MIRPUR UNIVERSITY OF SCIENCE AND TECHNOLOGY (MUST)

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 ASSIGNMENT NO 1

 DATA MINING

**Admission Trend Analysis (Hospital)**

* **Background:**

One of the most important tasks in the Emergency Department (ED) is to promptly identify the patients who will benefit from hospital admission. Crowding within emergency departments (EDs) can have significant negative consequences for patients. Data relating to hospital admissions of very young children for wheezing illness have been conflicting. Interactions among several environmental, behavioral, social, and biological variables contribute to the epidemiology of infectious diseases (IDs) and have an impact on the healthcare system and hospitalizations. Machine Learning (ML) techniques show promise as diagnostic aids in healthcare.

* **Existing systems:**

Existing systems used to check.

* Heart rate.
* Pulse oximetry.
* Respiratory rate.
* Systolic blood pressure.
* Stratum analyses were performed by age, sex, region, and cause-specific categories.

All these predictors of ICU admission.

**Existing system working on following algorithms:**

Used five machine-learning methods to sequence and predict elective patients:

1. Logistic regression (LR).
2. Random forest (RF).
3. Gradient-boosting decision tree (GBDT).
4. Extreme gradient boosting (XGBoost) Logistic regression.
5. Random under sampling boosting algorithm.
* **Problem existing system:**

The huge amounts of data generated by healthcare transactions are too complex and voluminous to be processed and analyzed by traditional methods like Logistic regression and a decision tree provide less accuracy in results.

* Poor design of systems and processes.
* The system’s inability to respond to changing patient demographics and related requirements.
* A failure to assimilate the rapidly growing and increasingly complex science and technology base.
* Slow adoption of information technology innovations needed to provide care.
* Little accommodation of patients’ diverse demands and needs.
* Personnel shortages and poor working conditions.
* **Purposed solution:**

We propose a five-step approach for the

* Design.
* Suitability assessment.
* Optimization of an admission lounge.

The approach uses a case mix optimization method to select patients for the admission lounge, clinical ward, or for both. Also, it determines the required admission lounge and clinical ward capacities using an Erlangen loss model combined with a novel analytical model.

The approach is integrated into:

* A decision support system.
* Which helps hospitals to identify the suitability of the admission lounge concept.
* Optimize its configuration.
* Identify the potential bed reduction in the clinical ward.

**We investigated the following features seeking to investigate their performance in predicting hospital admission:**

* Serum levels of Urea
* Creatinine
* Lactate Dehydrogenase.
* Creatine kinase.
* C - reactive protein.
* Complete Blood Count with differential
* Activated Partial Thromboplastic Time.
* D Dimer.
* International Normalized Ratio.
* Age and gender.
* Triage disposition to ED unit and ambulance utilization.
* **Achievements:**

Large tertiary hospitals usually face long waiting lines; patients who want to receive hospitalization need to be screened in advance. The patient admission screening process involves a health-care professional ranking patients by analyzing registration information.

The main achievement of this tool include easy access, availability, yes/no result, and low cost. The clinical implications of our approach might facilitate a shift from traditional clinical decision-making to a more sophisticated model.

Machine learning algorithms in predicting the risk of admission from the ED. The GBM performed better (accuracy = 80.31%, AUC-ROC = 0.859).

As toward increasing knowledge and capacity of in the family emergency department discipline

**References:**

Predicting Intensive Care Unit admission among patients presenting to the emergency department using machine learning and natural language processing Marta Fernandes ,Rúben Mendes,Susana M. Vieira,Francisca Leite,Carlos Palos,

Alistair Johnson,Stan Finkelstein,Steven Horng,Leo Anthony Celi Published: March 3, 2020

Using machine-learning methods to support health-care professionals in making admission decisions [Li Luo](https://onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Luo%2C+Li),[Jialing Li](https://onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Li%2C+Jialing),[Chuang Liu](https://onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Liu%2C+Chuang),[Wenwu Shen](https://onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Shen%2C+Wenwu) First published: 07 April 2019

