ospina; Lino Misoguti; Nikita S Dutta; Craig B Arnold; Cleber R. Mendonca
18	1571168663	Dependence of amplitude and shape of the Z-scan curve on the detection aperture	Lucius Borges de Souza; Paulo C de Oliveira; Renato A Cruz; Tomaz Catunda

Optical Communication

Poster number	Manuscript number	Title	Authors
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19	1571172713	Orthogonal Chirp Division Multiplexing for High-Speed Terahertz Wireless Systems	Anderson Sanches; Glecia Oliveira Pereira; Daniel M. C. Neves; Rafael Nobrega; Shyqyri Haxha; Antonio Jurado-Navas; Thiago R Raddo
20	1571171264	Experimental Analysis of a L-Band High-Concentration EDFA Performance Under Forward and Bidirectional Pumping	Marcionilo José da Silva; Marcelo Pereira Nogueira; Luis Gustavo Maciel Riveros; Tiago Sutili; Rafael C. Figueiredo
21	1571169912	Inferring Structured Beam Wavefront in Turbulent Free-Space Channel via Deep Learning	Paulo Monteiro de Carvalho Monson; Adriane Martins Alves; Antônio Pereira Junior; Yasmin Da Silva Bonfim; Marcos Gil De Oliveira; Cássio de Castro Silva; Christiano Moreira De Sá Do Nascimento; Braian Pinheiro da Silva; Valeria L da Silva
22	1571171209	Margin Analysis for QoT Estimation Using Analytical Network Digital Twins	Marcos Antonio de Almeida Cora; Jonathan Aguiar Soares; Darli Mello
23	1571165308	Analysis of the Influence of Different High-Power Laser Sources in a Raman-Amplified Radio and Power-over-Fiber Link	Paulo Kiohara; Romildo De Souza; Laura Ghisa; Veronique Quintard; Mikael Guegan; Arismar Cerqueira Sodré Junior; Olympio Coutinho; André Pérennou
24	1571171256	Performance Evaluation of Optical Short-Reach Links Without Blind Phase Search Algorithm Employing Narrow-Linewidth Lasers	Júlia Aline Sousa Maciel; Eduardo Rosa; Tiago Sutili; Rafael C. Figueiredo; Edson Porto da Silva
25	1571168938	Self-Homodyne 'Coherent-Lite' Technique for Optical DWDM Communication Systems	Mateus Souza Coelho; Pablo Rafael Neves Marciano; Maxwell E. Monteiro; Maria Jose Pontes; Jair Adriano Lima Silva; Marcelo E. Vieira Segatto
26	1571165419	Assessment of a Hybrid RoF-MWP Architecture	Frederico Francisco de Paula Campos; Arismar

		over Free-Space Optical Links	Cerqueira Sodré Junior; Celso Henrique
27	1571169022	Unsupervised Regression for Nonlinear Equalization in Coherent Optical Interconnects	Ana Laura Graças ; Gabriel Bozelli; Joao Pedro Gosmin; Artur Alfe; Leandra I de Abreu; Ivan A. Aldaya
28	1571169886	T-Shaped Microstrip Patch Antenna Design with Defected Ground Structure for Radio Frequency identification (RFID) and Modern Wireless Communications	Maryam Liaqat ; Ali Raza; Matheus Henrique Barros da Silva; Ghulam Nabi; Maklayne Barros De Pontes Santiago; Frederico Nunes; Antonino Celso Dantas Antonino

Photonics and Quantum Technologies

Poster number	Manuscript number	Title	Authors
29	1571171695	Implementation of a Fiber-Based Quantum Key Distribution (QKD) Testbed Using Attenuated Laser Pulses	Bruno Santos de Souza ; Franciele Renata Henrique; Marcio Daldin Teodoro; Celso J Villas Boas; Filippo Giovanni Ghiglieno; Paulo H. D. Ferreira

