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ESAI 21

The 2nd International Conference on Embedded Systems and Artificial Intelligence

ESAI'21

April 01-02, 2021

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ESAI 2021 provisional Program

Thursday, April 01, 2021	
08h15 - 09h:00	**Welcoming and Registration**
09h00 - 9h:30	**Opening Ceremony**
ZOOM Link:	**https://zoom.us/j/94375954078?pwd=dTRJOHlHSlhlQzRFczRuUkkwQmJLQT09**
09h30 - 10h30	**Keynote Talk 1 : Automated design of deep neural networks** **Prof. El-ghazali Talbi, University of Lille, France** **Moderator : Prof. Abdellatif EZZOUHAIRI**
10h30 – 13h00	**Oral Session ESAI 1 : Artificial intelligence** Chairs: **Prof. Nabil EL AKKAD, Prof. Mohammed BERRADA and Prof. Badraddine AGHOUTANE** **Oral Session ESAI 2 : Embedded systems and applications** Chairs: **Prof. Hassane MOUSTABCHIR, Prof. Jamal ZBITOU and Prof. Driss ACHEMLAL** **Oral Session ESAI 3 : Image and video processing** Chairs: **Prof. Khalid SATORI, Prof. Abderrahim SAAIDI and Prof. Mostafa EL MALLAHI** **Oral Session ESAI 4: Telecom & Network Technology** Chairs: **Prof. Bachir BENHALA, Prof. Said MAZER and Prof. Prof. Prof. Hakim EL FADILI**
13h00 - 15h00	**Break**
15h00 – 16h00	**Keynote Talk 2: Non-conventional computer arithmetic.** **Prof. Leonel Sousa, University of Lisbon, Portugal** Moderator : Prof. Hassan SATORI
ZOOM Link:	**https://zoom.us/j/94375954078?pwd=dTRJOHlHSlhlQzRFczRuUkkwQmJLQT09**
16h00– 18h30	**Oral Session ESAI 5 : Artificial intelligence** Chairs: **Prof. Khalid HADDOUCH, Prof. Mohamed LAZAAR and Prof. Karim EL MOUTAOUAKIL** **Oral Session ESAI 6 : Embedded systems and applications** Chairs: **Prof. Zakaria CHALH, Prof. Mohammed ALFIDI, Prof. Abdelmjid SAKA and Prof. Hicham HIHI** **Oral Session ESAI 7 : Image and video processing** Chairs: **Prof. Hamid TAIRI, Prof. Jamal RIFFI, Prof. Abdellatif EL ABDERRAHMANI and Prof. Mohammed Chakib SOSSE ALAOUI** **Oral Session ESAI 8: Data analysis and Serious games** Chairs: **Prof. Mohamed BENSLIMANE, Prof. Lahcen OUGHDIR and Prof. Ahmed ABERQI**

ESAI 2021 provisional Program

Friday, April 02, 2021	
ZOOM Link:	https://zoom.us/j/94375954078?pwd=dTRJOHlHSlhlQzRFczRuUkkwQmJLQT09
09h00 -10h00	**Keynote Talk 3: Network for the sky: Challenges and open problems** Prof. Amine Dhraief, University of Manouba, Tunisia. **Moderator : Prof. Jamal Zbitou**
10h00 – 12h30	**Oral Session ESAI 9 : Natural language processing** Chairs: Prof. El Habib NFAOUI, Prof. Adil JEGHAL, Prof. Fadoua ATAA ALLAH and Prof. Youssouf EL ALLIOUI **Oral Session ESAI 10: : Security and Wireless Network Technologies** Chairs: Prof. Abdellatif EZZOUHAIRI, Prof. Adil KENZI, Prof. Fadoua YAKINE and Prof. Afafe ANNICH **Oral Session ESAI 11: Renewable Energies** Chairs: Prof. Souad EL KHATTABI , Prof. Saad MOTAHHIR and Prof. Mohammed ZOUITEN **Oral Session ESAI 12 : Embedded systems and applications** Chairs: Prof. Mohammed OUDGHIRI BENTAIE, Prof. El mehdi MELLOULI, Prof. Badre BOUSSOUFI and Prof. Abdeslam EL AKKAD
12h30 - 15h	**Break**
15h00 - 16h00	**Keynote Talk 4 : Recent trends in fuzzy modeling and decision making applications in real time world** Prof. Sunny Joseph Kalayathankal, APJ Abdul Kalam Technological University, Thrissur, Kerala India **Moderator : Prof. El Habib NFAOUI** **Keynote Talk 5: The 3D reconstruction and its evolution in the last decades.** Prof. Khalid Satori, Sidi Mohamed ben Abdellah University, Fez, Morocco **Moderator : Prof. Nabil EL AKKAD**
ZOOM Link:	https://zoom.us/j/94375954078?pwd=dTRJOHlHSlhlQzRFczRuUkkwQmJLQT09
16h00– 18h30	**Oral Session ESAI 13 : Artificial intelligence** Chairs: Prof. Jaouad BOUMHIDI, Prof. Younes LAKHRISSI and Prof. Chakir LOQMAN **Oral Session ESAI 14 : Speech & Signal Analysis** Chairs: Prof. Hassan SATORI, Prof. Ali YAHYAOUI and Prof. Zouhair ABDELHAMID **Oral Session ESAI 15 : Fuzzy and Expert systems** Chairs: Prof. Abdelhak BOULAALAM, Prof. My Abdelouahed SABRI and Prof. Mohammed adnane MAHRAZ **Oral Session ESAI 16 : Artificial Intelligence and Embedded Systems** Chairs: Prof. Mhamed SAYYOURI, Prof. Jamila EL HAINI and Prof. Mostafa MERRAS
18h30 – 19h00	**Closing Ceremony**

