CERTIFICATE

The Director of the Laboratory of Applied Mathematics and Modeling (LMAM) hereby certifies that :

HELLAL Abdelaziz

participated with an ***Oral Presentation*** and presented a paper entitled:

"***Schrödinger-Maxwell-Type System Involving Variable Exponents***"

at the **2nd International Conference Mohand Moussaoui on Applied Mathematics and Modeling (ICMAM'25),**

held on **December 15–16, 2025**, at the University 8 May 1945, Guelma, Algeria.

The Laboratory Director
Pr. Hamza GUEBBAI

Chairmen of the Scientific Committee
Pr. AISSAOUI Med Zine

People's Democratic Republic of Algeria

Ministry of Higher Education and Scientific Research University
of 08 Mai 1945 – Guelma
Faculty of Mathematics and Computer Science and Material Sciences Laboratory
of Applied Mathematics and Modeling (LMAM)

Intervention Program

2nd International Conference Mohand Moussaoui on Applied Mathematics and Modeling

Organized by

Laboratory of Applied Mathematics and Modeling

(LMAM)

University 8 Mai 1945 Guelma

Guelma, 15-16th Dec, 2025

First Day Program

First day, 15th December 2025

08h30–09h30 Opening ceremony Google meeting link: https://meet.google.com/foy-dxxt-adf

In memory of the late Mr. Moussaoui Mohand

09h30–14h30 Plenary Sessions Google meeting link: https://meet.google.com/foy-dxxt-adf

Plenary Sessions Program

09h30–10h30	Chairman: Pr. Guebbai Hamza **Pr. Muhammet Kurulay:** The Mathematical Background of Artificial Intelligence and Disease Diagnosis from Medical Imaging
10h30–11h00	Break + Poster Session
11h00–12h00	Chairman: Pr. Aissaoui Med Zine **Pr. Fatma Zohra Nouri:** Flow Dynamics: Modeling, Analysis and Simulation
12h00–13h00	Lunch Break
13h00–14h00	Chairman: Pr. Chaoui Abderrazek **Pr. Aymen AMMAR:** Demicompact Linear Relations.

Ordinary Sessions Program

Room1: Integral & Differential Equations, Optimization, Numerical Methods, Ai

Chairwoman: Dr. Belhireche Hanane

Chairwoman: Dr. Kamouche Somia

14h00– 14h15	**Meriem HAMAMDA**: Limit Cycles of a Third Order (p, q)-Generalized Polynomial Liénard System Via Averaging Method
14h15– 14h30	**Samia MAMAR:** SVM for outlier detection in binary classification
14h30–14h45	**Mohammed MESSOUS :** On The Solvability Of Nonlinear Φ-Caputo Fractional Differential Equations In Banach Spaces
14h45–15h00	**Hamida Leila ACHOURA:** Improved Iterative–Nyström Approach for Fredholm Integral Equations on Large Intervals
15h00–15h30	**Coffee break**
15h30–15h45	**Aymen HOUAMED:** Wave Front Tracking for an Hyperpolic Triangular System
15h45–16h00	**Hamza REZIG:** IG-BS-LS: An Iterated Greedy Algorithm with Beam Search Reconstruction for the Permutation Flow Shop Problem
16h00–16h15	**Rabiaa OUAHABI:** Analysis of A Modified Three-Dimensional Continuous Chaotic System With Applications
16h15–16h30	**Samah NEZZAR:** New Stability Criteria of Linear Singular Systems
16h30–16h45	**Bachir BARROUK:** On The Encapsulation Of The New Xlindley Distribution
16h45–17h	**Hamouda MESSAADIA:** Volume and Area via of Submanifolds the Rotation Method
17h00–17h15	**Soumia KAMOUCHE**: Analytical And Numerical Study of Coupled Nonlinear Volterra Systems with Weakly Singular Kernels
17h15–17h30	**Hanane BELHIRECHE:** Numerical Treatment of the Volterra Equation with Delay

Room2: Operator Theory, Probability and Statistics

Chairman: Dr. Segni Sami

Chairman: Dr. Dida Rida

14h00– 14h15	**Nassima KHALDI**: Stability Of Essential Spectra Of Closed Operators Under T-Compact Equivalence And Perturbation
14h15– 14h30	**ABIR Yakoub:** The Solvability of Generalized Riccati Operator Equation
14h30– 14h45	**Aicha BOUAKA:** Weak Brownian Motions
14h45–15h00	**Sana BOUZIDI:** Invariance of Some Essential Spectra of the Sum of Two Blocks of Operators Matrices via Relatively Fredholm Perturbations
15h00–15h30	Coffee break
15h30–15h45	**Ahmed BENSALMA:** Fractional Augmented Dickey-Fuller Test
15h45–16h00	**Moussa TAZEROUTI:** A Large-Step Monte Carlo Method with Geometric Boundary Correction for Elliptic PDEs
16h–16h15	**Khaled HAMIDI:** On Factorable Strongly P-Summing Bloch Maps
16h15–16h30	**Houssam Eddine BENCHABANE:** Nilpotent and Quasinilpotent Linear Relations (Multivalue Operator)
16h30–16h45	**Dorsaf KOUAS:** SVEP and Bishop's Property of Quaternionic Right Linear Operators
16h45–17h00	**Mohamed ZAMIME :** Global Alliances In Some Graphs
17h00–17h15	**Randa CHAKAR:** Analyse Théorique Et Méthodes Numériques Pour Les Equations Intégrales De Volterra Non Linéaires A L'aide Des $\Rho$-F-Contractions.
17h15–17h30	**Sami SEGNI:** A Hybrid Backward Finite Difference–Nyström Method for Efficient Numerical Solution of Linear Fredholm Integro-Differential Equation

Room3: Fixed Point and Fractional Theory

Chairman: Dr. Amer Mesbahi

Chairwoman : Dr. Ghomrani Sarra

14h00– 14h15	**Ghania REBIAI:** A No-Conformable Fractional Dervative
14h15– 14h30	**Hana AOUADJIA:** Qualitive Analysis of Mild Solution for Iterative Fractional Differential Equations
14h30–14h45	**Zeineb KEBIR:** Hadamard Fractional Differential Equations: Existence and Positivity Results
14h45–15h00	**Abdellah DJAOUT:** Solvability of the System Involving the Mixed Derivative and Integral Erdélyi–Kober Equations of Fractional Order
15h00–15h30	**Coffee break**
15h30–15h45	**Salim BENCHIKH:** Banach Fixed-Point Theorem for Boundary Value Problems Via Riemann–Liouville Derivatives And Integrals
15h45–16h00	**SOLTANI Nor Elhouda:** Existence And Multiplicity Of Nontrivial Positive Solutions For Singular Fractional Elliptic System
16h00–16h15	**Kharoubi Mohammed El Amin:** Coincidence points for mappings defined on $(q1,q_2)$-quasimetric space
16h15–16h30	**Safia BAZINE:** Recent results on fixed points of nonlinear mappings
16h30–16h45	**Safia HIMRI :** Study of Molecular Assemblies with Quantum Methods
16h45–17h00	**Allaoua MEHRI**: Numerical Analysis of a Multi-Term Time-Fractional Convection-Diffusion Equation with a Nonlinear Source Term
17h00–17h15	**Souheil YAKHLEF:** The main uses of SPSS in demography
17h15–17h30	**Amer MESBAHI** : Non-Simultaneous Or Simultaneous Quenching In A Nonlinear Parabolic System Of Three Equations

