



ENSICAEN
ÉCOLE PUBLIQUE D'INGÉNIEURS
CENTRE DE RECHERCHE



CIA2ST'2022
2-3 Juin 2022
Beni Mellal, Maroc

International Symposium on Artificial Intelligence and the Security of New Telecommunications Systems (CIA2ST'2022)

PROGRAM OVERVIEW

02-Juin-2022	
08:00-09:30	Registration
09:30-10:00	Welcome and Symposium Opening Ceremony: <ul style="list-style-type: none">• Prof. Nabil HMINA, President of Sultan Moulay Slimane University• Prof. Benachir EL HADDADI, Dean of Polydisciplinary Faculty-the Beni Mellal• Prof. Belaid BOUIKHALENE, Director of the LIMATI laboratory• Prof. Pr. Said SAFI, Symposium Coordinator and Chair
10:00-10:30	Keynote Speaker Dr. Mohamed Kayyali, President at IFGICT <i>"The IoT, Taking IoT Further With A.I. Via Small Satellites"</i> Session Chairs Prof. A. Malaoui and Prof. N. Falih
10:30-10:50	Coffee Break
11:00-12:30	Sessions 1 & 2
12:30-14:00	Lunch
14:30-15:30	Keynote Speaker Prof. Miloud Frikel, From ENSICAEN, Caen, France, <i>"From Single-Sensor Signal Processing To Multi-Sensor Signal Processing"</i> Session Chairs: Prof. S. Safi and Prof. A. Darif.
15:40-16:10	Coffee Break
16:10-18:10	Sessions 3 & 4
03-Juin-2022	
09:00-9:40	Keynote Speaker , Prof. B. Bouikhalene, Polydisciplinary Faculty, Beni Mellal, Morocco, <i>"The Mathematical Concept Behind Deep Learning"</i> Session Chair Prof. H. Mouncif.



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9:40-10:20	Keynote Speaker, Prof. Youssef Naimi, From Hassan II University, Casablanca, Morocco, <i>"Storage Of Renewable Energies, Role Of Hydrogen"</i> Session Chair Prof. M. Moutaabbid.
10:20-10:40	Coffee Break
10:40-12:00	Sessions 5 & 6 (Posters+Workshops)
12:10-13:10	Lunch
14:30-16:00	Session 7: Special Session on Renewable Energies, Session Chairs, Prof. A. Malaoui and Prof. Y. Naimi.
15:50-16:10	Coffee Break
16:20-17:00	Keynote Speaker, Prof. Yassine Sadqi, Polydisciplinary Faculty, Beni Mellal, Morocco), <i>"Cybersecurity Challenges and Issues in Modern Applications"</i> Session Chair Prof. A. Farchane
17:00-18:20	Sessions 8 & 9 (Posters+Workshops)
18:20-19:00	Symposium Closure Ceremony

JUNE 02 2022: ORAL PRESENTATIONS

Session 1 - Session Chairs Prof. H. Hachimi and Prof. A. Darif	
11:00	«Detection Wideband Sources Propagating on a Small Antenna Array» , H. Ougraz, S. Safi and M. Frikel, LIMATI Laboratory, FPBM, USMS, Morocco.
11:15	«Positive Definite Kernels for Minimum Phase Channel Identification from Binary Output» , R. Fateh, A. Darif and S. Safi, LIMATI Laboratory, FPBM, USMS, Morocco.
11:30	«Algorithmes de decodage des codes MDPC quasi-cycliques pour le cryptosystème de McEliece» , A. Kichna and A. Farchane, LIMATI Laboratory, FPBM, USMS, Morocco.
11:45	«K-plane algorithm for identification of switched linear Systems» , A. Bourzik, S. Safi, B. Bouikhalene, M. Pouliquen and M. Frikel, LIMATI Laboratory, FPBM, USMS, Morocco.
12:00	«DOA Estimation Using Sparse Representation and Hight-resolution Methods in Various Noise Levels Environnements» , A. Ghandouri, S. Safi and M. Frikel, LIMATI Laboratory, FPBM, USMS, Morocco.
12:15	«Smart Livestock Monitoring System» , K. El Moutaouakil, B. Jabir and N. Falih, LIMATI Laboratory, FPBM, USMS, Morocco.
12:30	«Adequate modelling of COVID-19 pandemic based on time series analysis and Higher Order Statistics» , S. Safi, M. Frikel and M. Pouliquen, LIMATI Laboratory, FPBM, USMS, Morocco.