Oral Session ESAI 1 : Artificial Intelligence 10h30 – 13h00, Thursday, April 01, 2021 **Chairs: Prof. Nabil EL AKKAD, Prof. Mohammed BERRADA and Prof. Badraddine AGHOUTANE**	
ZOOM Link:	https://zoom.us/j/94075569687?pwd=NU94ZkVKT2hFVk9qZHBwVGVyTlpEUT09
ID: 24	**Mohammed Kamel Benkaddour, Asma Gouamid and Abir Mameri** Human Age And Gender Classication using Convolutional Neural Network
ID: 35	**Youssef Boutazart, Hassan Satori, Anselme Affane, Mohamed Hamidi and Khalid Satori** Two-dimensional Moroccan dataset COVID-19 classification using K-Means and EM algorithm
ID: 41	**Abdellatif El Ouissari, Karim El Moutaouakil, Hicham Baizri, Mouna Cheggour and Saliha Chellak** An original version of support vector machine for unbalanced datasets to early detection and predict of diabetes.
ID: 53	**Khadija Yakoubi, Hassan Moustachir and Ahmed El Khalfi** Isogeometric analysis: solution to solve the problem of linear elasticity, for more precision.
ID: 120	**Yassine Akhiat, Mohamed Chahhou and Ahmed Zinedine** Reinforcement Learning based approach for Feature Selection
ID: 25	**Khalid Alafandy, Hicham Omara, Mohamed Lazaar, Osama Faragallah and Mohammed Al Achhab** A Survey of Using Machine Learning Techniques for Classifying Remote Sensing Images

Oral Session ESAI 2 : Embedded systems and applications 10h30 – 13h00, Thursday, April 01, 2021 **Chairs: : Prof. Hassane MOUSTABCHIR, Prof. Jamal ZBITOU and Prof. Driss ACHEMLAL**	
ZOOM Link	https://zoom.us/j/96093390709?pwd=aVBNUC91ZlM2MWZtTjdBVk5ic3Fodz09
ID: 37	**Manare Zerifi, Abdellatif Ezzouhairi and Abdelhak Boulaalam** SDN and NFV security approaches for IoT environments
ID: 52	**Majda Lakhal, Mohamed Benslimane, Mehdi Tmimi and Abdelali Ibriz** ARCHITECTURE OF A TELEMEDICINE SYSTEM FOR REMOTE MONITORING OF CORONAVIRUS PATIENTS
ID: 60	**Boutaina Elkinany, Mohammed Alfidi and Zakaria Chalh** LMI And PID+LQR For Stabilizing A Unicycle Robot
ID:98	**Achraf Daoui, Hicham Karmouni, Mhamed Sayyouri and Hassan Qjidaa** LabVIEW Implementation of Bio-signal Zero-Watermarking Using Tchebichef Moments
ID: 104	**Nouha Taifi** Cloud Computing Synchronization: Case of Late Emails' Social Impact
ID: 123	**Hamid El-Moumen, Nabil El Akchioui and Mohammed Hassani Zerrouk** About the reliability Analysis by Stochastic Petri net and Markovien model

Oral Session ESAI 3 : Image and Video Processing 10h30 – 13h00, Thursday, April 01, 2021 **Chairs: Prof. Khalid SATORI, Prof. Abderrahim SAAIDI and Prof. Mostafa EL MALLAHI**	
ZOOM Link	https://zoom.us/j/95807900770?pwd=RmdoS3hUT2w1VlJJdWZPT211YzNldz09
ID: 8	**Mohammed Es-Sabry, Nabil El Akkad, Mostafa Merras, Abderrahim Saaidi and Khalid Satori** A New Image Encryption Algorithm Using Arnold Cat and Chebyshev Map
ID: 75	**Sara Chillali and Lahcen Oughdir** Image Encryption and Decryption Using Xilinx System Generator
ID: 119	**Mohamed Yamni, Hicham Karmouni, Mhamed Sayyouri and Hassan Qjidaa** New Invariant Meixner Moments for Non-Uniformly Scaled Images
ID: 144	**Laatra Yousfi, Lotfi Houam and Rachid Jennane** BSIF and Co-occurrence Matrices for Bone texture Characterization: Application to Osteoporosis Diagnosis
ID: 148	**Yahya M.A. Mohammed, Said El Garouani and Ismail Jellouli** Active Semantic Segmentation of Brain Tumor Regions from 2D MRI
ID: 202	**Aziz Sayouri, Mohammed Es-Sabry, Nabil El Akkad and Mostafa Merras** Encrypting Approach for Color Images Based on Combination of RSA Algorithm and XOR Operator
ID: 227	**Elazzaby Fouzia, Nabil El Akkad, Sabour Khalid and Kabbaj Samir** Image RGB Encryption Algorithm Based on a transformation by block and Pickover 3D