Optics and Instrumentation

Poster number	Manuscript number	Title	Authors
30	1571171187	Holographic optical tweezers using structured light beams	Marcos R. R. Gesualdi ; Rafael A. Bonilla Suarez
31	1571152849	Spectroscopic Characterization of Indigenous Pigments from the Museum of Archaeology and Ethnology at UFPR	Bruna M Gohl ; Carla Damasceno Feliciano; Evaldo Ribeiro; Sady Pereira Do Carmo Júnior; Emerson Cristiano Barbano
32	1571165051	Investigating Nonlinear Solvatochromism in Perylene	Artur Barbedo ; André Pelosi; João Victor Pereira Valverde; Orlando D Marbello Ospina; Leonardo de Boni; Cleber R. Mendonca
33	1571165052	First-Order Hyperpolarizability of bromochalcone derivatives	Nathan Bárbola Marucci ; João Victor Pereira Valverde; Eli Ducas; Pablo Gonçalves;

- Leonardo de Boni; Cleber R. Mendonca
- 34** **1571168607** A Methodological Approach to Dental Tissue Analysis Using Raman Spectroscopy: Development and Clinical Insights
- 35** **1571171127** Evaluation of Fine-tuning EfficientNet and Vision Transformer model architectures for Oral Lesion Classification
- 36** **1571172628** Cost-Effective AI-Driven Integrated Photonics for Spectroscopic Analysis in Biofuels
- 37** **1571171196** Turbulence effects in optical vortex: experimental generation and analysis via holographic techniques
- 38** **1571171431** Optical Monitoring of Antioxidant Degradation in Oil-Based Systems
- 39** **1571171871** Impact of Manual Agitation on FTIR Spectroscopic Characterization of Trichloroacetic Acid (TCA) Peels
- 40** **1571153599** AI-Driven Atmospheric Turbulence Compensation and Channel Modeling in FSO Systems
- Vicente S Mattos**; Jarbas de Castro Neto
- Akio Kenzo T Frazatto**; Ana Carolina F Motta; Ana Elisa R Alves Ribeiro; Renato Tinós; Luciano Bachmann
- Pedro Oliveira Mariz de Carvalho**; Guilherme Luiz Chinini; Alex Dante; Luis E. Ynoquio Herrera; Sérgio Barcelos
- Marcos R. R. Gesualdi**; George Reis
- Iuliia Riabenko**; Jeff Manthorpe; Ronald Miller
- Sara J Michalopoulos**; Luis Feilipe Carvalho; Sheila C Cortelli; Fernando Gonçalves Togni; Nelson Maurício Júnior; Tatiana Aguilar
- Felipe Braga Bittar**; Andrés Pablo López Barbero; Fernando Guiomar; Gil Fernandes; Paulo P Monteiro; Vinicius Nunes Henrique Silva

Identifying Inflammatory Signatures in Heart Tissue via FTIR and Linear Discriminant Mapping

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Abstract—Fourier-transform infrared (FTIR) imaging spectroscopy was used to investigate biochemical alterations in cardiac tissue samples treated with Interleukin-1beta (IL-1 β). Linear Discriminant Analysis (LDA) was applied to spectra in the 1500–1800 cm^{-1} region. In this work, the LDA component score for each pixel was plotted as a heatmap, enabling spatial visualization of spectral alterations. Heatmaps were generated for each of the three control and three treated samples. Additionally, the LDA loading curves show the induced alterations across wavenumbers.

Index Terms—FTIR imaging, Linear Discriminant Analysis, IL-1Beta, Heart Tissue, Spectral Mapping, Inflammation Biomarker.

I. INTRODUCTION

Interleukin-1 beta (IL-1 β) is a pivotal cytokine in inflammatory pathways affecting cardiac tissue remodeling, fibrosis, and electrophysiology [1]–[4]. Detecting biochemical changes induced by IL-1 β in heart tissue can provide insights into inflammatory mechanisms.

Fourier-transform infrared (FTIR) spectroscopy imaging enables non-destructive biochemical characterization of tissues through vibrational signatures of molecular bonds [5]. Previous studies have applied FTIR combined with multivariate analyses such as Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) to distinguish treated from control samples, identifying affected spectral regions [6].