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Session 2 - Session Chairs Prof. H. Mouncif and Prof. H. Ouchitachen	
11:00	«Mask R-CNN for Weeds Detection: training in different technical environments» , B. Jabir, K. El Moutaouakil and N. Falih, LIMATI Laboratory, FPBM, USMS, Morocco.
11:15	«Cybersecurity Virtual Labs for Online Learning: Current Trends and Recommendations for Improvements» , A. Rehaimi, Y. Sadqi and Y. Maleh, LIMATI Laboratory, FPBM, USMS, Morocco.
11:30	«Coverage Sets Scheduling for lifetime maximization of wireless sensor networks: Genetic algorithm approach» , I. Laghlimi, H. Ouchitachen and H. Mouncif, LIMATI Laboratory, FPBM, USMS, Morocco.
11:45	«Web attack detection using ML algorithms and CIC-IDS 2017 dataset» , O. Chakir and Y. Sadqi, LIMATI Laboratory, FPBM, USMS, Morocco.
12:00	«Logout in identity and access management systems» , Y. Belfaik, Y. Sadqi and S. Safi, LIMATI Laboratory, FPBM, USMS, Morocco.
12:15	«Low overhead routing in wireless sensor networks» , M. Lachgar, A. Darif and H. Mouncif, LIMATI Laboratory, FPBM, USMS, Morocco.
12:30	«Social engineering: common attacks and countermeasures» , M. Zaoui and Y. Sadqi, LIMATI Laboratory, FPBM, USMS, Morocco.

Session 3 - Session Chairs Prof. A. Farchane and Prof. S. Hakimi	
16:10	«Développement d'un robot autonome de nettoyage de panneaux solaires» , H. Facoiti, L. Lombo, S. Safi and A. Boumezough, LIMATI Laboratory, FPBM, USMS, Morocco.
16:25	«Energy Efficiency of a Public Lighting Network: from Diagnosis to Improvement of Electrical Performances» , B. Boukhris, L. Elmahni and F. Douslimane, LASIME, Ibn Zohr University, Morocco.
16:40	«Algorithmes de sécurité pour les réseaux mobiles Ad hoc» , H. Khalfaoui, A. Farchane and S. Safi, LIMATI Laboratory, FPBM, USMS, Morocco.
16:55	«The distribution of heuristic methods applied to complex systems» , E. Ouassam, N. Hmina, B. Bouikhale and H. Hachimi, LIMATI Laboratory, FPBM, USMS, Morocco.
17:10	«Radar de vision par ordinateur» , H. Facoiti, A. Boumezough and S. Safi, LIMATI Laboratory, FPBM, USMS, Morocco.
17:25	«Task Offloading for the Single-User Single-Task Scenario in Mobile Edge Computing Networks» , M. Myyara, A. Darif and A. Farchane, LIMATI Laboratory, FPBM, USMS, Morocco.



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17:40	«A review of Radio Frequency Identification technologie to combat COVID-19» , E. Rouan, S. Safi and A. Boumezough, LIMATI Laboratory, FPBM, USMS, Morocco.
17:55	«Browser security and privacy: challenges and issues» , A. Zineddine and Y. Sadqi, LIMATI Laboratory, FPBM, USMS, Morocco.