Oral Session ESAI 4: Telecom & Network Technology 10h30 – 13h00, Thursday, April 01, 2021 **Chairs: Prof. Bachir BENHALA, Prof. Said MAZER and Prof. Prof. Hakim EL FADILI**	
ZOOM Link	https://zoom.us/j/93130093415?pwd=UmM0MWt0ODVZbEp1ZjZqYmpUZUwvdz09
ID: 4	**Tounzi El Mehdi, Rouijaa Hicham, Zbitou Jamal, Latrach Mohammed and Lakhssassi Ahmed** A New design of a Millimeter Planar Antenna for 5G Applications
ID: 57	**Elyazid Flilihi, Mohammed Sriti, Driss Achemlal and El Haroui Mohamed** Convective heat transfer in porous materials : Semi-analytical simulation approach
ID: 67	**Souad Ajjaj, Souad El Houssaini, Mustapha Hain and Mohammed-Alamine El Houssaini** Taguchi and ANOVA methods for the performance analysis of VANET routing protocols
ID: 92	**Mohammed Bendaoued, Rachid Mandry, Abdelali Tajmouati, Otman Oulhaj, Larbi El Abdelaoui and Mohamed Latrach** Design of a Planar Multi-band Antennas Array based on Split Ring Resonator
ID: 97	**Jamal-Eddine Salhi, Tarik Zarrouk and Najim Salhi** Analysis of the surface state's influence on the thermohydraulic behavior of an incompressible fluid in convective laminar flow through a microchannel with corrugated surfaces
ID: 100	**Fatima Ouberri, Abdelali Tajmouati, Jamal Zbitou, Ahmed Errkik, Larbi El Abdellaoui and Mohamed Latrach** A Novel Circular Polarized Antenna Array for Wireless Power Transmission
ID: 101	**Asmae El Beqal, Bachir Benhala and Izeddine Zorkani** Genetic Algorithm for the Optimal Design of CMOS Voltage Controlled Oscillator
Oral Session ESAI 5 : Artificial Intelligence 16h00 – 18h30, Thursday, April 01, 2021 **Chairs: Prof. Khalid HADDOUCH, Prof. Prof. Mohamed LAZAAR and Prof. Karim EL MOUTAOUAKIL**	
ZOOM Link	https://zoom.us/j/94075569687?pwd=NU94ZkVKT2hFVk9qZHBwVGVyTlpEUT09
ID: 33	**Asmae Bouchareb, Abdelhak Boulaalam, HASSANI Abdelhadi and HAROUI Ahmed Amine** Sustainable Product Lifecycle Management through Internet of Things: An IoT-based Smart Parking System
ID: 86	**Narjiss Tilioua, Fatima Bennouna and Zakaria Chalh** Implementation of digital technologies to support automotive Products lifecycle management towards efficient collaboration
ID: 139	**Lotfi Houam, Abdallah Meraoumia, Meriem Mebarkia, Seddik Khemaissia and Rachid Jennane** Improved Osteoporosis Detection Accuracy Through Ensemble Classification
ID: 147	**Badreddine Benyacoub, Mohamed Barhdadi and Mohamed Ouzineb** A variable neighborhood search (VNS) algorithm model for credit scoring
ID: 195	**Ali El Kihel, El Mahdi Bouyahrouzi, Amar Bakdid, Yosra El Kihel, Hassan Gziri and Abdelmajid Saka** Bearing Fault Detection based on Artificial Neural Networks for the implementation of predictive maintenance
ID: 138	**Rokia Lamrani Alaoui and El Habib Nfaoui** Web attacks detection approach based on stacked generalization ensemble for LSTMs and word embeddings
Oral Session ESAI 6 : Embedded systems and applications 16h00 – 18h30, Thursday, April 01, 2021 **Chairs: Prof. Zakaria CHALH, Prof. Mohammed ALFIDI, Prof. Abdelmjid SAKA and Prof. Hicham HIHI**	
ZOOM Link	https://zoom.us/j/96093390709?pwd=aVBNUC91ZlM2MWZtTjdBVk5ic3Fodz09
ID: 31	**Hammadi Mezin, Ahmed Oussous and Ayoub Ait Lahcen** E-commerce recommender systems: A concise survey
ID: 109	**Youssef Jedidi, Abdelali Ibriz, Mohamed Benslimane, Mehdi Tmimi and Mounia Rahhali** Predicting student's performance using Data Mining Techniques from Big Data Technology in Cloud Computing
ID: 122	**Aissa Hali and Yamina Khlifi** A fine modeling of three types of photovoltaic modules using a combined analytical and numerical approach
ID: 183	**Hajar Chadli, Sara Chadli, Youssef Bikrat, Khalid Salmi, Abdelwahad Tahani and Amine Fakir** Real-time implementation of novel 5-level inverter controlled by digital SPWM technique
ID: 127	**Abderrahim Zannou, Abdelhak Boulaalam and El Habib Nfaoui** Data gathering from IoT networks
ID: 133	**Anass Slamti, Youness Mehdaoui, Driss Chenouni and Zakia Lakhliai** Design of High PSRR LDO Regulator for Internet of Things System on a Chip in 180-nm CMOS Technology

Oral Session ESAI 7: Image and Video Processing 16h00 – 18h30, Thursday, April 01, 2021 **Chairs: Prof. Hamid TAIRI, Prof. Jamal RIFFI, Prof. Abdellatif EL ABDERRAHMANI and Prof. Mohammed Chakib SOSSE ALAOUI**	
ZOOM Link	https://zoom.us/j/95807900770?pwd=RmdoS3hUT2w1VlJJdWZPT211YzNldz09
ID: 40 **ID: 66** **ID: 129** **ID: 135** **ID: 180** **ID: 188**	**Hamza Abdellahoum and Abdelmadjid Boukra** I-FCM: improving the Fuzzy c-means with a cooperative approach : Application in Image segmentation **Fatima Haddani, Anas El Maliki and Ahmed Lkouen** Random Microstructure Generation **Ilham Addarrazi, Hassan Satori and Khalid Satori** The Moroccan Arabic viseme-based visual speech recognition system using HMM **Haouam Mohamed Yassine, Meraoumia Abdallah, Laimeche Lakhdar and Bendib Issam** A Lightweight deep learning DCTNet for Facial Age Estimation **Mohamed Najoui, Mounir Bahtat, Abdessamad Klilou, Anas Hatim and Said Belkouch** Faster Implementation Scheme of Complex Matrix Multiplication for VLIW architecture **Zoheir Mentouri, Hakim Doghmane, Kaddour Gherfi, Rachid Zaghdoudi and Hocine Bourouba** Tool combination for the description of steel surface image and defect classification
Oral Session ESAI 8 : Data analysis and Serious games 16h00 – 18h30, Thursday, April 01, 2021 **Chairs: Prof. Mohamed BENSLIMANE, Prof. Lahcen OUGHDIR and Prof. Ahmed ABERQI**	
ZOOM Link	https://zoom.us/j/93130093415?pwd=UmM0MWt0ODVZbEp1ZjZqYmpUZUwvdz09
ID: 9 **ID: 39** **ID: 50** **ID: 87** **ID: 173** **ID: 197** **ID: 130**	**Khaled Lounnas, Mourad Abbas, Mohamed Lichouri, Hocine Teffahi, Mohamed Hamidi and Hassan Satori** A Transfer Learning Approach For Identifying Spoken Maghrebi Dialects **Manal Mouhajir, Abdellatif Ezzouhairi, Mohamed Baghrous and Soukayna Riffi Boualam** OBSdp: Ontology of Bike Sharing data privacy and their measures **Soufiane Montassir, Hassane Moustabchir and Ahmed El Khalfi** A NURBS Basis Function for Structural Analysis **Okba Kamal, Tmimi Mehdi, Ouazzani Kamar and Benslimane Mohamed** Artificial intelligence a major asset for Serious Games **Amina Bengag, Asmae Bengag and Mohamed El Boukhari** The Greedy Perimeter Stateless Routing protocol in VANETs: Review, enhancements and analysis **Adil Kenzi and Fadoua Yakine** A Model Driven Development Approach to Creating Adaptable REST Services **Abdelouahed Selmani, Bachir Benhala, Mohamed Guerbaoui, Mohamed El Khayat, Iliass Rkik, Abdelali Eddahhak and Abdeslam Lachhab** Proposal of low-cost design for portable autonomous artificial respirator with remote managing features
Oral Session ESAI 9 : Natural language processing 10h00 – 12h30, Friday, April 02, 2021 **Chairs: Prof. El Habib NFAOUI, Prof. Adil JEGHAL, Prof. Fadoua ATAA ALLAH and Prof. Youssouf EL ALLIOUI**	
ZOOM Link	https://zoom.us/j/94075569687?pwd=NU94ZkVKT2hFVk9qZHBwVGVyTlpEUT09
ID: 63 **ID: 79** **ID: 153** **ID: 201** **ID: 121**	**Otman Moussaoui, Yacine El Younoussi and Chaimae Azroumahli** Creating a Corpus of Moroccan comments by exploring Facebook **Saida Laaroussi, Si Lhoussain Aouragh and Abdellah Yousfi** Distant n-gram Language Model for Contextual Spelling Correction Applied to Arabic Language **Ibrahim Kaibi, El Habib Nfaoui, Hassan Satori and Benaissa Bellach** ArCovBERT: an Arabic Natural Language Understanding Model for Covid-19 Web Content Processing and Analysis **Awatif Karim, Jaouad Boumhidi, Loqman Chakir and Youssef Hami** Classification of text documents: A Survey **Hanane Grissette and El Habib Nfaoui** Embedded Techniques Comparison for Bio-Medical Sentiment Analysis: A Corpus-Based Case Study of COVID19 Drug-related Reviews