Room4: Other Topics

Chairman: Dr. Benrabia Noureddine
Chairman: Dr. Guebbai Hamza

14h00– 14h15	**Saliha DJENAOUI:** Equicontinuous Totally Disconnected Factors of Cellular Automata
14h15– 14h30	**Dyhia FEDALA:** The Diophantine Equations T_x±T_y=P^n
14h30–14h45	**SIF Eddine BELKADI :** A Blow-Up Phenomenon for Nonlinear Heat Equations with Variable Exponent Diffusion
14h45–15h00	**Adel SEDDIKI:** Une Etude Qualitative D'un Système Dynamique Non Linéaire Avec Des Dérivées Généralisées
15h00–15h30	**Coffee break**
15h30–15h45	**Oumkeltoum BENHAMOUDA :** Stability of a One-Dimensional Wave–Heat Coupled System Governed by Fourier's Law of Heat Conduction
15h45–16h00	**Rachid LEMDANI:** Quelques Résultats Sur Le Nombre Chromatique De Packing De Quelques Graphes
16h00–16h15	**Redha SAKRI:** Upper-Bound Characterization of Generalized Petersen Graphs P(2m+1,2) Under Locating–Coloring
16h15–16h30	**Abdelhamid TALLAB:** Some Properties of $\Tau(P,Q)$-Summing Bloch Maps
16h30–16h45	**Saadia MAHIDEB :** Common Fixed Point Results In Quasi-Partial Metric Spaces Via Simulation Functions With An Application .
16h45–17h00	**Mohammed Es-Salih ARIES** : Stabilisation Des Quelques Problèmes D'evolutions
17h00–17h15	**Noureddine BENRABIA:** An Adaptive Hybrid Conjugate Gradient Method with Guaranteed Global Convergence
17h15–17h30	**Hamza GUEBBAI:**

Poster Session

- **Mohamed Lamine SAADA KHELKHAL:** Thermoelasticity with Infinite Memory and Delayed Damping: Well-Posedness and Energy Decay
- **Karima BOUIBED**: Optimization of the Transportation Plan for Dry Products of Cevital
- **Doursaf ZARAOULIA**: Regularized Projection Approach for Solving Ill-Posed Fredholm Integral Equations with Weakly Singular Kernels
- **Ibtissam KERMICHE:** Solving Unconstrained Minimization Problems with A New Hybrid Conjugate Gradient Method
- **Nada ROUABHIA:** Application Of the Hille–Yosida Theorem to a Poro-Thermal System with Distributed Delay
- **Djamel AAID:** An Efficient Coupled Alienor–Branch-and-Bound Method for Multivariate Global Optimization Problems
- **Ahlam ROUAG**: Monte Carlo Simulations of Matrix Field Theory
- **Khaoula MEKALFA:** Étude Comparative Entre Deux Modèles Sismiques Basés Sur Des Equations Intégrales De Volterra
- **Djihane BOURESSACE:** Approche Intégrale Pour Le Traitement Du Modèle Brusslator
- **Ghania HADJI** : A Hybrid Conjugate Gradient Algorithm Based on a Convex Combination of PRP and RMIL+ Formulas
- **Saleh SADI:** Existence de solutions $ L^p $ presque périodiques pour des équations différentielles stochastiques à coefficients périodiques
- **Wafa SAYOUD**: Analytical Study for an Integro-Differential Nonlinear Volterra Equation
- **Amira HAMDI:** A New Conjugate Gradient Method for Unconstrained Optimization and Training Neural Networks for Heart Disease Prediction
- **Imane ZOUAK:** Nonlinear Dynamics of Discrete-Time Model for Computer Virus Propagation: Chaos, Complexity, Stabilization and Synchronization
- **CHIBI Mouhamed Amine:** An Adaptive Hybrid Nonlinear Conjugate Gradient Method with Global Convergence Guarantee
- **Nabil HANECHE:** Chaos Analysis and Control in a Discretized Fractional-Order Financial System

- **Raouia HAMIS:** Existence and Uniqueness of Positive Solutions for Multi-Order Fractional Nonlinear Systems with Variable Delays
- **Bochra LAMRI**: Some Results On Lyapunov-Type Inequalities for Certain Fractional Boundary Value Problems
- **Lamia HARKAT:** Y-Compactness and Set-Open Topologies On C(X, Y)
- **Elhachmi HAMIDATOU:** Equations Aux Dérivées Partielles Fractionnaires, Existence D'attracteurs.
- **Wassim MERCHELA :** Results on $b-$metric space
- **Mohamed Lamine MERIKHI:** A New Fractional Modeling of a Nonlinear Reaction–Diffusion System Supported by Numerical Simulation
- **Chabna Halima:** Recherche Des Zéros D'une Fonction Non Linéaire Dans Un Espace De Dimension Infinie
- **Abdallah MEDJOURI:** Sur Les Equations Intégro-Différentielles Issues Des Modèles Électrodynamiques
- **Mohammed KHEMIS:** Linear Volterra Integro-Differential Equations With Delay Terms .

Second Day Program

Second day, 16th December 2025

Online Day

08h45–09h00 Opening ceremony

In memory of the late Mr. Moussaoui Mohand

Room1: Integral & Differential Equation, Optimization, Numerical Methods, Ai

Integral & Differential Equation: Ordinary session (Morning 8h45-12h15)

Chairman: Pr. Ellaggoune Fateh

Chairman: Dr. Aries Mohammed Es-Salih

Google meeting link: https://meet.google.com/jtx-hpdv-cae

09h–09h15	**Houria KAMACHE:** General Decay of Solution for A Viscolastic Equation with Dynamic Boundary Conditions and Delay Terms
09h15–09h30	**Abdellah MESKINE:** Boundedness ,Square Integrability and Uniform Stability Result for the Solutions of Neutral Type Fourth-Order Vector Differential Equation with Multiple Delay
09h30–09h45	**Abed YFRAH:** Convergence and Stability of Semi- And Fully-Discrete Approximations for a Nonlinear Wave Equation
09h45–10h00	**Amel ATMANI:** Local and Global Well Posdness for a Coupled System of Generalized Kdv Equations
10h00–10h15	**Hamour BOUSSAD:** Some Existence Results for a Nonlinear Problem with Source Term in Zygmund-Space
10h15–10h30	**Abdelmoumene MOHAMDI:** Existence of Solutions of P-Kirchhoff Type Problem Involving a Hardy Potential
10h30–10h45	**Moufida AMIOUR:** Viability Result for Caratheodory Non-Convex Differential Inclusion in Finite Dimensional Setting
10h45–11h00	**Nadjla ABIDAT:** A Qualitative Study of TB–HIV Co-Dynamics in a Compartmental Model
11h00–11h15	**Break**
11h15–11h30	**Ibtissam FEKRACHE:** On the Stability of a Nonlinear Viscoelastic Timoshenko System
11h30–11h45	**Khadidja BENZERROUG:** Existence Result of an Elliptic Problem with a Singular Term
11h45–12h00	**Abdelkader TAMI:** Coefficients in the Asymptotic Expansion of Solutions to the Heat Equation in Polygonal Domains
12h00–12h15	**Abdelaziz HELLAL:** Schrödinger-Maxwell-Type System Involving Variable Exponents