Session 4 - Session Chairs Prof. S. Belaaouad and Prof. N. Barj	
16:10	« Contribution to increasing the energy efficiency of photovoltaic cells with formamidinium perovskite layers: study and simulation by SCAPS-1D» , A. Malaoui, Laboratoire LRPSI, Université Sultan Moulay Slimane, Béni Mellal, Maroc
16:25	«A review of materials used in extrusion based 3D Concrete Printing» , A. Najm-Eddine, I. Arroub, A. Bahlaou, M. Abouelmajd, I. Chiguer, Y. Najm-Eddine and S. Belhouideg, LRPSI, FPBM, USMS, Morocco.
16:40	«Length and diameter effects on earth-to-air heat exchanger performance in in hot temperate climate» , Y. Najm-Eddine, I. Arroub, A. Bahlaoui, M. Abouelmajd, I. Chiguer, A. Najm-Eddine, S. Belhouideg, LRPSI, FPBM, USMS, Morocco.
16:55	«Comparison between the Analytical and Numerical Solutions of the Thermosolutal Mixed Convection in a Vertical Cavity» , M. Rahmoun, M. Lamsaadi, T. Makayssi, S. Ziane, B. EL Hadoui and H. El Harfi, LRPSI, FPBM, USMS, Morocco.
17:10	«Charctersitics of Double-Diffusive Mixed Convection Opposing Mechanism Inside a Double Lid-Driven Cavity Submited to Heat and mass Fluxes» , Y. Tizakast, M. Kaddiri and M. Lamsaadi, Industrial Engineering Laboratory, FPBM, USMS, Morocco.
17:25	«Effect of Buoyancy Ratio on Natural, Mixed, and Forced Convection Fluid Flow and Heat and Mass Transport in a Single Lid-Driven Rectangular Cavity» , Y. Tizakast, M. Kaddiri and M. Lamsaadi, Industrial Engineering Laboratory, FPBM, USMS, Morocco.
17:40	«Convection naturelle dans une cavité chauffée latéralement» , K. El Merrakchi and M. Lamsaadi, Laboratoire de Recherche en Physique et Sciences pour l'Ingénieur, FPBM, USMS, Morocco.
17:55	«The contribution of RBF neural networks to the command and control of 5MW wind turbine Horizontal axis class Based on differential speed regulation By using a Bond Graph Approach» , M.Karimi , Z. Khaouch, M. Zekraoui, M. Kadiri and Y. Khoya, Industrial Engineering Laboratory Sultan My Slimane University, Beni Mellal, Morocco.



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JUNE 03 2022: Special Sessions + Posters and Workshops

14h30 - 17h

Soutenance d'une thèse en cotutelle avec l'ENSICAEN de l'université de Caen France, sous le titre : « Contributions à l'identification en boucle ouverte/fermée des systèmes à base de données binaires » Co-encadré par S. Safi, M. Pouliquen et M. Frikel.
Salle des polyvalente de la FST.

	Session 5 - (Posters+Workshops)- Session Chairs Prof. I. Ellahiani and Prof. Y. Sadqi
	«Machine Learning approach based on meteorological parameters for long term Solar Radiation forecasting», H. Hissou, S. Benkirane, A. Beni-Hssane and A. Guezzaz, Chouaib Doukkali University, Morocco.
	«Binary Segmentation of Microscopic Bacterial Images based on Convolutional Neural Networks (CNNs)», A. El Hatimy, S. Safi and A. Boumezzough, LIMATI Laboratory, FPBM, USMS, Morocco.
	«A NIDS based on a Genetic Algorithm and ensemble learning for IIoT Edge Computing», M. Mohy-Eddine, S. Benkirane and A. Guezzaz, Higher School of Technology, Cadi Ayyad University, Morocco.
	«Contribution to the Coverage Optimization in Wireless Sensor Networks», A. Baali, H. Ouchitachen and A. Farchane, LIMATI Laboratory, FPBM, USMS, Morocco.
	«An Enhanced Intrusion Detection Approach For Cloud Environments», H. Attou, A. Guezzaz and S. Benkirane, Higher School of Technology, Cadi Ayyad University, Morocco.
	«Online learning on e-learning platforms during and after COVID-19 containment: perceptions of students at SMS University», R. Hamzaoui, M. Boutalline, H. Faouzi and B. Boukhalene, LIMATI Laboratory, FPBM, USMS, Morocco.
	«Etude analytique et numérique de la convection mixte dans une cavité verticale», S. Ziane, M. Lamsaadi, H. El Harfi and M. Rahmoun, Laboratoire de Recherche en Physique et Sciences de l'Ingénieur, FPBM, USMS, Morocco.

	Session 6 - (Posters+Workshops)- Session Chairs Prof. M. Bassiri and Prof. A. Boumezzough
	«Hydrogen storage in solid materials using DFT studies», A. Benaddi, A. Hasnaoui, Laboratory of Materials Science, FPK, USMS, Morocco.
	«Efficiency of clay beads for heavy metals removal from aqueous environment», R. Bassam, M. Elalouani , J. Maissara , N. Jarmouni , Y. Rachdi, M. El Mahi Chbihi and S. Belaaouad, Laboratory of physical chemistry of materials, Faculty of Sciences Ben M'Sik, Hassan II University of Casablanca, Morocco.
	«Study of the inhibiting efficiency of the corrosion inhibitor (prop-2-yn-1-ol, methyloxirane) used in the chemical pickling of mild steels in HCl medium», A. Salim, S. Elmazouzi, Y. Naimi and S. Elharrari, Laboratoire chimie physique des matériaux, Faculté des Sciences Ben M'Sik Casablanca, Morocco.
	«Fenoprofen as a copper corrosion inhibitor in sulfuric acid solution », S. El Harrari, Casablanca, Morocco.