	Oral Session ESAI 10: Security and Wireless Network Technologies 10h00 – 12h30, Friday, April 02, 2021
	Chairs: **Prof. Abdellatif EZZOUHAIRI, Prof. Adil KENZI, Prof. Fadoua YAKINE and Prof. Afafe ANNICH**
ZOOM Link	https://zoom.us/j/96093390709?pwd=aVBNUC91ZlM2MWZtTjdBVk5ic3Fodz09
ID: 10	**Anselme Russel Affane Moundounga, Hassan Satori, Youssef Boutazart and Khalid Satori**
	An Energy Reducing Routing Model Based-on HMM in WSNs
ID: 29	**Rachid Fateh, Anouar Darif and Said Safi**
	Reproducing Kernel for Broadband Radio Access Network Channel Identification With Binary-Valued Outputs
ID: 46	**Latifa El Ahmar, Ahmed Errkik, Jamal Zbitou, Ilham Bouzida and Mohamed Latrach**
	A New Configuration of A Planar Passive UHF RFID Tag Antenna using Meander Technique
ID: 49	**Salaheddine Aourik, Ahmed Errkik and Jamal Zbitou**
	Design and Simulation of a Planar 4x4 Butler Matrix feeding a Serial Patch Antenna Arrays at 28 GHz
ID: 56	**Imad Badi, Hassan Badi, Mohamed Adoch, Abdelkhalek Bahri and Karim Elmoutaouakil**
	Supervised Identification and Equalization of Transmission Channel Using Reproducing Kernel Hilbert Space
ID: 62	**Mohamed El Haroui, Mohammed Sriti, Driss Achemlal and Elyazid Flilihi**
	Mixed Convective flow in a Saturated Porous Medium with Variable Permeability
ID: 113	**El Fezazi Youssef, Said Idrissi, El Fezazi Nabil and Tissir El Houssaine**
	Stabilization of discrete systems with time-varying delay: control of the Mach number dynamics in wind tunnels

	Oral Session ESAI 11: Renewable Energies 10h00 – 12h30, Friday, April 02, 2021
	Chairs: **Prof. Souad EL KHATTABI , Prof. Saad MOTAHHIR, and Prof. Mohammed ZOUITEN**
ZOOM Link	https://zoom.us/j/95807900770?pwd=RmdoS3hUT2w1VlJJdWZPT211YzNldz09
ID: 110	**Elmostafa Chetouani, Youssef Errami, Abdellatif Obbadi and Smail Sahnoun**
	Optimal Control of a DFIG Wind Turbine using Multi-Objective Particle Swarm Optimization Meta-Heuristic Algorithm
ID: 152	**Jamal-Eddine Salhi and Najim Salhi**
	Three-dimensional analysis of flow characteristics in a heat exchanger equipped with a perforated heat sink
ID: 210	**Hassna Salime, Badre Boussoufi and Youness El Mourabit**
	Fuzzy logic control for a permanent magnet synchronous generator used in wind energy conversion system
ID: 162	**Mohammed Karrouchi, Ismail Nasri, Hajar Snoussi, Kamal Kassmi and Abdelhafid Messaoudi**
	Realization and demonstration an attack technique on the vehicle's electrical system to control the dashboard computer via the CAN bus
ID: 177	**Mohamed Ribate, Rachid Mandry, Jamal Zbitou, Larbi El Abdellaoui and Mohamed Latrach**
	A 1.5 ~ 3.1 GHz Microstrip Broadband Power Amplifier for L and S Bands Applications
ID: 154	**Mounir Amraoui, Rachid Latif, Abdelhafid El Ouardi and Abdelouahed Tajer**
	Efficient GPU Implementation to Speed up Bio-Inspired Simultaneous Localization and Mapping of Mobile Robots

	Oral Session ESAI 12 : Embedded systems and applications 10h00 – 12h30, Friday, April 02, 2021
	Chairs: **Prof. Mohammed OUDGHIRI BENTAIE, Prof. El mehdi MELLOULI, Prof. Badre BOUSSOUFI and Prof. Abdeslam EL AKKAD**
ZOOM Link	https://zoom.us/j/93130093415?pwd=UmM0MWt0ODVZbEp1ZjZqYmpUZUwvdz09
ID: 159	**Hamdaoui Mohammed, Alsharahi Gamil, Rochdi Majid and Faize Ahmed**
	Ground-penetrating radar modeling and application for detection and location of rebar in concrete
ID: 203	**Hanae Chaaouan, Mohamed Bouhadda, Rachid El Alami, Abdelouahed Essahlaoui and Youness Mehdaoui**
	Machine Learning Algorithms for Early and Accurate Diabetic Detection
ID: 209	**Iliass El Mrabti, Abdelhamid Touache, Abdelhadi El Hakimi and Abderrahim Chamat**
	Using artificial neural networks to predict springback in deep drawing process
ID: 214	**Ali Abarkan, Abderrahim Saaidi and Majid Benyakhlef**
	Educational-fun method for learning a programming language
ID: 215	**Youssef Admi**
	Gap Spacing Effect Between a Cylinder and Two partitions on Wake Structure and Drag Force
ID: 226	**Badreddine Lahfaoui**
	Digital Control of Wind Turbine Systems Without Disturbance by Using a DSPACE Card