This study focuses on the 1500–1800 cm^{-1} spectral region, rich in protein and lipid vibrational bands. The novel aspect is the spatial projection of LDA component scores for each pixel, generating heatmaps that localize biochemical alterations induced by IL-1 β .

II. MATERIALS AND METHODS

A. IL-1 β inoculation

Mice used in this study ($n = 3$ per group) were administered daily subcutaneous injections of recombinant murine IL-1 β at a dose of 4 ng per injection, based on established protocols to ensure sustained circulating IL-1 β levels [7] [8]. Control animals received equivalent volumes of saline (0.9% NaCl). Treatments were conducted over a period of 15 consecutive days, after which mice were euthanized for experimental analyses.

B. Sample Preparation and FTIR Imaging

Cardiac atria samples from C57BL/6 mice treated with IL-1 β and saline controls were fixed in formaldehyde, paraffin-embedded and sectioned. FTIR imaging was performed using a Cary 660 Agilent FTIR spectrometer coupled with a Cary 620 Agilent microscope, in transfection mode, collecting spectra from 900 cm^{-1} to 4000 cm^{-1} .

C. Spectral Preprocessing

Spectra were restricted to the 1500–1800 cm^{-1} range to avoid paraffin interference (1350–1500 cm^{-1}). Pixels containing only paraffin were excluded using Otsu's thresholding method [9]. Spectra were normalized by the Standard Normal Variate (SNV) method and smoothed using a Savitzky–Golay filter with a polynomial order of 2 and a window size of 9 points [10].

D. Multivariate Analysis

Dimensionality reduction was performed via PCA (30 components), followed by LDA to classify spectra as IL-1 β treated or control. LDA scores were calculated for each pixel and

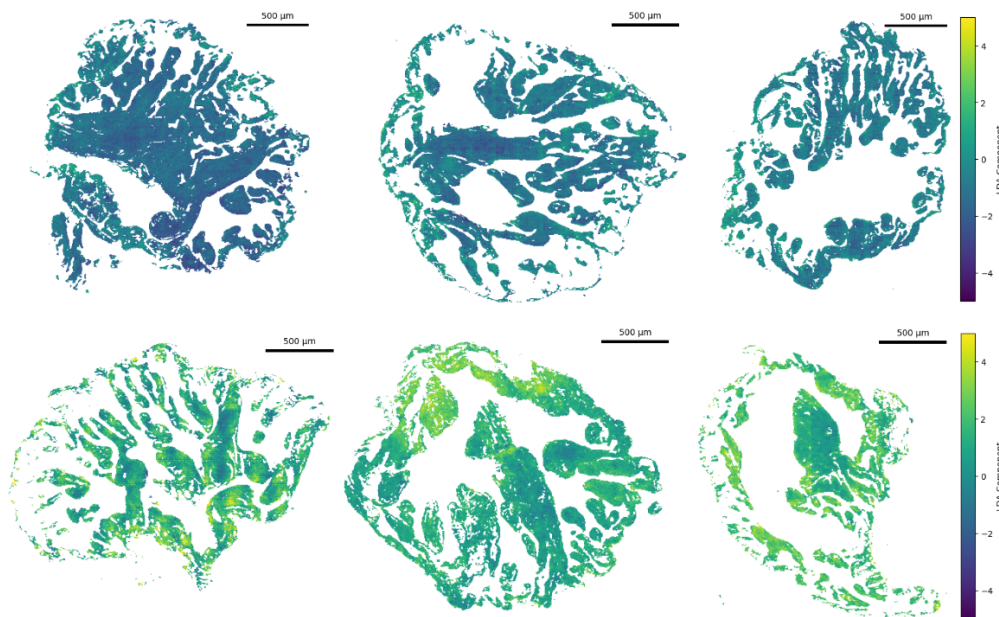


Fig. 1: Heatmaps of LDA component scores for 3 control (top row) and 3 IL-1 β treated (bottom row) heart tissue samples.