Integral & Differential Equation: Ordinary session (Afternoon 13h30-16h30)

Chairwoman: Dr. Naima Hamel

Google meeting link: https://meet.google.com/jtx-hpdv-cae

13h30–13h45	**Tayeb LAKROUMBE:** Existence and Decay Rates of Semilinear Wave Equation with General Strong Dissipation by A Variable Coefficient
13h45–14h00	**Nadji TOUIL:** Critical Energy Levels and Blow-Up Estimates in Kirchhoff-Type Parabolic Equations
14h00–14h15	**Abdelhaq ALIOUAT:** Energy Blow-Up in a Nonlinear Biharmonic Wave Model with Variable Exponents and Mixed Boundary Conditions
14h15–14h30	**Nihad MIMOUNI:** On the Dynamics at Infinity in Classes of Liénard-Duffing Systems
14h30–14h45	**Faissal Mansouri:** Optical Similaritions in Nonlinear Fiber Amplifiers: Self-Similar Evolution and Analytical Modeling
14h45–15h00	**Nabila SEGHIRI:** Operational Matrices of Genocchi Polynomials for Solving Linear Fredholm Integral Equations

Integral & Differential Equation: Ordinary session (Morning 8h45-12h15)

Chairwoman: Dr. Labadla Amel

Google meeting link: https://meet.google.com/brx-ubmh-uhb

09h00-09h15	**Sarra HADI:** Allencahn Equation in Cylindrical and Non-Cylindrical Domains: an Asymptotic Study
09h15-09h30	**Yassine BENIA:** Existence of Solutions to Burgers-Huxley Equation in Domains That Can Be Transformed Into Rectangles
09h30-09h45	**Affaf REZIG:** Asymptotic Stability and Numerical Analysis for A Timoshenko System Under Viscoelastic Damping
09h45-10h00	**Aymene KHELAIFA:** A Review of Nonlinear Age-Structured Tumor Cell Populations Model
10h00-10h15	**Meriem DJIBAOUI:** Variational Methods to Second-Order Dirichlet Boundary Value Problems on The Half-Line
10h15-10h30	**Kamilia Chettouh:** Analysis of an Age-Structured Tumor Growth Model
10h30-10h45	**Abdelaziz DOUAH:** H^2-Convergence of Solutions to a Biharmonic Problem on a Truncated Non-Convex Sector as the Angle Approaches Π
10h45-11h00	**Dounia BOUCHELIL:** On the Kelvin–Voigt Wave Equation with a Viscoelastic Term
11h00-11h15	**Break**
11h15-11h30	**Louiza MERZOUGUI:** Dimension Reduction Method and Error Estimates
11h30-11h45	**Mohamed BOUGUERROUMI**: Well-Posedness and Stability of a Nonlinear Beam
11h45-12h00	**Asma MAADADI:** Numerical Solution of Nonlinear Fredholm Integro-Differential Equations Using Chebyshev
12h00-12h15	**Nadia BENGOUGA**: Decomposition of a Beam Displacement and Error Estimates

Integral & Differential Equation: Ordinary session (Afternoon 13h30-16h30)

Chairwoman: Dr. Bouazila Nada
Chairwoman: Dr. Chakar Randa

Google meeting link: https://meet.google.com/brx-ubmh-uhb

13h30–13h45	**khadidja DAAS:** Employing Chaotic Dynamical Systems for Advanced Contemporary Cryptographic Techniques
13h45–14h00	**Madani DOUIB:** On the Exponential Stabilization of a Flexible Structure with Delay
14h00–14h15	**Hocine AYADI** : On Weighted P(.)-Laplacian Problems with Singular Nonlinearities and Variable Exponents
14h15–14h30	**Wafiya BOUKROUK:** Une Question Portant Sur Les Solutions De Deux Problèmes Liés
14h30–14h45	**Imane BAZINE :** Numerical and Analytical Study of a Weakly Singular Volterra–Fredholm Equation
14h45–15h00	**Sarra Ghomrani:** Nonlinear Fredholm Integral Equations in Economic Model with Intertemporal Spillovers

Optimization: Ordinary session (Morning 8h45-12h15)

Chairwoman: Dr.Benssaad Meryem

Google meeting link: https://meet.google.com/cgn-wttj-gcr

09h00–09h15	**Maroua HAKIM:** An Hybrid Algorithm to Solve the Fixed Charge Transportation Problem
09h15–09h30	**Islem BENNADJA:** A Multi-Objective Optimal Control Framework for Infectious Disease Management
09h30–09h45	**Welid GRIMES:** A Quadratically Convergent Full-Newton Primal-Dual Interior-Point Algorithm for Convex Quadratic Optimization
09h45–10h00	**Youcef Elhamam HEMICI:** A New Combined Conjugate Gradient Method Applied to Image Restoration
10h00–10h15	**Sarah BOUDA:** An Adapted Ant Super Colony Algorithm to Solve Bus University Routing Problem(op)
10h15–10h30	**Dounia BAHALI:** SDDES with Finite Horizon
10h30–10h45	**Selma KALLIL:** Multi-Objective Coalition Formation in Heterogeneous Uavs Using an Mopso Algorithm
10h45–11h00	**Louiza DEHBI:** Prey-Predator in Two and Three Species Cases
11h00–11h15	**Break**
11h15–11h30	**Amira AIBECHE:** Dynamic of a Second-Order Variational Inequality
11h30–11h45	**Adlane BAAZIZ:** Bi-Objective Two-Agent Single-Machine Total Weighted Tardiness Scheduling
11h45–12h00	**Nadia Amal MESSAOUDI:** Parameter Identification in an Hiv Dynamics Model via Chaotic Optimization Algorithms
12h00–12h15	**Ouafa BELGUIDOUM:** A Projection-Type Algorithm for Generalized Variational Inequalities Problem

Optimization: Ordinary session (Afternoon 13h30-16h00)

