Mohcine Madkour

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Big Data Architectures, Machine Learning, and Deep Learning

Long experience in predictive modeling, statistical analysis, data visualization, and ontology engineering. Has successfully delivered projects in artificial intelligence, data integration, and feature engineering working in medicine, biomedical informatics, and engineering. Driven by the opportunity to apply data analytics and artificial intelligence to build new tools and organizational capabilities.

Professional Experience

- **Research Assistant Professor, School of Medicine**, University of Florida, Gainesville, FL **June 2017- Present**

Education and higher Training

- **Postdoctoral associate**, **School of Biomedical Informatics**, UTHealth, Houston, TX **May 2015-May 2017**
- **Postdoctoral fellow**, **Engineering Technology Department**, University of Houston, T **Nov 2013- March 2015**
- **Ph.D. in Computer Science, with Honors, University of Mohamed 5,** Morocco **2013**
- **M.S. in Web Technologies and Security, Télécom Bretagne,** France **2016**
- **M.S. in Computer Science, University of Ibn Zohr,** Morocco **2009**
- **B.S. in Applied Mathematics, University of Ibn Zohr,** Morocco **2006**

Technical Proficiencies

- **Language & Cloud -** Python, R, Java, C++, JavaScript, AWS System admin.
- **Data visualization –** ggplot2, Matplotlib, Seaborn, d3.js & Tableau
- **Machine Learning –** Scikit-learn, Pandas, NumPy, Tweepy, Weka, MATLAB, K-means, GAM, & Random Forest
- **Deep Learning** -Deep Reinforcement Learning, RNN, CNN, TensorFlow, Theano, Keras
- **Web Development -** Flask.py, Spring-MVC, PHP, JQuery.js, HTML, CSS, Pelican.py & Wordpress.
- **Databases -** MySQL, SQLServer, NoSql, Cassandra, CQL, Neo4J
- **Agile methodology -** Agile Scrum, Iterative Development

Machine-learning and Software Engineering Experience:

- **Preoperative Risk Prediction** - Developed and Validated of a Machine-learning Risk Algorithm for Major Complications After Surgery using Generalized Additive Model (GAM) with logistic link function.
- **Postoperative Mortality Prediction** - Developed and Validated of a random forests based classifier to predict the risk for death at 1, 3, 6, 12, and 24 months after surgery using 5-fold cross validation and bootstrap sampling.
- **Intelligent Perioperative system** - Delivered a platform that provides real-time risk scores prediction builds on the spark real-time complications risk scores prediction, Kafka based high through-output batched data streaming, and NoSQL based data storage.
- **HL7 data Integration** - Developed an HL7-compliant data integration hub for real-time risk prediction in Intraoperative using Mirth Connect healthcare interoperability engine.
- **MySurgeryRisk web application** - Developed an intuitive graphical web interface for real time surgery risk prediction interaction using LAMP (Linux, Apache, MySQL and PHP) stack, Apache HTTP server using Laravel 5.
- **Performance measurement** - Delivered study that assess model's discrimination using the AUC. Sensitivity, specificity, positive and negative predictive values, model calibration, and 99% CIs were calculated using optimal thresholds, Hosmer-Lemeshow statistic, and predictiveness curves.
- **Reinforcement learning for optimization of chiller central plant** – Applied Reinforcement learning algorithm and simulate control of virtual energy environments with collection of agents, buildings and chillers.
- **Eligibility Criteria Modeling** - Developed a model for Semantic Representation of Clinical Trial Eligibility Criteria for Large Scale Patient Screening using SPARQL Inferencing Notation (SPIN).
- **Narratives2Timeline** - Designed and developed a timeline and visual analytics tool based on OWL API and SMILE Exhibit framework for patients' records visualization and clinical events ordering and clustering. The developed

extraction model is based on min-conflicts and K-means algorithms that can find missing temporal events information and group events in predefined time-bins.