Using machine learning techniques to predict hospital admission at the emergency department [Georgios Feretzakis](https://arxiv.org/search/cs?searchtype=author&query=Feretzakis%2C+G), [George Karlis](https://arxiv.org/search/cs?searchtype=author&query=Karlis%2C+G), [Evangelos Loupelis](https://arxiv.org/search/cs?searchtype=author&query=Loupelis%2C+E), [Dimitris Kalles](https://arxiv.org/search/cs?searchtype=author&query=Kalles%2C+D), [Rea Chatzikyriakou](https://arxiv.org/search/cs?searchtype=author&query=Chatzikyriakou%2C+R), [Nikolaos Trakas](https://arxiv.org/search/cs?searchtype=author&query=Trakas%2C+N), [Eugenia Karakou](https://arxiv.org/search/cs?searchtype=author&query=Karakou%2C+E), [Aikaterini Sakagianni](https://arxiv.org/search/cs?searchtype=author&query=Sakagianni%2C+A), [Lazaros Tzelves](https://arxiv.org/search/cs?searchtype=author&query=Tzelves%2C+L), [Stavroula Petropoulou](https://arxiv.org/search/cs?searchtype=author&query=Petropoulou%2C+S), [Aikaterini Tika](https://arxiv.org/search/cs?searchtype=author&query=Tika%2C+A), [Ilias Dalainas](https://arxiv.org/search/cs?searchtype=author&query=Dalainas%2C+I), [Vasileios Kaldis](https://arxiv.org/search/cs?searchtype=author&query=Kaldis%2C+V) *[Submitted on 23 Jun 2021 (*[*v1*](https://arxiv.org/abs/2106.12921v1)*), last revised 28 Jun 2021 (this version, v2)]*

Predicting hospital admission at emergency department triage using machine learning

Woo Suk Hong, Adrian Daniel Haimovich,R. Andrew Taylor Published: July 20, 2018

Predicting hospital admission at the emergency department triage: A novel prediction model [Clare AllisonParkerMD](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[a](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[NanLiuPhD](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[bc](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[Stella XinziWuMD](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[b](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[YuzengShenMBBS](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[d](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[Sean Shao WeiLamPhD](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[bc](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[Marcus Eng HockOngMBBS, MPH](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21)[bd](https://www.sciencedirect.com/science/article/abs/pii/S073567571830891X%22%20%5Cl%20%22%21) [Volume 37, Issue 8](https://www.sciencedirect.com/science/journal/07356757/37/8), August 2019 Predicting emergency department admissions Justin Boyle[1](https://emj.bmj.com/content/29/5/358.short#aff-1), Melanie Jessup[2](https://emj.bmj.com/content/29/5/358.short#aff-2),[3](https://emj.bmj.com/content/29/5/358.short#aff-3),

Julia Crilly[3](https://emj.bmj.com/content/29/5/358.short#aff-3), David Green[3](https://emj.bmj.com/content/29/5/358.short#aff-3), James Lind[3](https://emj.bmj.com/content/29/5/358.short#aff-3), Marianne Wallis[2](https://emj.bmj.com/content/29/5/358.short#aff-2),[3](https://emj.bmj.com/content/29/5/358.short#aff-3), Peter Miller[4](https://emj.bmj.com/content/29/5/358.short#aff-4), Gerard Fitzgerald[5](https://emj.bmj.com/content/29/5/358.short#aff-5)

[Using data mining to predict hospital admissions from the emergency department](https://ieeexplore.ieee.org/abstract/document/8300528/)

[B Graham](https://scholar.google.com/citations?user=GaT0qyMAAAAJ&hl=en&oi=sra), [R Bond](https://scholar.google.com/citations?user=WN5qJ-EAAAAJ&hl=en&oi=sra), M Quinn, [M Mulvenna](https://scholar.google.com/citations?user=BAPrwN0AAAAJ&hl=en&oi=sra) - IEEE Access, 2018 - ieeexplore.ieee.org

[Prediction of emergency department hospital admission based on natural language processing and neural networks](https://www.thieme-connect.com/products/ejournals/html/10.3414/ME17-01-0024) [X Zhang](https://scholar.google.com/citations?user=9SwTEqgAAAAJ&hl=en&oi=sra), J Kim, [RE Patzer](https://scholar.google.com/citations?user=QdkkWsgAAAAJ&hl=en&oi=sra), [SR Pitts](https://scholar.google.com/citations?user=UWt-d20AAAAJ&hl=en&oi=sra)… - … of information in …, 2017

[Text mining approach to predict hospital admissions using early medical records from the emergency department](https://www.sciencedirect.com/science/article/pii/S1386505617300011) [FR Lucini](https://scholar.google.com/citations?user=FMXrDPcAAAAJ&hl=en&oi=sra), [FS Fogliatto](https://scholar.google.com/citations?user=VyKXjYkAAAAJ&hl=en&oi=sra), [GJC da Silveira](https://scholar.google.com/citations?user=KkzE27IAAAAJ&hl=en&oi=sra)… - International journal of …, 2017 –