Chairwoman: Dr. Belhireche Hanane

Google meeting link: https://meet.google.com/cgn-wttj-gcr

13h30–13h45	**Ayache BENHADID:** Studies on General And Extended General Variational Inequalities
13h45–14h00	**Nour El Islem HIBER:** Approximation Solution Set of Lipschitz Nonlinear Equations Using Concave Support Functions and $\Alpha$-Dense Curves
14h00–14h15	**Imane MANCER:** Risk-Sensitive Optimal Control in Wasserstein Space: a Stochastic Maximum Principle with Impulse Effects
14h15–14h30	**Boualem SLIMI:** Quasi-Monte Carlo Methods for Calculating European Call Options
14h30–14h45	**Ilias BADAOUI:** Acceleration of the L-Shaped Method: Stochastic Optimization
14h45–15h00	**Nadia LACHEMI:** A Network-Based Approach for Generating Efficient Solutions to the Bi-Objective 0/1 Knapsack Problem
15h00–15h15	**Bochra ZEGHAD:** Modified Extragradient Algorithm Using Bregman Distance
15h15–15h30	**Djamel ZERROUKI:** Improved Convex Lower Bound Function for Univariate Nonconvex Functions
15h30–15h45	**Amira LAHMER:** Integro- Differential Inclusion Associated with Primal Lower Regular Functions
15h45–16h00	**BENDJEDI Akram :** A DC-Penalized dual reformulation for solving mixed-Integer bilevel quadratic programs

Numerical Methods, Ai: Ordinary session (Morning 8h45-12h15)

Chairwoman: Dr. Kaidouchi Wahida

Google meeting link: https://meet.google.com/vod-wiss-dov

09h00-09h15	**Fatima OUAAR:** Effectiveness Fitting Of Linear Regression In Deep-Learning Approach
09h15-09h30	**Mohammed ELAROUSSI:** Redundancy in Abstract Argumentation: Towards Minimal Frameworks and Efficient Dynamics
09h30-09h45	**Nassima ANANE:** A Two-Step Iterative Fixed-Point Method for New General Absolute Value Equations
09h45-10h00	**Abdelouahab MANI:** Efficient Numerical Schemes for Nonlinear Quadratic Integral Equations
10h00-10h15	**Nesserine BENELMIR:** Stability and Bifurcation Analysis of a 4d Nonlinear Dynamical System
10h15-10h30	**Hadjer ZEROUALI:** Solving Pseudo-Hyperbolic Equation with Non Local Conditions Using Numerical Technique
10h30-10h45	**Fouzia BIREM:** A Numerical Method for Solving Systems of Volterra Delay Integro-Differential Equations
10h45-11h00	**Ouidad BOULAKOUR:** Solving Nonlinear Time-Fractional Evolution Problems Using the Laplace–Residual Power Series Method
11h00-11h15	**Break**
11h15-11h30	**Chahinaz HENNOUS:** Numerical Solution of Pantograph-Type Integral Equations via Taylor Collocation
11h30-11h45	**Roumaissa BENSEGHIR:** Reproducing Kernel Method For Solving Delay Integro-Differential Equations
11h45-12h00	**Chafika SAKHANE:** Taylor Collocation Method for Solving Two Dimensional Double Delay Differential Equations
12h00-12h15	**Safia MEKHALFA:** On the Orthogonality of a New Combination of Two Sequences of Classical Orthogonal Polynomials

Numerical Methods, Ai: Ordinary session (Afternoon 13h30-16h30)

Chairwoman: Dr. HIMRI Safia

Google meeting link: https://meet.google.com/vod-wiss-dov

13h30–13h45	**Khaoula Imane SAFFIDINE:** Periodic Pattern Reaction-Diffusion System
13h45–14h00	**Salah Eddine BENCHELLALI:** Mathematical Analysis and Numerical Simulation to Investigate the Propagation Properties of Kink Soliton in the Higher Order Nonlinear Schrödinger Equation in the Presence of Quintic Term
14h00–14h15	**Abdennour KROUCHI:** Local Discontinuous Galerkin Method for \Vspace Second Order Partial Differential Equation
14h15–14h30	**Abdelhakim DEHAMNIA:** Homogenization and Uniform Stabilization for a Nonlinear Second Order Equation with Multiple Spatial Scales
14h30–14h45	**Seddik MERDACI:** Homogénéisation a symptotique des Plaques Hétérogènes Visco-Elastique Affaiblies Par des Micro-Fissures
14h45–15h00	**Najia HAOUARI:** A Python-Based Neural Network Method for Linear Programming
15h00–15h15	**Sara LABIDI:** From Physical Models to Mathematical Analysis

Room2: Operator Theory, Probability and Statistics

Operator Theory: Ordinary session (Morning 8h45-12h15)

Chairwoman: Dr. Bazine Imane

Google meeting link: https://meet.google.com/pbw-cxrp-cyz

09h00–09h15	**Nadjet MERDJ:** On The Operator Equation XDX + Y EX + AX − BX = C
09h15–09h30	**Hicham KASRI:** Theoretical Analysis and Uniform Stability for a Hyperbolic Equation with Dirichlet and Wentzell Boundary Conditions
09h30–09h45	**Farida MEKKAOUI:** A Note on (F,G)-Aluthge Transforms of Operators
09h45–10h00	**Belaala MAATOUGUI :** An Over View on Lipschitz Ph-Summing Operators
10h00–10h15	**Nesrine HAMIDI:** Estimation of the Relative Error Under Functional Censured Data
10h15–10h30	**Aissa BOUHALI:** Commutants of the Sums of Two Toeplitz Operators on the Bergman Sapce with General Symbols
10h30–10h45	**Raoudha LAFFI:** Boundedness and Reproducing Kernels of Multiplier Operators in the Fourier-Laguerre Setting
10h45–11h00	**Antar BOUYELLI:** On the Extended Spectrum of Certain Operators
11h00–11h15	**Break**
11h15–11h30	**Abdelaziz GHERDAOUI:** Some Estimates for Hardy-Steklov-Type Operators Acting on Monotone Functions in Lp Speces With 0 < P < 1.
11h30–11h45	**Mohammed Aiman: DOUCHE** A Review on the Applications of the Drazin Inverse in Solving Differential Equations
11h45–12h00	**Tayeb MAHROUZ:** Regularity of Differential Operators of Constant Strength in Roumieu Spaces
12h00–12h15	**Ayyoub FELLAG ARIOUAT:** Example of Non Normal Operator on Hilbert Spaces

Operator Theory: Ordinary session (Afternoon 13h30-16h30)

Chairman : Pr. Guebbai Hamza

Google meeting link: https://meet.google.com/pbw-cxrp-cyz

13h30–13h45	**Brahim ABDELMALEK:** Existence and Multiplicity of Solutions for Nonlinear Elliptic Systems
13h45–14h00	**Mourad RAGHDI:** Dense Range of Nonlinear Operators and Approximate Controllability of Semilinear Heat Equations
14h00–14h15	**Mustapha MAADANI:** A-Isometry Operators in Semi-Hilbertian Spaces
14h15–14h30	**Abdelkader BOUREBAI:** Normal Forms and Semiclassical Spectra of Schrödinger Operators Near Resonance
14h30–14h45	**Rachid YAHI:** Lipschitz Factorable P-Summing Operators
14h45–15h00	**Wissem CHOUGAR:** The Controllability Of A Parabolic System Using Carleman's Estimates.
15h00-15h15	**KAIDOUCHI Wahida**: Study Of A Nonlinear Infinite-Dimensional Equation