- **Temporal Event Ontology** - Developed of Temporal Event Ontology (TEO), designed for temporal information annotation in clinical narratives evaluated on EHR and VAERS Reports data.
- **Conceptual work product modeling** -Developed a SPARQL Inferencing Notation (SPIN) based model of Health IT Workflow for model checking of complex systems. The work was to SysML Object Management Group for the extension of the specification "Semantics of a Foundational Subset for Executable UML Models".
- **Context Aware Living Campus Ontology (CALC)** - Designed of an ontology to model the operational and physical processes of University of Houston Chiller Central Plant with focus on energy profiling.
- **PhD Thesis dissertation** - Developed a context-aware middleware that support uncertain information and handle user preferences for pervasive and multi-context servicing environments.
- **Master Thesis dissertation** - Designed and developed an evaluation of software reliability model
- **Senior Project** - Implemented morphological operators for image patterns discovering and classification

Synergistic Research Projects:

Integrating data, algorithms and clinical reasoning for surgical risk assessment- IDEALIST (R01 GM, A.Bihorac)
Apply computational methods to timely identify patients at the greatest risk of complications using readily available medical data in electronic health records. Preventive interventions to improve outcomes are then tailored to each patient's personal risk profile.

Predictive models for primary care patients (IRB Exempt, M. Madkour, Ryan James)
Build prediction models that help taking smart decisions using EHR collected in a primary care clinic. Working on real world event analysis application that predicts specific actionable primary care encounter events and detect soft patterns in data.

Modeling and Analyzing Clinical Care workflow for HIT Improvement (R01 HS, K.Butler, M.Madkour)
Created OWL based model that capture essential features and requirements of the Conceptual Work Product (CWP) and the multiple specifications required by a system's functions. We used the consistency checking of OWL reasoner engine along with model checking to validate the CWP of an IT healthcare systems.

Patient Medical History Representation, Extraction, and Inference from EHR Data (R01 LM, Cui Tao)
Develop tools for automatically harvesting temporal constraints of clinical events from EHR, using OWL based knowledge representation, normalization, extraction, and reasoning. Applications are : StoryTelling with unstructured text data, find missing temporal details, untangle and linearize temporal constraints of clinical events embedded in highly diverse large-scale EHR data, visual exploration of temporal events.

Smart Grid Education and Training Coalition UH Smart Campus (DoE, R. E. Cline, D Benhaddou)
Use a data-driven approach (AI / Machine learning) to estimate energy saving potential and monitor the demand response of energy at the University of Houston campus. Using Reinforcement learning technique, we optimized central plant operations, and therefore reduced energy consumption.

Teaching Experience

- Teaching Assistant, Adjunct Prof., Lecturer, Java, SQL, C, UML, University Mohamed V Morocco **2006-2012**
- Adjunct Prof., ELET - 2300 Introduction to C++ Programming, University of Houston, Main Campus **2013-2014**
- Teaching Assistant, HI 5304 - Advanced Database Concepts for Health Informatics, UTHealth, Houston **2014-2015**
- Teaching Assistant, BMI 6306 - Information and Knowledge Representation in Health Informatics, UTHealth, Houston **2015-2016**

Certifications / Awards / Services / Grant Submission

- Mirth Certified, NextGen, Irvine, CA, since January 2018
- Best paper Award in the 10th IEEE International Conference On Computer Systems And Applications
- Data Award for the project Smart House organized by BrightWork CoResearch
- Member of the organization team of the ICBO 2014 at Houston
- PC of the 3th IEEE International Conference on Computer Systems and Applications, AICCSA 2016.
- Linux , Apache, Shibboleth: Setup Shibboleth service provider (SP) in Apache server to perform Single Sign-on (SSO) for the UF GatorLink Authentication service.
- Active member in PASS, SQL Server Community

- PI, CTSI UFII: Development of a FHIR-compliant data integration hub for real-time risk prediction in Intraope period
- Co-I, Qatar-QNRF_2013: Smart Campus Energy Management System: a User Preference-Behavioral Approach
- Co-I, NSF_CPS: Synergy-2013: Smart Management of Interconnected Federated Microgrids: Big data approach.

Example Publications

Grant Report

[G01] K. A. Butler, M. **Madkour** et al. "Modeling and Analysis of Clinical Care for HIT Improvement", Final report, Agency for Healthcare Research and Quality, Grant Award Number: 4R01HS021233-04

Book Contribution

[B01] M. Madkour, M. Bakhouya, A. Maach, D. El Ghanami "An Approach for Context-Aware Service Selection Using QoS and User Preferences" In Maristella Matera, Gustavo Rossi "Trends in Mobile Web Information Systems" pp 110-119, Springer International Publishing.