	Oral Session ESAI 13 : Artificial intelligence 16h00 – 18h30, Friday, April 02, 2021 **Chairs: Prof. Jaouad BOUMHIDI, Prof. Younes LAKHRISSI and Prof. Chakir LOQMAN**
ZOOM Link	https://zoom.us/j/94075569687?pwd=NU94ZkVKT2hFVk9qZHBwVGVyTlpEUT09
ID: 47	**Monir Ech-Chouyyekh, Mohamed Lazaar and Hicham Omara** Content-based filtering recommendation systems for scientific articles using SOM and k-means
ID: 48	**Safae Belamfedel Alaoui, Hassan Chafik and Mohamed Berrada** Land cover and land use classification: A comparison between random forest and k-means
ID: 55	**Sabrine Ennaji, Khalid Haddouch and Nabil El Akkad** An Analytical Performance Evaluation of Machine Learning Classifiers for Network Intrusion Detection System
ID: 150	**Nessrine Moumen, Abdellatif Ezzouhairi and Khalid Haddouch** Towards a new approach of intrusion detection system based on machine learning algorithms
ID: 167	**Hamza Touil, Nabil El Akkad and Khalid Satori** Enhance data integrity security in communication-based on the SHA-1 reconstruction.
ID: 176	**Ismail Nasri, Mohammed Karrouchi, Hajar Snoussi, Kamal Kassmi and Abdelhafid Messaoudi** Safety Embedded System for Accident Prevention Based on Artificial Intelligence Techniques

	Oral Session ESAI 14 : Speech & Signal Analysis 16h00 – 18h30, Friday, April 02, 2021 **Chairs: Prof. Hassan SATORI, Prof. ALI YAHYAOUI and Prof. Zouhair ABDELHAMID**
ZOOM Link	https://zoom.us/j/96093390709?pwd=aVBNUC91ZlM2MWZtTjdBVk5ic3Fodz09
ID: 45	**Nouhaila Bensalah, Ayad Habib, Abdellah Adib and Abdelhamid Ibn El Farouk** Improving Arabic to English Machine Translation
ID: 17	**Ezzine Abderrahim, Hassan Satori and Mohamed Hamidi** Automatic Speech Recognition for Mixed Amazigh and Darija Moroccan Dialects
ID: 15	**Ezzine Abderrahim, Mohamed Hamidi and Hassan Satori** Moroccan Darija Connected words Speech Recognition System
ID: 171	**Mohamed Sraitih and Younes Jabrane** An overview on signal processing methods for ECG Denoising
ID: 12	**Mohamed Hamidi, Hassan Satori, Ouissam Zealouk, Khaled Lounnas, Mourad Abbas, Mohamed Lichouri and Hocine Teffahi** Mixed ASR System for Amazigh and Arabic Under-Resourced Dialects in Maghreb Region
ID: 18	**Khaoula El Manaa, Hassan Satori and Mohamed Hamidi** Moroccan Arabic Voice Commands for Drones Control System

	Oral Session ESAI 15 : Fuzzy and Expert systems 16h00 – 18h30, Friday, April 02, 2021 **Chairs: Prof. Abdelhak BOULAALAM, Prof. My Abdelouahed SABRI and Prof. Mohammed adnane MAHRAZ**
ZOOM Link	https://zoom.us/j/95807900770?pwd=RmdoS3hUT2w1VlJJdWZPT211YzNldz09
ID: 91	**Lahcen Ouboubker, Jawad Lamterkati, Mohamed Khafallah and Aziz El Afia** IP Fuzzy Self Tuning Controller Based on Direct Torque Control for Improved Speed Control of Induction Machine
ID: 114	**Soukayna Riffi Boualam and Abdellatif Ezzouhairi** The utility of combining link and node metrics using fuzzy logic
ID: 208	**Mohammed Benzaouia, Bekkay Hajji, Anne-Megan Dubois, Adel Mellit and Rabhi Abdelhamid** An intelligent irrigation system based on fuzzy logic con-trol: A case study for Moroccan oriental climate region
ID: 102	**Irfan Syamsuddin and Dekar Urumsah** A Fuzzy Analytic Hierarchy Process (FAHP) Methodology to Open Source Cloud Data Storage Selection
ID: 140	**Abdelilah Et-Taleby, Mohamed Benslimane, Mohammed Boussetta and Kaoutar Kouryani** Photovoltaic Faults Detection and Classification Based on K-means and Fuzzy Logic Algorithms
ID: 174	**Mohammed Merhraoui and Nabil Elakkad** Extraction and analysis of consumer opinions on the web for decision-making: Application to tourism

Oral Session ESAI 16 : Artificial Intelligence and Embedded Systems 16h00 – 18h30, Friday, April 02, 2021 Chairs: Prof. Mhamed SAYYOURI, Prof. Jamila EL HAINI and Prof. Mostafa MERRAS	
ZOOM Link	https://zoom.us/j/93130093415?pwd=UmM0MWt0ODVZbEp1ZjZqYmpUZUwvdz09
ID: 94	**Jamal-Eddine Salhi, Tarik Zarrouk, Seyed Soheil Mousavi Ajarostaghi and Najim Salhi** Numerical Evaluation the Impact of the Inserts Shape on Thermo-Flow Behavior in a Heat Exchanger
ID: 181	**Houda Bouyarmane, Mehdi El Amine and Mohammed Sallaou** Taking into Account Behavior Models Accuracy on the Product Environmental Performance
ID: 191	**Hayat El Asri, Laila Benhlima and Abderrahim Agnaou** From Paper-based to Electronic Procurement: The Role of Artificial Intelligence
ID: 206	**Mohamed Baghrous, Abdellatif Ezzouhairi, Nabil Benamar, Manal Mouhajir and Soukayna Riffi Boualam** Deploying Fog Computing in Smart Farming
ID: 193	**Abdeslam Fakchich, Mohamed Bouhadda, Rachid El Alami, Abdelaouahed Essahlaoui and Youness Mehdaoui** Optical Wireless Communication using BPSK Modulation over Turbulence Channel with Fog Attenuation.
ID: 228	**Nadia Berrahou, Abderrahim Mesbah, Abdelmajid El Alami, Zouhir Lakhili and Hassan Qjidaa** Charlier Moments for Reducing the Computational Complexity and Improving Image Classification of Deep Convolutional Neural Networks

A Fuzzy Analytic Hierarchy Process (FAHP) Methodology to Open Source Cloud Data Storage Selection

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Abstract. This paper aims to tackle to problem of selecting the most appropriate open source data storage based on cloud technology among many available options. Data storage based on cloud technology is currently required to deal with a continuous demand of electronic learning services at the university in particular during covid 19. E-learning data center is proposed to overcome the issue of storing daily digital data from various e-learning courses. The study proposes a decision making model based on Fuzzy Analytic Hierarchy Process (FAHP) in choosing the best open source cloud data storage for establishing e-learning data center. There are many perspectives to be compromised during the selection process and all pairwise comparison met maximum inconsistecy rate allowed of 0.1. It is finally concluded that OwnCloud is the suitable open source solution for solving the given problem.