Probability and Statistics: Ordinary session
(Morning 8h45-12h15)

Chairwoman: Dr. Kamouche Somia

Google meeting link : https://meet.google.com/nsw-xohg-vri

09h00–09h15	**Oum Kelthoum BELLAOUI:** Existence and Uniqueness of Riemann-Liouville Fractional Integro-Differential Equations with Random Coefficient
09h15–09h30	**Atika AOURI:** Estimation of Spatiotemporal Garch Model
09h30–09h45	**Kheira SENOUCI:** On the Local Linear Estimation of the Conditional Cumulative Distribution for Functionally Dependent and Censored Data
09h45–10h00	**Faiza LIMAM-BELARBI:** Robust Estimation for Censored Functional Time Series: Strong Consistency Results of a Trimmed Regression Approach
10h00–10h15	**Ahmed LAKEHAL:** The Application of Brass' Relational Models for Estimating Experience Mortality
10h15–10h30	**Ahmed AKRIMI:** Local Linear Estimation of Spectral Density Function with Missing Data
10h30–10h45	**Ikram HAMED:** Risk Sensitive for Fractional Brownian Motion
10h45–11h00	**Oum Elkheir BENAOUDA :** A Note on the Conditional Distribution Estimate in Single Functional Index Model
11h00–11h15	**Break**
11h15–11h30	**Abdellatif GUENAIZI:** Détection Offline Des Ruptures Dans Les Modèles De Durées
11h30–11h45	**Billel ALIAT:** On Markov Regime Switching Periodic Linear State Space Models: Filtering, Estimation and Applications
11h45–12h00	**Samia MAZOUZ:** Partial Functional Mean Characterization Based Tests for the Bivariate Skew-Normal Distribution
12h00–12h15	**Farida SLIMI :** Algebraic Method for Computing Weibull Moments

Probability and Statistics: Ordinary session (Afternoon13h30-16h30)

Chairman : Dr.Segni Sami

Google meeting link: https://meet.google.com/nsw-xohg-vri

13h30–13h45	**Hafida BEN BRAHIM:** Martingale Problem and Weak Solution for General Sdes
13h45–14h00	**NOUR El-Hayet Ladaouri:** Impact of Choosing the Kernel, Smoothing Parameter and Norm on the Estimation of the Conditional Density with Functional Data
14h00–14h15	**Aida ZITOUNI:** A Chaos–Sobol Framework for Global Sensitivity Analysis of GI/M/1/N Queuing Systems
14h15–14h30	**Asma HADJOU BELAID:** Stochastic Stability Analyses of a Diffusion Drift System with the Lyapunov Function
14h30–14h45	**Dihia BELAIZA:** Reliability Analysis of an M/M/1 Retrial Queue with Negative Arrivals and Breakdowns
14h45–15h00	**Dahbia HAFAYED :** Sufficient Conditions for Optimal Control of Forward-Backward Doubly Stochastic Volterra Systems with Random Jumps
15h00–15h15	**Oussama BAHI:** Bayesian inference for Twice-Censored Data

Room3A: Fixed Point and Fractional Theory

Ordinary session (Morning 8h45-12h15)

Chairwoman: Dr. Bazine Safia

Google meeting link: https://meet.google.com/mnz-cdkm-xse

09h00–09h15	**Fatma BERRIGHI:** Study of Mild Solutions to Conformable Fractional-Order Evolution Equations
09h15–09h30	**Aboubaker El-Saddik BOUZIANE:** Investigating a Class of Caputo-Type Fractional Integro-Differential Equations
09h30–09h45	**Rachid CHERIEF:** Novel Doubly Periodic and Other Solutions of the Conformable Time-Fractional (2+1)-Dimensional Modified Kdv-CBS Equation
09h45–10h00	**Amar BENKERROUCHE:** Initial Value Problem With Ordinary And Fractional Derivatives forNon-Autonomous Variable Order Differential Equations
10h00–10h15	**Nassima MELOUANE:** Fixed Point Index for Positive Meir-Keeler Condensing Operator and Application
10h15–10h30	**Naima BOUSSEKKINE:** Weak Solutions for a Fractional Boundary Value Problem (Bvp) Involving Ψ Caputo Impulsive Fractional Differential Equations
10h30–10h45	**Souhila SABIT:** Existence, Uniqueness, And Stability of Fractional Operator Approach to Cauchy-Type Problems
10h45–11h00	**Hammou BENMEHIDI:** Coupled Fractional Differential Systems with the Caputo-Fabrizio Operator
11h00–11h15	Break
11h15–11h30	**Belqassim AZZOUZ:** On a Nonlinear Fractional Differential Equation Under Certain Condition
11h30–11h45	**Yacine ELHADJ MOUSSA:** Smoking As An Epidemic: Relapse Dynamics With Caputo Derivatives
11h45–12h00	**Radhowane CHAIB:** Contraction Sequences and Fixed Points in B-Metric Spaces
12h00–12h15	**Azeddine NOUIKAS :** Variational Approach to Hadamard Fractional Boundary Value Problems with Infinitely Many Solutions

Room3A: Ordinary session (Afternoon13h30-16h30)

Chairwoman: Dr. Djennaoui Saliha

Google meeting link: https://meet.google.com/mnz-cdkm-xse

13h30–13h45	**Mohammed Elamine BEROUDJ:** Solving An Inverse Problem Of A Fractional Partial Differential Equation Using Orthonormal Legendre Polynomials
13h45–14h00	**Rachid BELKFIF:** Existence , Uniqueness And Ulam--Hyers Stability For Two--Point Fractional Boundary Value Problems
14h00–14h15	**KAMACHE Fares:** Positive Solution For Singular Double Phase Nonhomogeneous Quasilinear Problems Involving The $\Psi $-Hilfer Fractional Operator
14h15–14h30	**Abdelhak ABDALLAH:** Study Of A Three Sequential Abstract Fractional Differential Equations
14h30–14h45	**Said MEKHDOUA:** On the Existence and Uniqueness of Solutions for a Coupled System of Nonlinear Langevin Equations
14h45–15h00	**Amouria HAMMOU:** Impulsive Fractional Differential Equations Involving The Caputo-Hadamard Fractional Derivative In A Banach Space
15h00–15h15	**Randa HADJADJ**: A Common Fixed Point Approach to Equilibrium in Abstract Economies
15h15-15h30	**Bourega Abdeldjabar**: Coupled Riemann–Liouville Fractional Systems Via Fixed Point Theorems In Generalized Banach Spaces.
15h30-15h45	**Zineb KORICHI:** Mathematical Solution Of The Fractional Liouville Equation
15h45-16h00	**Maroua NOUAR:** INITIAL Data Reconstruction in Time-Fractional Allen-Cahn Equations
16h00-16h15	**Oussama BOUANANE** : analytical and numerical study of the time-fractional caputo-burger equation

Room3B: Fixed Point and Fractional Theory

Ordinary session (Morning 8h45-12h15)