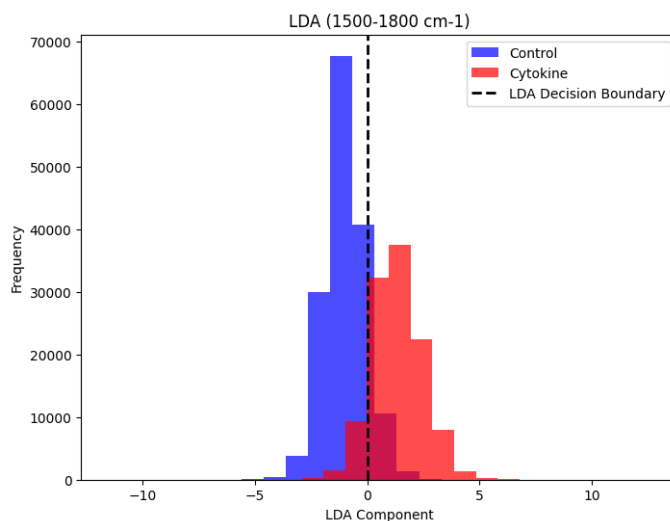


Fig. 2: Histogram of LDA component scores showing separation between control and IL-1 β treated spectra.

spatially projected to generate heatmaps of affected regions. Additionally, histograms of LDA scores illustrate class separation, and LDA loading plots as a function of wavenumber identify spectral features contributing to discrimination. LDA was chosen for its ability to maximize class separation and yield interpretable coefficients, allowing identification of spectral features most associated with treatment-induced alterations.

III. RESULTS AND DISCUSSION

A. LDA Heatmaps

Figure 1 shows heatmaps of the first LDA component for three control and three IL-1 β treated samples. Higher LDA scores in treated samples indicate localized biochemical alterations consistent with inflammatory effects.

B. Class Separation

The histogram in Figure 2 reports the separation between control and treated spectra along the first LDA component (for a LDA with 2 classes there is only 1 component).

C. Loading Plots

Figure 3 presents the LDA loading coefficients across the 1500–1800 cm^{-1} region. Peaks around 1680–1700 cm^{-1} (Amide I) and 1530–1570 cm^{-1} (Amide II) indicate protein structural changes, while contributions near 1730 cm^{-1} relate carbonyl groups from lipids or nucleotide bases [6].

Such alterations are consistent with IL-1 β -induced remodeling, where protein secondary structure changes reflect inflammatory stress and early fibrotic signaling, while lipid