Keywords: Cloud Computing, Decision Making, Fuzzy AHP, Open Source, Cloud Data Storage.

1 Introduction

The role and benefits of e-learning have become increasingly important lately during the Covid 19 pandemic. Since all lectures are required online, the number of courses presented using listening has increased sharply in addition to the amount of data generated by students online has increased rapidly [1].

Therefore, the capacity of the e-learning media storage service somewhat fails to handle the significant increase in the amount of data generated by students through this massive online learning. Therefore, there is a strong need to establish a new e-learning data center [2].

Cloud computing adoptions on e-learning have been found in many countries. With cloud computing, e-learning could be completely centralized, which in turn reduces the expense of network management and makes the administrator much easier than before.

In particular, the most critical reason to implement cloud infrastructure in favor of e-learning is the economic point of view, as using cloud technologies can dramatically minimize the expense of network creation and maintenance relative to the existing client server model [2].

Considering the advantages of cloud computing, we aim to improve the capacity of current e-learning infrastructure by adopting cloud data storage based developed by open source community.

Actually, there are several existing open source solutions in this regards that should be chosen properly before implementing any of them. To deal with the given problem, this paper proposes a fuzzy analytic hierarchy process (FAHP) approach to deal with the issue on how to choose among many open source cloud storage for developing e-learning data center with low cost in mind.

The paper is structured within five sections. Section 2 presents theoretical concepts about new cloud technology and open source solution for cloud storage. Next, methodology being used is described in section 3. Details of analysis and results are found in the next section. Finally, section 5 concludes the findings of this research.

2   Literature Review

Cloud storage refers to the storage of data using cloud computing technologies. Due to its four unique characteristics, currently cloud computing commonly applied in many organizations, such as government, universities and business.

On demand aspect is the first characteristic of cloud computing. Anytime more CPU, storage or network demanded, users automatically will obtained such services without direct allocation by the service provider [3].

Second characteristic is resource pooling that enables users to obtain combination of various cloud resources although they have different requirements in simple way [3][4].

The third one namely rapid elasticity is the uniqueness of cloud computing that

enable users to scale up services or scale down according to their needs.

The final aspect of cloud computing is known as calculated services. This helps cloud providers to know exactly how many programs or facilities are used by individual users or shared by multiple users [5].

Cloud computing also unique in terms of service model it applies. Three service model known as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS)

In addition, fundamental cloud computing is also unique from its deployment model. Basically, there are three types of cloud computing model, Public, Private and Hybrid.

Cloud storage system as addressed in this study specifically deals with deployment model. Cloud storage is a combination of IaaS and SaaS. It is considered as cloud infrastructure, and SaaS as it relies on particular applications to make users able to store their digital data on the cloud [6].

Currently, cloud storage solution might be found as both open and closed source basis. Considering low cost in mind, we only discuss open source in this review, since this is the key focus to be mentioned. Three open source cloud storage tools are OwnCloud, Seafile, and Cozy. The way to properly choose these open source cloud storage will be approached using Fuzzy Analytic Hierarchy Process (FAHP) methodology mentioned below.

3   Methodology

As the study falls into multi criteria decision making problem, Analytic Hierarchy Method (AHP) in combination with Fuzzy Set Theory is implemented. AHP is the most common MCDM methodology used in academic and industry case study [12][14] to address problems containing various points of view, different criteria that often clash with each other, with a variety of alternatives to be preferred or selected[12].

The AHP based hierarchy for the given problem is presented in figure 1, considering five aspects namely response time, accuracy, stability, security, and community support.

In many studies, AHP has been widely applied in many success practical cases that involving multiple aspects, point of view both qualitative and quantitative means [12]. According to Saaty [12] AHP is applied within the following steps:

- Establish the objective that needs to be addressed.
- Develop a hierarchy of decision-making elements.
  In the simplest, it consists of three layers, the objective or sometimes called goal, then the point of view and finally the alternatives.
- Perform pair-wise comparison for all layers of requirements and alternatives.
- Calculate the degree of accuracy level to ensure that decisions are consistent.
- Calculate the proportional weights of the components of the judgment.
- Integrate all hierarchical weights to get the final rank from the highest to the lowest ones..

In addition to advancing AHP [12], Fuzzy set theory which is based on the rationality of ambiguity due to fuzziness or ambiguity usually implemented in integrative way [14].

In the field of Multi Criteria Decision Making, fuzzy set theory has given a significant contribution by accepting uncertainty and inconsistent judgment as a nature of human decision making [13][14].

Fuzzy set is determined by a membership function whose membership is defined by Lower, Medium and Upper numbers. The membership function of M=(l,m,u) is given by

$$\mu(x) = \begin{cases} \dfrac{x-l}{m-l} & if\ l \le x \le m \\ \dfrac{u-x}{u-m} & if\ m \le x \le u \\ 0 & if\ \ x < l\ or\ x > u \end{cases}$$

$$.......(1)$$

These fuzzy numbers may be calculated by means of a formula, either by using them explicitly on the basis of the decision-maker's interpretation or by taking them from linguistic variables on a verbal scale.
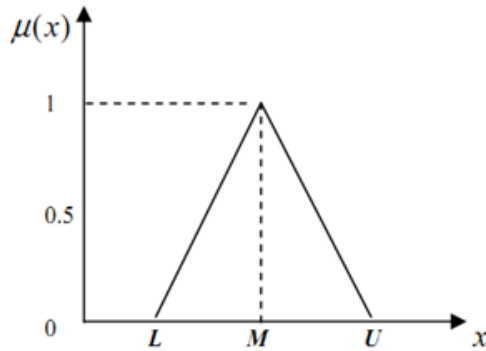
Fig. 1. Triangular fuzzy numbers

Table 1 shows the linguistic variables and their associated fuzzy scales as well as reciprocal scales which will be used in the calculation processes using fuzzy set theory in conjunction with the Analytic Hierarchy Process.