Chairman: Dr. Dida Rida

Google meeting link: https://meet.google.com/foy-dxxt-adf

09h00–09h15	**Souheyla DEBBOUCHE :** Quelques Définition De La Dérivée Fractionnaire Avec Une Application Aux Equations Logistiques
09h15–09h30	**Aymen LAKEHAL:** MATHEMATICAL Analysis of Spatial SEIAR Models with Componentwise Caputo Derivatives and Non Linear Diffusion
09h30–09h45	**Hamdi Cherif MOUNTASSIR:** Analytical Solutions Of Fractal Partial Differential Equations Via A Unified Local Fractional Transform Approach
09h45–10h00	**Mohammed KOUIDRI:** Analytical Foundations And Applications Of Fractional Resonant Boundary Value Problems
10h00–10h15	**Soumia BENSIMESSAOUD:** Realization Of Compound Combination Synchronization Between Three Identical Integer-Order Chaotic Systems And A Fractional-Order Chaotic System
10h15–10h30	**ABDELAZIZ Belaada:** Existence Of Weak Solution For A Fractional P-Laplacian Problem
10h30–10h45	**Bochra AZZAOUI:** Integral Equation Of Nonlinear Boundary Value Problem In Fractional Sobolev Spaces
10h45–11h00	**Aida BELLOUT:** A Study of Chaotic Dynamics in a Fixed-Memory Fractional Cardiac Action Potential Duration Model
11h00–11h15	**Break**
11h15–11h30	**Samia YOUCEFI:** Existence and Ulam-Hyers Stability of Boundary Value Problems for Nonlinear Variable-Order Caputo Fractional Differential Equations
11h30–11h45	**Naceur CHEGLOUFA:** Neutral Ψ-Hilfer Fractional Delay Equations: Existence of S-Asymptotically Bloch Type Periodic Solutions
11h45–12h00	**Nora BENMIR :** Euler-Bernoulli Beam Model For Lateral Dynamics Of Drill Strings: Analysing Resonance And Stability Under Axial Tension And Compression
11h45-12h00	**Lilia ZENKOUFI:** Positive Solution of a Three-Point Boundary Value Problem for a Fifth-order Differential Equation

Room4: Other Topics

Room4A: Ordinary session (Morning8h45-12h15)

Chairman: Dr. SEDKA Ilyes

Google meeting link: https://meet.google.com/rca-mcaa-xbo

09h00–09h15	**Mohamed BEKIRI :** Nodal Solutions For A Yamabe Type Problem On Compact Manifold
09h15–09h30	**Nawel HAMBLI :** Numerical Analysis To Investigate The Impact Of Chirp On The Propagation Of Optical Pulses In Nonlinear Media
09h30–09h45	**Dounya HAMEK: An** Entirely New Family Of Generating Functions for Binary Products of Gaussian Pell Padovan Numbers With Bivariate Polynomials.
09h45–10h00	**Rayane BOUCHERMA:** Modeling the Dynamics of Tuberculosis Transmission in Algeria
10h00–10h15	**Sara DRIDI:** A Boolean Satisfiability Formulation of Regional Controllability in Cellular Automata
10h15–10h30	**Aicha BENGUETAIB** : Singular Elliptic Equations with Variable Exponents and $L^{1}-$ Data
10h30–10h45	**Khelifa BERKANE:** Modeling Infectious Disease Spread Using a Fractional Stochastic Sirds Framework
10h45–11h00	**Ayoub KEMARI:** Stabilité De La Méthode Linéaire Appliquée A Un Système Caténaire A Tricompartiments. Le Cas Du Système Polynomial D'ordre $(\Alpha + \Beta)$.
11h00–11h15	**Break**
11h15–11h30	**Nadjet LAKEHAL:** On the Synchronization of a Novel Chaotic System with Two Method
11h30–11h45	**Nawel ABDESSELAM :** Blow-Up of Nonlinear Shcrödinger Equations with Variable Coecients and Memory
11h45–12h00	**Chahinez IMINE:** Measuring Symmetry Resistance in Graph Products
12h00–12h15	**Abdeldjalil KADRI:** Dynamics of a Time-Delayed Stochastic Sir Model With Nonlinear Incidence and Treatment Rate

Room4A: Ordinary session Afternoon 13h30-16h00)

Chairwoman: Dr. Khalfallaoui Roumaissa

Google meeting link: https://meet.google.com/rca-mcaa-xbo

13h30–13h45	**Amina BELLIL :** Decomposition Of Quasi-Twisted Codes Over Non-Chain Ring
13h45–14h00	**FIDA BAHBA:** Advances In Harmonic Analysis Within The Opdam-Cherednik Framework
14h00–14h15	**Zaineb LOKSAIER**: A Rational-Closure of the Heisenberg Group : Application to Image Texture Analysis
14h15–14h30	**Djahida BOUCHEFRA**: Dirac Equation with Exactly Solvable Killingbeck with a Ring-Shaped Oscillatory Potential
14h30–14h45	**Yacine BRIEDJ:** Integer Points of a Family of Elliptic Curves Induced by a Diophantine Set
14h45–15h00	**Said AMROUCHE :** Un Triangle Arithmétique Liè A La Suite De Fibonacci
15h00–15h15	**Ibrahim DAAMECHE:** Exponential Stability of the Von Kármán System With Internal Damping
15h15–15h30	**Saad MOHAMED:** Fuzzy Subring
15h30–15h45	**Hamza LEKHCHINE**: Mohand Moussaoui: A Scientific Legacy and Historical Vision in the Development of Applied Mathematics
15h45–16h00	**Maroua Amel BOUBEKEUR:** Impact of Chronic Diseases on Epidemic Dynamics: A Mathematical Perspective
16h00–16h15	**Moustafa TADJ:** a Generalisation of Biharmonic Maps in Riemannian Manifolds

Room4B: Ordinary session (Morning 8h45-12h15)

Chairwoman: Dr. Djaghout Manal

Google meeting link: https://meet.google.com/tue-aroo-xhe

09h00–09h15	**Yassine OUAKOUAK:** Exponential Stability of a Thermoelastic Shear Beam Model With Lord-Shulman Type
09h15–09h30	**NABIL Hamidi:** A Model of Plasmid-Bearing and Plasmid-Free Competition in a Chemostat with Distinct Removal Rates
09h30–09h45	**KOUAKOU Kouassi Vincent:** Congruent Numbers From The Unity Circle Via Elliptic Curves: Trigonmetric And Galaxy Families
09h45–10h00	**Amel RAHMANI:** Multiplicity Results For Boundary Value Problems Of Kirchhoff Type On The Half-Line Via Genus Theory
10h00–10h15	**Hamid ACHAB:** On the Mathematical Modeling of Thermo-Viscoplastic Contact with Time-Fractional Derivatives
10h15–10h30	**Amina BECHEROUL:** Trend Function Estimation In Stochastic Differential Equations Driven By Generalized Mixed Bi-Fractional Brownian Motion
10h30–10h45	**Chahinaze DJADI:** On Extended Congruence Relations And Arithmetic Properties Of Generalized Binomial Coefficients
10h45–11h00	**Hossemddine ACHOUR:** Self-Similar Solution For The Inverse Problem That Occurs In Image Restoration
11h00–11h15	**Break**
11h15–11h30	**Rebiha SAFFIDINE :** The Regularization Method For Solving Bilinear Sub-Riemannian Geodesic Problem
11h30–11h45	**Oussama REZAIGUIA :** Optimal Control Strategies For A Cost-Effective Diphtheria Transmission Model
11h45–12h00	**Meriem El-Batoul KEDDAR :** Controlling Covid-19 Dynamics Using An Epidemic Model
12h00–12h15	**Souad AZRA :** Nilpotent-By-Polycyclic-By-Cernikov Groups Nilpotent-By-Polycyclic-By-Cernikov Groups