[Early prediction of hospital admission for emergency department patients: a comparison between patients younger or older than 70 years](https://emj.bmj.com/content/35/1/18.abstract) JA Lucke, J de Gelder, F Clarijs… - Emergency Medicine …, 2018

[Emergency department triage prediction of clinical outcomes using machine learning models](https://ccforum.biomedcentral.com/articles/10.1186/s13054-019-2351-7) [Y Raita](https://scholar.google.com/citations?user=lcQKfGkAAAAJ&hl=en&oi=sra), [T Goto](https://scholar.google.com/citations?user=CoF0Mx8AAAAJ&hl=en&oi=sra), MK Faridi, DFM Brown… - Critical …, 2019

[Prediction of admission in pediatric emergency department with deep neural networks and triage textual data](https://www.sciencedirect.com/science/article/pii/S0893608020300897) BP Roquette, [H Nagano](https://scholar.google.com/citations?user=seKqjacAAAAJ&hl=en&oi=sra), EC Marujo, AC Maiorano - Neural Networks, 2020

[Early prediction of hospital admission for emergency department patients: a comparison between patients younger or older than 70 years](https://emj.bmj.com/content/35/1/18.abstract) JA Lucke, J de Gelder, F Clarijs… - Emergency Medicine …, 2018

[Emergency department triage prediction of clinical outcomes using machine learning models](https://ccforum.biomedcentral.com/articles/10.1186/s13054-019-2351-7) [Y Raita](https://scholar.google.com/citations?user=lcQKfGkAAAAJ&hl=en&oi=sra), [T Goto](https://scholar.google.com/citations?user=CoF0Mx8AAAAJ&hl=en&oi=sra), MK Faridi, DFM Brown… - Critical …, 2019

[Prediction of emergency department patient disposition based on natural language processing of triage notes](https://www.sciencedirect.com/science/article/pii/S1386505619303752) NW Sterling, [RE Patzer](https://scholar.google.com/citations?user=QdkkWsgAAAAJ&hl=en&oi=sra), M Di, [JD Schrager](https://scholar.google.com/citations?user=ONDIRcAAAAAJ&hl=en&oi=sra) - International journal of medical …, 2019

[Machine learning–based prediction of clinical outcomes for children during emergency department triage](https://jamanetwork.com/journals/jamanetworkopen/article-abstract/2720586) [T Goto](https://scholar.google.com/citations?user=CoF0Mx8AAAAJ&hl=en&oi=sra), [CA Camargo](https://scholar.google.com/citations?user=zkc9pukAAAAJ&hl=en&oi=sra), MK Faridi, [RJ Freishtat](https://scholar.google.com/citations?user=pMLnjGoAAAAJ&hl=en&oi=sra)… - JAMA network …, 2019

[Predictive analytics for hospital admissions from the emergency department using triage information](https://www.sciencedirect.com/science/article/pii/S0925527318304778) [OM Araz](https://scholar.google.com/citations?user=rlNx4YIAAAAJ&hl=en&oi=sra), [D Olson](https://scholar.google.com/citations?user=_dsl8AoAAAAJ&hl=en&oi=sra), [A Ramirez-Nafarrate](https://scholar.google.com/citations?user=Yv3jCQkAAAAJ&hl=en&oi=sra) - International Journal of …, 2019

[A machine learning approach to predicting need for hospitalization for pediatric asthma exacerbation at the time of emergency department triage](https://onlinelibrary.wiley.com/doi/abs/10.1111/acem.13655)[SJ Patel](https://scholar.google.com/citations?user=vYI_GVgAAAAJ&hl=en&oi=sra), [DB Chamberlain](https://scholar.google.com/citations?user=tSrE7EUAAAAJ&hl=en&oi=sra)… - Academic Emergency …, 2018

[Emergency department triage prediction of clinical outcomes using machine learning models](https://ccforum.biomedcentral.com/articles/10.1186/s13054-019-2351-7) [Y Raita](https://scholar.google.com/citations?user=lcQKfGkAAAAJ&hl=en&oi=sra), [T Goto](https://scholar.google.com/citations?user=CoF0Mx8AAAAJ&hl=en&oi=sra), MK Faridi, DFM Brown… - … care, 2019