Table 1. Fuzzy linguistics variable.

Linguistic Variable	Fuzzy Scale	Reciprocal Scale
Equally Important	(0.5,0.5,0.5)	(0.5, 0.5, 0.5)
Slightly Important	(0.55, 0.6, 0.65)	(0.35, 0.4, 0.45)
Important	(0.65, 0.7, 0.75)	(0.25, 0.3, 0.35)
Very Important	(0.75, 0.8, 0.85)	(0.15, 0.2, 0.25)
Absolutely Important	(0.85, 0.9, 0.9)	(0.1, 0.1, 0.15)

In terms of analysis stages, the same procedure of classical AHP steps is applied except the crisp numbers in which we use fuzzy numbers as represented in table 1.

4 Results And Discussion

In structuring decision hierarchy, we follow approach proposed by Wang [13]. He summarized several factors significantly contribute to the successful adoption of cloud computing technology, whether in the form of SaaS, IaaS or PaaS. Similar approach was adopted in this paper by developing a new Cloud Adopting System

for Decision Making of Open Source Cloud Storage.

Wang suggests five fundamental aspects to consider in the adoption of any cloud computing technology [13]. The aspects are response time, accuracy, stability, security, and community support. These aspects are carefully and properly considered in shaping the selection process of cloud based storage system. For further description on each of these aspects, readers may refer them in more details in [13].

Figure 2 clearly shows the decision hierarchy which is structured within three levels. The decision hierarchy is organized properly by following structure based on the Analytic Hierarchy Process. Then with the employment of the fuzzy triangular numbers, we could make the survey understandable by employing linguistic variables.
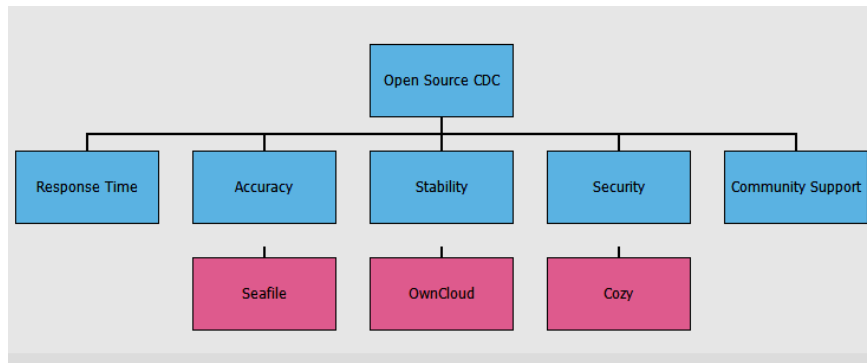

Fig. 2. The decision hierarchy

The first pairwise comparison is applied to the five aspects with respect to the goal. As can be seen in figure 3, weights for response time, accuracy, stability, security and community support are accounted for 0.178, 0.198, 0.178, 0.223 and 0.223 respectively. This clearly shows that the highest aspect to be considered is both security and community support.
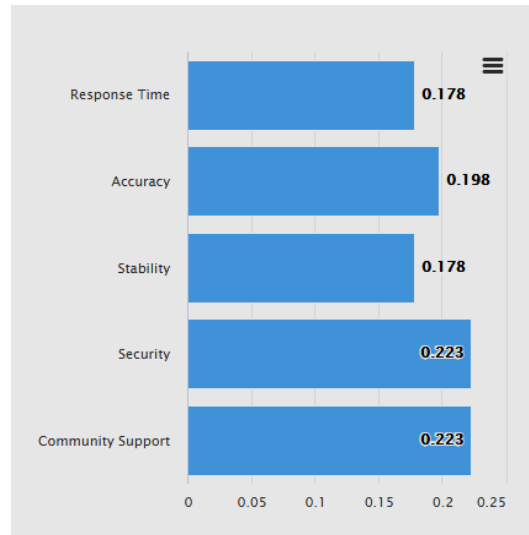
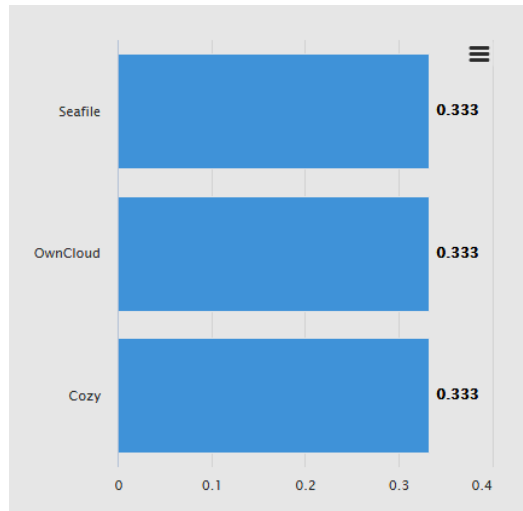**Fig. 3.** Priorities with respect to goal

Then the pairwise comparison is applied to the three alternatives with respect to each of the five aspects. Figure 4 shows the weights for Seafile, OwnCloud and Cozy with respect to response time are accounted for 0.345, 0.497 and 0.158 respectively. This clearly shows that OwnCloud is the best alternative from response time point of view.
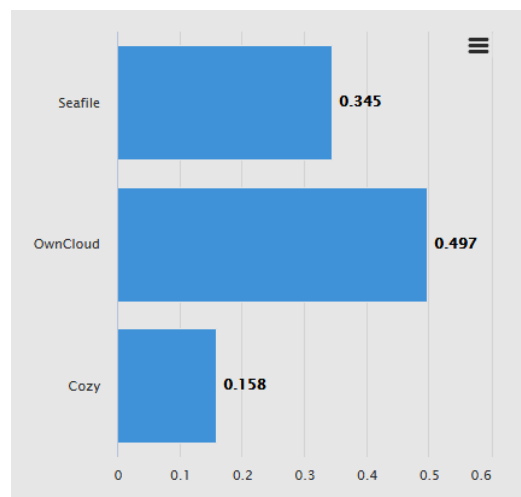