Room4B: Ordinary session (Afternoon13h30-16h30)

Chairwoman: Dr. Hafaidia Imane

Google meeting link: https://meet.google.com/tue-aroo-xhe

13h30–13h45	**Yasmina GHETTOUT:** Synchronization Of Chaotic Systems Using Active Control And Backstepping Control Methods
13h45–14h00	**Samiha AGUEB:** L'effet De L'ajout D'une Chaine Sur Le Nombre B-Chromatique
14h00–14h15	**Bochra GHERIBI:** Morrey Space And Besov Space
14h15–14h30	**Ghania GUETTAI:** Exploring A Novel Class Of Polynomials Derived From The Laguerre Transform
14h30–14h45	**MOUSSA FALL:** Classification Of Algebraic Points On The Hyperelliptic Curve Of Affine Equation $ Y^{2} = X^{5} + 3x^{3} + X $
14h45–15h00	**Abdelaziz BENNOUR:** Existence And Multiplicity Of Solutions To The Nonhomogeneous Biharmonic Problem Involving Critical Growth And Hardy Potentials
15h00–15h15	**Amina GUERROUMA :** A Comparative Study of Heuristic-Based Memetic Algorithms for Multi-Objective Stochastic Knapsack Problems

Schrödinger-Maxwell-Type System Involving Variable Exponents

Abdelaziz Hellal

University of M'sila, University Pole

2nd International Conference Mohand Moussaoui on Applied Mathematics and Modeling (ICMAM'25)

December 15-16, 2025 - University of Guelma

Outline:

Introduction

Schrödinger–Maxwell System: V. Benci and D. Fortunato (1998)[1]

$$\begin{cases} -\frac{1}{2}\Delta u + \phi u = \omega u \\ -\Delta \phi = 4\pi u^2 \end{cases}$$

- They studied the eigenvalue problem for the Schrödinger operator when coupled with an electromagnetic field.
- In the last twenty years, many works have been devoted to various problems that are closely related to this system.

Introduction

Consider the doubly singular semi-linear elliptic system:

$$
\begin{aligned}
-\operatorname{div}(H(x)Du) + v^{1-\theta}u^{r-1} &= \frac{f}{u^{\gamma(\cdot)}} \quad \text{in } \Omega, \\
-\operatorname{div}(H(x)Dv) &= \frac{u^r}{v^\theta} \quad \text{in } \Omega, \\
u = v &= 0 \quad \text{on } \partial\Omega,
\end{aligned}
$$

Where Ω is a bounded open domain in $\mathbb{R}^N$ ($N \geq 3$) with Lipschitz boundary $\partial\Omega$, with $u > 0$ in $\{f > 0\}$, $v > 0$ in Ω.

Assumptions:

1. $f \geq 0$, $f \not\equiv 0$, $f \in L^{m(\cdot)}(\Omega)$ for suitable $m(\cdot)$, where $m : \overline{\Omega} \longrightarrow (1, +\infty)$ is a continuous function.
2. $H \in L^{\infty}(\Omega; \mathbb{R}^{N \times N})$ symmetric, uniformly elliptic:

$$\alpha|\xi|^2 \leq H(x)\xi \cdot \xi \leq \beta|\xi|^2 \quad \text{(a.e. } x \in \Omega, \forall \xi \in \mathbb{R}^N\text{)}$$

   with $0 < \alpha \leq \beta$
3. Parameters: $r \geq 2$, $\theta \in [0, 1)$, $\gamma : \overline{\Omega} \longrightarrow (0, 1)$ is a continuous function.

- We prove the existence of solutions $(u, v) \in H_0^1(\Omega) \times H_0^1(\Omega)$ for a doubly singular elliptic system with variable exponents.

Remarks:

- The proofs rely on an approximation scheme, a priori estimates, Schauder's fixed point theorem, and careful convergence arguments.
- When $f = 1$ and $\theta = 0$, singular nonlinearities for the Schrödinger–Maxwell system were first considered by L. Boccardo et al. [2] (2022).

$$\begin{cases} -\operatorname{div}(H(x)Du) + vu^{r-1} = \dfrac{1}{u^{\gamma}} & \text{in } \Omega \\ -\operatorname{div}(H(x)Dv) = u^{r} & \text{in } \Omega \\ u, v > 0 & \text{in } \Omega \\ u = v = 0 & \text{on } \partial\Omega \end{cases}$$

Remarks:

- When $\gamma = 0$, L. Boccardo et al. [2] (2024) established some regularizing effects for the singular elliptic system.

$$\begin{cases} -\operatorname{div}(A(x)Du) + v^{1-\theta}u^{r-1} = f & \text{in } \Omega \\ -\operatorname{div}(M(x)Dv) = \dfrac{u^r}{v^\theta} & \text{in } \Omega \\ u, v > 0 & \text{in } \Omega \\ u = v = 0 & \text{on } \partial\Omega \end{cases}$$

- For constant exponents m and γ, the system was recently studied by G. Giannone [4] (2026).

Main Result

Definition - Weak Solution

We say that $(u, v) \in H_0^1(\Omega) \times H_0^1(\Omega)$ is a weak solution to our system if $u, v > 0$ a.e. in Ω,

$$\frac{f}{u^{\gamma(\cdot)}}\varphi,\ \frac{u^r}{v^\theta}\varphi \in L^1(\Omega) \quad \forall \varphi \in H_0^1(\Omega), \tag{1}$$

and

$$\begin{cases} \int_\Omega HDu \cdot D\varphi + v^{1-\theta}u^{r-1}\varphi \,\mathrm{d}x = \int_\Omega \frac{f}{u^{\gamma(\cdot)}}\varphi \,\mathrm{d}x & \forall \varphi \in H_0^1(\Omega) \\ \int_\Omega HDv \cdot D\psi \,\mathrm{d}x = \int_\Omega \frac{u^r}{v^\theta}\psi \,\mathrm{d}x & \forall \psi \in H_0^1(\Omega). \end{cases} \tag{2}$$

Main Result

The main result is the following

Theorem

If $m(\cdot) \geq \frac{N}{2}$, then our system has a weak solution (u, v), such that u belongs to $L^{\infty}(\Omega)$ if $m(\cdot) > \frac{N}{2}$, and to every $L^{p(\cdot)}(\Omega)$ where $p : \overline{\Omega} \longrightarrow (1, +\infty)$ is a continuous function, if $m(\cdot) = \frac{N}{2}$. Moreover, v belongs to $L^{\infty}(\Omega)$.