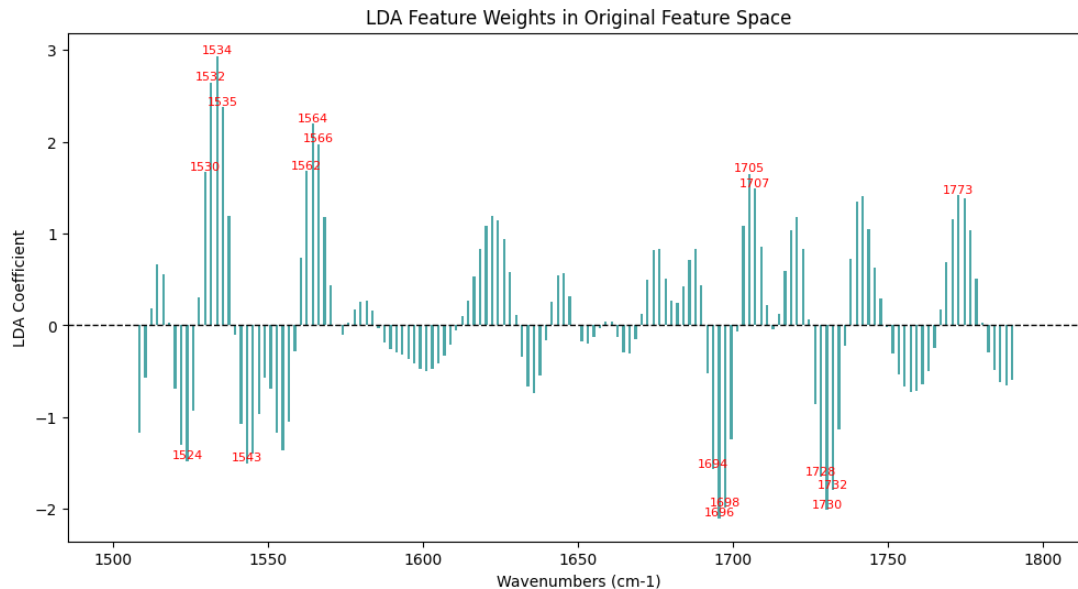


Fig. 3: LDA loading coefficients across the 1500–1800 cm^{-1} wavenumber region. The loading plot identifies which spectral features contribute most to the separation of sample groups. Positive loadings indicate spectral characteristics associated with inflammatory tissue, while negative loadings correspond to features typical of healthy tissue.

and carbonyl modifications may correspond to membrane turnover and oxidative processes that disrupt normal atrial electrophysiology.

These results align with prior findings that IL-1 β induces biochemical remodeling in cardiac tissue, affecting protein and lipid content [1]–[4].

D. Temporal considerations

The 15-day interval between IL-1 β inoculation and euthanasia is likely to have influenced the biochemical signatures detected. At this stage, the spectra mainly reflect mid-to-late inflammatory processes, such as protein structural alterations and lipid composition changes, rather than acute responses. Earlier time points might emphasize transient immune activation, whereas longer exposures could accentuate fibrosis and chronic remodeling.

IV. CONCLUSION

This study demonstrates that spatial projection of LDA component scores offers a novel means of localizing induced biochemical alterations in cardiac tissue via FTIR imaging. The 1500–1800 cm^{-1} region proved effective for classification and mapping, highlighting protein and lipid changes consistent with potential disruption of atrial function. The use of LDA underscores the value of supervised multivariate methods for extracting biologically relevant information from spectral data. Within the 15-day treatment window, our results capture a specific stage of tissue remodeling. Future work with larger cohorts and multiple time points could clarify the progression from acute to chronic responses.

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REFERENCES

- [1] E. Melton and H. Qiu, "Interleukin-1 β in multifactorial hypertension," *Int. J. Mol. Sci.*, vol. 22, no. 16, p. 8639, 2021.
- [2] N. G. Frangogiannis, "Interleukin-1 in cardiac injury, repair, and remodeling," *Discoveries*, vol. 3, no. 1, 2015.
- [3] N. A. Turner, "Effects of interleukin-1 on cardiac fibroblast function," *Vasc. Pharmacol.*, vol. 60, no. 1, pp. 1–7, 2014.
- [4] O. Moreno-Loaiza, V. C. Soares, M. de Assumpção Souza, N. Vera-Núñez, A. Rodríguez de Yurre Guirao, T. P. da Silva, and E. Medei, "IL-1 β enhances susceptibility to atrial fibrillation in mice by acting through resident macrophages and promoting caspase-1 expression," *Nature Cardiovascular Research*, pp. 1–18, 2025.
- [5] B. H. Stuart, *Infrared spectroscopy: fundamentals and applications*. John Wiley Sons, 2004.
- [6] A. Rohman, "The use of ftir and raman spectroscopy in biomedical fluids," *Biomed. Spectrosc. Imaging*, vol. 8, no. 3-4, pp. 55–71, 2019.
- [7] C. Masotto, G. Caspani, M. G. De Simoni, M. Mengozzi, M. Scatturin, M. Sironi, A. Carezzi, and P. Ghezzi, "Evidence for a different sensitivity to various central effects of interleukin-1 β in mice," *Brain research bulletin*, vol. 28, no. 2, pp. 161–165, 1992.
- [8] R. Newton, J. Uhl, M. Covington, and O. Back, "The distribution and clearance of radiolabeled human interleukin-1 beta in mice," *Lymphokine research*, vol. 7, no. 3, pp. 207–216, 1988.
- [9] S. L. Bangare, "Reviewing otsu's method for image thresholding," *Int. J. Appl. Eng. Res.*, vol. 10, no. 9, pp. 21 777–21 783, 2015.
- [10] K. Kitamura, "Effect of savitzky-golay smoothing on second-derivative spectra," *Anal. Chim. Acta*, vol. 201, pp. 301–304, 1987.