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	<p>«Performance of perovskite solar cell using Mg-doped ZnO as electron transport layer (ETL)», M. Archi, O. Bajjou, L. Moulaoui, A. Najim and K. Rahmani, LRPSI, FPBM, USMS, Morocco.</p>
	<p>«Caracterisation des Argiles Activees Thermiquement (Benslimane Maroc)», K. Azizi, M. Jabran, Y. Naimi and S. Belaaouad, Laboratory of Chemistry and Physics of Materials, Faculty of Sciences, Casablanca, Morocco.</p>

Session 7- Part I (Special Session)- Session Chair Prof. A. Malaoui	
14:30	<p>«Laser effect on unstable particle decay», M. Jakha, S. Mouslih, S. Taj and B. Manaut, RTTPM, FPBM, USMS, Morocco.</p>
14:45	<p>«Adsorption and photocatalytic reduction investigation of methylene blue on TiO₂-bentonite surface in aqueous solution», Y. GHERRABY, R. CHEROUAKI, S. Belaaouad and J. NAJA, Laboratory of Chemistry-Physics of Materials, Faculty of Sciences Ben M'Sik, University Hassan II of Casablanca, Morocco.</p>
15:00	<p>«Quantum size effect in Cadmium Selenium quantum dots», N. Jarmouni, M. Tomaiuolo, A. Gabbani, F. Pineider, R. Bassam, S. Belaaouad and S. Benmokhtar, Laboratory of Physical Chemistry of Materials, University Hassan II, Casablanca, Morocco</p>
15:15	<p>«Laser-Assisted High Energy Process», M. Ouhammou, M. Ouali, S. Taj and B. Manaut, Laboratory of Research in Physics and Engineering Sciences, FPBM, USMS, Morocco.</p>
15:30	<p>«Etude de l'effet de la direction du champ laser sur le processus de la désintégration du pion», S. Mouslih, M. Jakha, S. El Asri, S. Taj, B. Manaut, and S. El Arbi, FPBM, USMS, Morocco.</p>
15:45	<p>«Cubic PbCeO₃ perovskite oxide: A compound with striking electronic, thermoelectric and optical properties explored using DFT studies», M. Agouri, A. Awqdim, A. Abbassi, S. Taj, B. Manaut and M. Driouich, Laboratory of Research in Physics and Engineering Sciences, FPBM, USMS, Morocco.</p>
16:00	<p>«Les catalyseurs ORR en metaux non précieux pour l'application des piles à combustible H₂/O₂», H. Achakour, A. Antar and Y. Naimi, LCPM, Faculté des Sciences Ben M'Sik, Morocco.</p>

Session 7 - Part II (Special Session)- Session Chair Prof. Y. Naimi	
14:30	<p>«Effect of Semiconductor Geometric Parameters on Thermoelectric Generator Properties: Iterative Computational Study», L. Ouhmad and A. Malaoui, FPBM, USMS, Morocco.</p>
14:45	<p>«Study and Simulation of a Thermoelectric Generator Feeding Intelligent Agriculture Systems», L. Ouhmad and A. Malaoui, FPBM, USMS, Morocco.</p>
15:00	<p>«First-principles calculations of the structural, electronic, magnetic, thermodynamic and optical properties of the cubic Sr_{1-x}Mn_xTe ternary alloys», Y. Chaib, S. Belaaouad, S. Benmokhtar and M. Moutaabid, Université Hassan 2, Casablanca, Morocco.</p>



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15:15	«Amélioration de la qualité des signaux électriques injectés au réseau électrique», J. Khyat, N. Taifi and A. Malaoui, LRPSI, FPBM, USMS, Morocco.
15:30	«Evidence based solar energy virtual learning: Evaluating students experimentation using BigBlueButton», A. Moulay Taj and A. Malaoui, FPBM, USMS, Morocco.
15:45	«Conception d'une commande MPPT basé sur l'algorithme d'optimisation des loups gris en combinaison avec le filtre de KALMAN», I. Belaaalia, N. Taifi and A. Malaoui, LRPSI, FPBM, USMS, Morocco.
16:00	«Elaboration d'une cellule photovoltaïque organique à couche photo-active de polyaniline et des nanotubes de carbone», F. Saouti, S. Hamham, S. Elmazouzi, H. Mabrak, S. Belaaouad and Y. Naimi, Laboratoire Chimie Physique des Matériaux, Faculté des Sciences Ben M'Sik, Casablanca, Morocco.