Fig. 4. Priorities with respect to Response Time

Next pairwise comparison is applied again to the three alternatives (Seafile, OwnCloud and Cozy) with respect to accuracy aspect. The results are the same for all three alternatives by 0.333. This clearly shows that Seafile, OwnCloud and Cozy are considered equal from accuracy point of view (see figure 5).
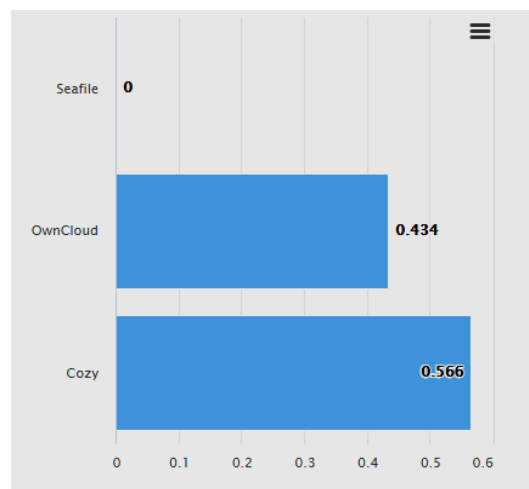

Fig. 5. Priorities with respect to Accuracy
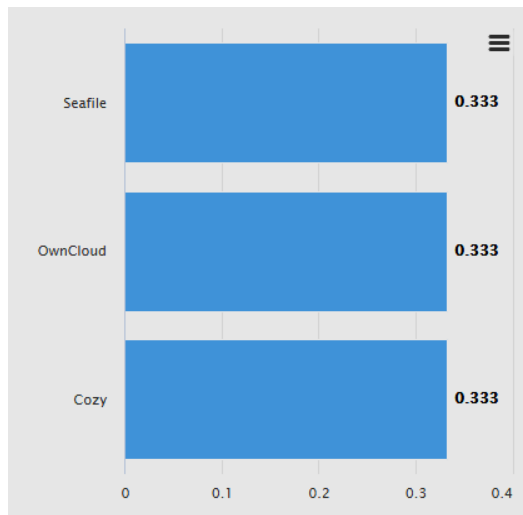
Fig. 6. Priorities with respect to Stability

The same results are presented in figure 6 where pairwise comparison is applied to Seafile, OwnCloud and Cozy as alternatives with respect to stability aspect in which all three alternatives has the same weight of 0.333. This means from stability point of view, Seafile, OwnCloud and Cozy are considered equal.

Figure 7 shows the results of pairwise comparison of Seafile, OwnCloud and Cozy with respect to security aspect. Cozy is selected as the highest weight of 0.566 followed by OwnCloud of 0.434 and Seafile of 0.

Fig. 7. Priorities with respect to Security

The last pairwise comparison of Seafile, OwnCloud and Cozy is applied with respect to the last aspect of community support. As depicted in figure 8, OwnCloud received significant weight of 0.958, while Cozy only 0.042 and again Seafile is 0.

Finally, the whole results are aggregated to obtain the final weight of all alternatives as described in table 1. It is clearly concluded that OwnCloud is chosen as the most suitable open source cloud data storage solution for the development of electronic learning data center based on cloud technology.
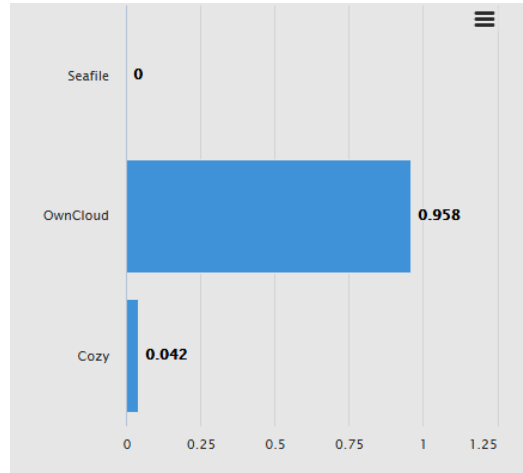
Fig. 8. Priorities with respect to Community Support

Table 2. Final result

Rank	Name	Weight
1	OwnCloud	0.524
2	Cozy	0.288
3	Seafile	0.186

It is finally found that the application of Fuzzy AHP method has chosen Own-Cloud as the most applicable one among others. The selection of OwnCloud is mainly because its large community supports from its users all around the world that has been existing earlier than other alternative open source cloud storages. Such community support is believed as effective source for in-house developer in dealing with improving features and facilities of OwnCloud.

In terms of security aspect, although OwnCloud weight is below Cozy since Cozy offers better security mechanisms, the limitation might be tackled by open source third party as suggested by OwnCloud community. As a result, OwnCloud still dominates other options in many aspects therefore it is chosen as the best one to be deployed in this study.

It is clearly showed that fuzzy AHP methodology is applicable to support the selection process and also human tackle vagueness in decision making process.

The novelty of our approach is unique in terms of methodology development and object being observed. Previous related studies found that similar problem focused on selection of cloud providers [15], service selection of cloud [16] or more recently cloud services selection in hybrid cloud [17] or based on different methodology such as market mechanism [18] particular consensus mechanism [19]. Hence, the application of Fuzzy AHP in selecting the best open source cloud storage is a new approach in the area.

5.   Conclusion

The issue of how to make selection among several candidates of open source storage to develop e-learning data center has been addressed in this study. Fuzzy AHP methodology is applied to support the selection process to accommodate vagueness in decision making process. The decision hierarchy consists of three layers (goal, in which the last layer represents the three candidate of open source cloud storage namely OwnCloud, Cozy and Seafile. Considering response time, accuracy, stability, security and community support (second layer of decision aspects), many the alternatives of open source cloud storage, Owncloud is finally selected as the most adequate solution for establishing e-learning data center.

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Appendix

Sample of Survey

Pairwaise Comparison Survey

A   With Respect to Goal

Select between two Aspects and also choose its level of importance

• ResponseTime	Equally Important • Slightly Important Important Very Important Absolutely Important	o Accuracy
o ResponseTime	Equally Important Slightly Important • Important Very Important Absolutely Important	• Stability
• ResponseTime	• Equally Important Slightly Important Important Very Important Absolutely Important	o Security
• ResponseTime	Equally Important Slightly Important Important • Very Important Absolutely Important	o CommunitySupport

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B   **With Respect to ResponseTime**

Select between two Alternatives and choose its level of importance

o Seafile	• Equally Important Slightly Important Important Very Important Absolutely Important	• OwnCloud
o Seafile	Equally Important • Slightly Important Important Very Important Absolutely Important	• Cozy
• OwnCloud	Equally Important Slightly Important • Important Very Important Absolutely Important	o Cozy