Strategy of the proof of the Theorem

Our approach is based on an approximation procedure.

1. Approximation Scheme
2. A priori estimates
3. Passage to the limit

Step 01: Approximate Scheme

Assume that $f_n = \min\{f, n\}$, we prove that the regularized system

$$\begin{cases} -\operatorname{div}(H(x)Du_n) + v_n^{1-\theta} u_n^{r-1} = \dfrac{f_n}{\left(u_n + \frac{1}{n}\right)^{\gamma(\cdot)}} & \text{in } \Omega, \\ -\operatorname{div}(H(x)Dv_n) = \dfrac{u_n^r}{\left(v_n + \frac{1}{n}\right)^{\theta}} & \text{in } \Omega, \\ u_n, v_n > 0 & \text{in } \Omega, \\ u_n = v_n = 0 & \text{on } \partial\Omega, \end{cases} \tag{3}$$

admits a unique weak, bounded solution for each $n \in \mathbb{N}$.

Step 01: Approximate Scheme

Lemma 1: G. Giannone [4] (2026)

For every $n \in \mathbb{N}$, there exists $(u_n, v_n) \in \left(H_0^1(\Omega) \cap L^\infty(\Omega)\right)^2$ such that $u_n, v_n > 0$ a.e. in Ω and

$$\begin{cases} \displaystyle\int_\Omega HDu_n \cdot D\varphi + v_n^{1-\theta} u_n^{r-1} \varphi \, \mathrm{d}x = \int_\Omega \frac{f_n}{\left(u_n + \frac{1}{n}\right)^{\gamma(\cdot)}} \varphi \, \mathrm{d}x & \text{(a)} \\ \displaystyle\int_\Omega HDv_n \cdot D\psi \, \mathrm{d}x = \int_\Omega \frac{u_n^r}{\left(v_n + \frac{1}{n}\right)^{\theta}} \psi \, \mathrm{d}x & \text{(b)} \end{cases}$$

for all $\varphi, \psi \in H_0^1(\Omega)$.

- The strong maximum principle for the operator $-\operatorname{div}(H(x)D\cdot)$.

Step 02: A priori estimates

In this step, we show suitable a priori estimates on (u_n), which depends on the standing regularity assumption on f. In particular, we show that (u_n) is bounded in $L^{p_m}(\Omega)$, where

$$p_m = \begin{cases} \infty & \text{if } m(\cdot) > \frac{N}{2} \\ \text{any continuous function } p : \overline{\Omega} \longrightarrow (1, +\infty), & \text{if } m(\cdot) = \frac{N}{2}. \end{cases}$$

Then, we deduce a priori estimates on (u_n) and (v_n).

Step 02: A priori estimates

Lemma 2

Let (u_n) be the sequence given by Lemma 1. Then:
(i) if $m(\cdot) > \frac{N}{2}$, then there exists a constant $C = C(N, |\Omega|, \alpha, m^-) > 0$ such that

$$\|u_n\|_{L^\infty(\Omega)} \leq 1 + C\|f\|_{L^{m^-}(\Omega)}.$$

(ii) If $m(\cdot) = \frac{N}{2}$, then for every continuous function $p : \overline{\Omega} \longrightarrow (1, +\infty)$ there exists a constant $C = C(N, |\Omega|, \alpha, \gamma, p(\cdot)) > 0$ such that

$$\|u_n\|_{L^{p(\cdot)}} \leq C\|f\|_{L^{\frac{N}{2}}}^{\frac{1}{1+\gamma}}.$$

- (i) Since $T_n(f) \leq f$, by choosing a test function in Lemma 1(a).
- (ii) as in (i).

Step 02: A priori estimates

Now, Let (u_n) and (v_n) be the sequences given by Lemma 1. By Lemma 2 and testing Lemma 1(a)-(b) with u_n and v_n, respectively, we obtain the a priori energy estimates

$$\alpha\|u_n\|^2_{H^1_0} \leq \int_\Omega \frac{f_n}{(u_n+\frac{1}{n})^{\gamma(x)}}u_n\,dx \leq \int_\Omega f u_n^{1-\gamma(x)}\,dx \leq C\|f\|_{L^{m-}}, \tag{E-1}$$

$$\alpha\|v_n\|^2_{H^1_0} \leq \int_\Omega \frac{u_n^r}{(v_n+\frac{1}{n})^{\theta}}v_n\,dx \leq \int_\Omega u_n^r v_n^{1-\theta}\,dx \leq C_1^{1-\theta}\|u_n\|^r_{L^r} \leq C_2. \tag{E-2}$$

Step 03: Passage to the limit

By (E-1) and (E-2) there exist $u, v \in H_0^1(\Omega)$ such that, up to subsequences, $(u_n) \rightharpoonup u$ and $(v_n) \rightharpoonup v$ weakly in $H_0^1(\Omega)$, strongly in $L^q(\cdot)(\Omega)$ for every $1 \leq q(\cdot) < 2^*$, and almost everywhere in Ω. Moreover, by the estimates above, $u \in L^{p(\cdot)}(\Omega)$ for all $1 \leq p(\cdot) < \infty$ and $v \in L^\infty(\Omega)$. Since $u_n, v_n > 0$ a.e., we also have $u, v \geq 0$ a.e.

Then, we conclude that (u_n, v_n) converges weakly in $H_0^1(\Omega) \times H_0^1(\Omega)$ and strongly in $L^2(\Omega) \times L^2(\Omega)$ to a weak solution of the system that satisfies (1).

Conclusion and perspectives

- Extend the results to the case where γ and θ depend on x, or where the singularities are of the form $u^{-\gamma(x)}$, $v^{-\theta(x)}$.
- Study the system in $\mathbb{R}^N$ or in exterior domains, where compactness and embedding properties are weaker.
- Replace the linear elliptic operator $-\operatorname{div}(H(x)Du)$ with a p-Laplacian or a more general quasilinear operator.

Some References

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- H. Abdelaziz and R. Mecheter, Regularity results for a singular elliptic equation involving variable exponents, *Bol. Soc. Paran. Mat.* (3s.) v.(43): (2025), 1–25.
- H. Abdelaziz and R. Mecheter, Nonlinear Anisotropic Parabolic Problem involving a Singular Nonlinearity, *Azerbaijan Journal of Mathematics*, **16(1)**: (2026), (to appear).
- H. Abdelaziz and F. Mokhtari, *Nonlinear anisotropic degenerate parabolic equations with variable exponents and irregular data*, J. Ellip. Para. Equa. **8**, (2022), 513-532.

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- G. Giannone, *Regularizing effects for an elliptic system of singular equations*,J. Math. Anal. Appl. 554 (2026) 129950.

Thank you for your attention

Questions are welcome