	Session 8 - (Posters+Workshops)- Session Chairs Prof. M. Bouzid and Prof. M. Bassiri
	«Etude de quelques propriétés mécaniques du Béton Autoplacant», M. Kajja, H. Bita, N. Taifi and A. Malaoui, FPBM, USMS, Morocco.
	«Comparative study of water electrolysis technologies», H. Mabrak, S. Elmazouzi, F. Saouti, D. Takky, and Y. Naimi, Laboratory of physical chemistry of materials, Faculty of Sciences Ben M'Sik, Hassan II University of Casablanca, Morocco.
	«Materials used in extrusion based 3d concrete printing», A. Najm-Eddine, FPBM, USMS, Morocco.
	«Effect of Electrode Modification Substrates on Fuel Cell Microbial Performance: Review», S. Elmazouzi, H. Mabrak, S. Ayoub, F. Saouti, I. Zerdani and Y. Naimi, Laboratoire Chimie Physique Des Matériaux (LCPM), Faculté des Sciences Ben M'Sik, Casablanca, Morocco.
	«Theoretical investigation of structural, optoelectronic, elastic and thermoelectric properties of halide cubic perovskite CsInZrX ₆ (X = Cl, Br and I)», A. Harbi, Y. naimi, M. Tace, M. Moutaabbid, Laboratory of Chemistry and Physics of Materials LCPM, Faculty of Sciences, Department of Chemistry, Casablanca, Morocco
	«Évaluation des risques de sécurité dans réseau IOT et application dans smart Agriculture », M. Bouzidi, B. Boukhalene and S. Safi, LIMATI Laboratory, FPBM, USMS, Morocco.
	« Charged Higgs pair production inside an external field in Inert Higgs Doublet Model (IHDM) », M. Ouali, M. Ouhammou, S. Taj, R. Benbrik, and B. Manaut, RTTPM Team, FPBM, USMS, Morocco.

	Session 9 - (Posters+Workshops)- Session Chairs: Prof. S. Belaaoud and Prof. M. Lamssadi
	«Etude théorique de la diffusion élastique d'un neutrino muonique par un électron en présence d'un champ laser intense», S. El Asri, S. Mouslih, M. Jakha, S. Taj and B. Manaut, FPBM, USMS, Morocco.
	«First principle calculation of thermoelectrical behavior of Simple Perovskite SrGeO ₃ », A. Waqdim, A. Abbassi, M. Agouri, B. Manaut, S. Taj, M. El Idrissi, A. El Haji and S. Bennajare, FSTBM, USMS, Morocco.



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	<p>«Numerical simulation of InAs/GaAs quantum dots solar cells», A. Hmairrou, E. Chahid, S. Belaaouad, M. Azza and A. Malaoui, Laboratory of Chemistry-Physics of Materials, Faculty of Sciences Ben M'Sik, University Hassan II of Casablanca, Morocco.</p>
	<p>«Evaluation of mechanical and chemical pretreatments in the anaerobic degradation of organic matter of mixture of fruit and vegetable waste and mowed lawn waste», S. Rhandouriate, Y. Naimi, M. Tahiri and M. Saghir, Laboratoire Physico-Chimie des Matériaux, Faculté des Sciences Ben M'Sik, Casablanca, Morocco.</p> <p>«Charged Higgs pair production inside an external field in Inert Higgs Doublet Model (IHDM) »M. Ouali, M. Ouhammou, S. Taj, R. Benbrik, and B. Manaut, Sultan Moulay Slimane University, Polydisciplinary Faculty, Research Team in Theoretical Physics and Materials, Beni Mellal, Morocco.</p>

SYMPORIUM COMMITTEE

HONORARRY COMMITTEE

- ❖ Professor **Nabil HMINA**, *President of Sultan Moulay Slimane University*
- ❖ Professor **Benachir EL HADDADI**, *Dean of Polydisciplinary Faculty-the Beni Mellal*
- ❖ Professor **Belaid BOUIKHALENE**, *Director of the LIMATI laboratory*