Refereed Journal Papers

[J01] Azra Bihorac, T Baslanti, A Ebadi, A Motaei, **M Madkour**, et al "MySurgeryRisk: Development and Validation of a Machine-learning Risk Algorithm for Major Complications and Death After Surgery" Annals of surgery, 2018/4/6
[J02] **M. Madkour,** D. Benhaddou, C. Tao "Temporal data representation, normalization, extraction, and reasoning: A review from clinical domain" Computer methods and programs in biomedicine Volume 128, May 2016, Pages 52–68
[J03] **M Madkour,** D. El Ghanami, A. MAACH "QoS-Based Approach For Context- Aware Service Selection With Fuzzy Preferences Handling" International Journal of Computer Applications in Technology, Vol. 47, No 4 /2013, pp. 379-391
[J04] **M. Madkour,** A Maach, D. El Ghanami, A. HASBI "Context- Aware Service Adaptation: An Approach Based on Fuzzy Sets and Service Composition" Journal of Information Science and Engineering Vol. 29, No.1, ISSN: 1016-2364, pp. 1-16
[J05] **M. Madkour,** A Maach, D.El Ghanami, "Context-Aware Middleware For Services Retrieval And Adaptation" International Review on Computers and Software Vol. 7 N. 1 Print ISSN 1828-6003 Cd- om ISSN: 1828-6011
[J06] **M. Madkour,** A. Maach, D. El Ghanami, "An Ontology-Based Context Modeling For Vehicle Context-Aware Service" Journal of Theoretical and Applied Information Technology Vol. 34 No2 E-ISSN 1817-3195 ISSN 1992-8645
[J07] **M. Madkour**, D El Ghanami, A Maach "QoS-Based Approach For Context-Aware Service Selection" International Journal of Computational Linguistics Research, Volume: 3, Issue: 3 pp: 109-124
[J08] M. Madkour, A. Maach, "Intelligent Pervasive Middleware for Context-Aware Vehicle Services" Journal of Communications and computer Engineering VOL 2, NO 3 ISSN: 2090-6234

Selected Referred papers at Conferences

[C01] **M. Madkour,** J. Du, H. Song, C. Tao "A Representational Analysis of A Temporal Indeterminancy Display in Clinical Events" at The 1st International Workshop on Semantics-Powered Data Analytics (SEPDA 2016) in conjunction with the IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2016) to be held at Shenzhen, China on December 15, 2016
[C02] **M. Madkour**, J. Du, H.Song, C. Tao "Temporal clinical events clustering and visualization", Proceedings of the IEEE VIS 2016 Workshop on Temporal & Sequential Event Analysis.
[C03] **M Madkour,** D. Benhaddou, R. Cline, M. Buriello, N.Khalil "Living campus: Towards a Context-Aware Energy Efficient Campus using Weighted Case Based Reasoning" The 29th Artificial Intelligence Conference, January 25–30, 2015, Austin Texas, USA, (AAAI-15)
[C04] **M Madkour,** A Maach, D. El Ghanami "Policy driven adaptation of context-aware services with preferences supporting" in proceeding of the10th IEEE International Conference On Computer Systems And Applications(AICCSSA'13)
[C05] **M. Madkour**, A. Maach, D. El Ghanami, A. Hasbi "Context- Aware Service Retrieval In Uncertain Context" in Proceeding of IEEE International Conference on Multimedia Computing and Systems (ICMCS'12)
[C06] **M.Madkour,** A. Maach, D. El Ghanami, A.Hasbi "Fuzzy-Based Approach For Context-Aware Service Retrieval " in proceedings of IEEE Second international conference on Innovative Computing Technology (INTECH'12)
[C07] **M. Madkour,** A. Maach, D. El Ghanami, "Vehicle Context Aware Framework For Services Provisioning And Adapting" in proceeding of International Workshop on Information Technologies and Communication (Wotic'11)
[C08] **M. Madkour**, A. Maach, "Plateforme de localisation et de télédiagnostic des véhicules" in proceedings of Logistiqua'10