[Machine learning–based prediction of clinical outcomes for children during emergency department triage](https://jamanetwork.com/journals/jamanetworkopen/article-abstract/2720586) [T Goto](https://scholar.google.com/citations?user=CoF0Mx8AAAAJ&hl=en&oi=sra), [CA Camargo](https://scholar.google.com/citations?user=zkc9pukAAAAJ&hl=en&oi=sra), MK Faridi, [RJ Freishtat](https://scholar.google.com/citations?user=pMLnjGoAAAAJ&hl=en&oi=sra)… - JAMA network …, 2019

[Mortality prediction of septic patients in the emergency department based on machine learning](https://www.mdpi.com/569222) JW Perng, [IH Kao](https://scholar.google.com/citations?user=TRlsw6UAAAAJ&hl=en&oi=sra), CT Kung, SC Hung, [YH Lai](https://scholar.google.com/citations?user=6Y8BgcIAAAAJ&hl=en&oi=sra)… - … of clinical medicine, 2019

[A machine learning approach to predicting need for hospitalization for pediatric asthma exacerbation at the time of emergency department triage](https://onlinelibrary.wiley.com/doi/abs/10.1111/acem.13655) [SJ Patel](https://scholar.google.com/citations?user=vYI_GVgAAAAJ&hl=en&oi=sra), [DB Chamberlain](https://scholar.google.com/citations?user=tSrE7EUAAAAJ&hl=en&oi=sra)… -Emergency Medicine, 2018

[Early risk assessment for COVID-19 patients from emergency department data using machine learning](https://www.nature.com/articles/s41598-021-83784-y) [FS Heldt](https://scholar.google.com/citations?user=eWX_y28AAAAJ&hl=en&oi=sra), [MP Vizcaychipi](https://scholar.google.com/citations?user=ASO1AvAAAAAJ&hl=en&oi=sra), S Peacock, [M Cinelli](https://scholar.google.com/citations?user=4jjYTgcAAAAJ&hl=en&oi=sra)… - Scientific reports, 2021

[Predicting urinary tract infections in the emergency department with machine learning](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0194085)

[RA Taylor](https://scholar.google.com/citations?user=AZcprXQAAAAJ&hl=en&oi=sra), CL Moore, [KH Cheung](https://scholar.google.com/citations?user=5HRoD5MAAAAJ&hl=en&oi=sra), [C Brandt](https://scholar.google.com/citations?user=fS3V2AIAAAAJ&hl=en&oi=sra) - PloS one, 2018

[Prediction of admission in pediatric emergency department with deep neural networks and triage textual data](https://www.sciencedirect.com/science/article/pii/S0893608020300897) BP Roquette, [H Nagano](https://scholar.google.com/citations?user=seKqjacAAAAJ&hl=en&oi=sra), EC Marujo, AC Maiorano - Neural Networks, 2020

[Prediction of emergency department patient disposition based on natural language processing of triage notes](https://www.sciencedirect.com/science/article/pii/S1386505619303752) NW Sterling, [RE Patzer](https://scholar.google.com/citations?user=QdkkWsgAAAAJ&hl=en&oi=sra), M Di, [JD Schrager](https://scholar.google.com/citations?user=ONDIRcAAAAAJ&hl=en&oi=sra) - International journal of medical …, 2019

[Short and long term predictions of hospital emergency department attendances](https://www.sciencedirect.com/science/article/pii/S1386505618302429)

[T Jilani](https://scholar.google.com/citations?user=Sd3_wxoAAAAJ&hl=en&oi=sra), G Housley, [G Figueredo](https://scholar.google.com/citations?user=DXNNUcUAAAAJ&hl=en&oi=sra), PS Tang… - International journal of …, 2019

 [Emergency department triage prediction of clinical outcomes using machine learning models](https://ccforum.biomedcentral.com/articles/10.1186/s13054-019-2351-7) [Y Raita](https://scholar.google.com/citations?user=lcQKfGkAAAAJ&hl=en&oi=sra), [T Goto](https://scholar.google.com/citations?user=CoF0Mx8AAAAJ&hl=en&oi=sra), MK Faridi, DFM Brown… - Critical …, 2019

[Early risk assessment for COVID-19 patients from emergency department data using machine learning](https://www.nature.com/articles/s41598-021-83784-y) [FS Heldt](https://scholar.google.com/citations?user=eWX_y28AAAAJ&hl=en&oi=sra), [MP Vizcaychipi](https://scholar.google.com/citations?user=ASO1AvAAAAAJ&hl=en&oi=sra), S Peacock, [M Cinelli](https://scholar.google.com/citations?user=4jjYTgcAAAAJ&hl=en&oi=sra)… - Scientific reports, 2021