GENERAL CHAIR

- ❖ Pr. **Said SAFI** (Coordinator and general Chair), *Sultan Moulay Slimane University*

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KEYNOTES



Biographie : Dr. Mohamed KAYYALI Scientist awarded by UK royal science council, former researcher at University of California UCSB at image processing labs, PhD from WCU, innovation management certified from Harvard Business School, chartered fellow in the UK, he published many conferences papers, authors of 5 indexed books, entrepreneur and IEEE industrial officer, UN and EU Int. speaker, CEO and co-founder of 4D Business Consulting, CEO at KSF Space Foundation USA, president at IFGICT International federation of ICT (ITU Partner), DNBC TV an IPTV and Time Business News co-founder..

Title : The IoS, Taking IoT Further With A.I. Via Small Satellites



Biography: Dr. Miloud FRIKEL is an Associate Professor at National Graduate School of Engineering and Research Center (ENSICAEN), and head of SATE's Department (Embedded Systems and Control), and he is the Deputy-Director of the Systems Engineering Lab of Normandy (LIS). He was with the R&T (Networks and Telecommunications) Department of the University of Caen (Normandy University). He received his Ph.D. degree from the Center of Mathematics and Scientific Computation CNRS URA 2053, France, in array signal processing. Dr. Frikel was with the Signal Processing Lab, Institut for Systems and Robotics, Institute Superior Tecnico, Lisbon, as a researcher in the field of wireless location and statistical array processing. And he worked in the Institute for Circuit and Signal Procesing of the Technical University of Munich, Germany. M. Frikel is member of German Foundation: Alexander von Humboldt Stiftung. His research interests span several areas, including statistical signal and array processing, cellular geolocation (wireless location), direction finding and source localization, blind channel identification for wireless communication systems and MC-CDMA systems.

Title : From Single-Sensor Signal Processing To Multi-Sensor Signal Processing



Biography: Dr. Belaid BOUIKHALENE obtained a Ph.D. degree in Mathematics in 2001 and a degree of Master in Telecommunication and Computer science in 2007 from the University of Ibn Tofel Kenitra, Morocco. He is currently a professor at University Sultan Moulay Slimane, Morocco. His research focuses on mathematics and applications, decision information systems, e-learning, pattern recognition and artificial intelligence.

Title : The Mathematical Concept Behind Deep Learning



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Biography: Dr. **Yassine SADQI** received his MSc and his PhD in Computer Science with a focus on computer security from Ibn Zohr University, Faculty of Sciences Agadir, Morocco, in 2012 and 2015, respectively. From 2017 to 2021, he was an Assistant Professor at Sultan Moulay Slimane University. As of February 2021, he became an Associate Professor. Dr. Sadqi's is the vice-president of the African Research Center of Information Technology & Cybersecurity. He is a Senior Member of the IEEE, ACM Professional Member, and a Member of OWASP. Dr. Sadqi has made contributions in the fields of Web security, authentication protocols, network security, and cybersecurity. He has published several peer reviewed research articles in international journals, book chapters, and conferences/workshops. Furthermore, He has served and continues to serve on executive and technical program committees and as a reviewer of numerous international conferences and journals.

Title : Cybersecurity Challenges And Issues In Modern Applications



Biography: Dr. **Youssef NAIMI** Born in 1966 in Casablanca. He obtained a bachelor's degree in experimental sciences in 1985 at the Moulay Abdellah high school in Casablanca. He obtained a license in Chemistry at the Faculty of Sciences of Ain Chock Casablanca in 1989. Then, he obtained a DEA in electrochemistry at the Pierre and Marie Curie University in Paris. In the same university, he obtained a doctorate (Ph.D.), thesis: Optimization study of the hydrogen electrode of fuel cells with proton exchange membrane. In 1996, he joined university teaching at the Faculty of Sciences Ben M'sik, Casablanca. He continued his research work on H₂/O₂ fuel cells in collaboration with the Cnam (Conservatoire National des Arts et Métiers) in Paris and defended a State doctorate in 2006. He coordinated several research projects, supervised twenty doctoral theses. He is the coordinator of the Specialized Master in Renewable Energies and Materials. He is head of the Chemistry Department at the Ben M'sik Faculty of Sciences, since January 2020.

Title : Storage Of Renewable Energies, Role Of Hydrogen