



REENGINEERING
THE HEALTHCARE SYSTEM



Data science in Maritime medicine



Peachaong Poolpol, MD, Msc

Diploma of the Thai Board of Preventive medicine (Maritime medicine)

Health Business Analyst and Data Scientist at H Lab Co, Ltd



REENGINEERING
THE HEALTHCARE SYSTEM

Agenda

- 01 What is Data science?
- 02 Data science research in Maritime medicine

What is data science?

 10 min

What is Data Science?

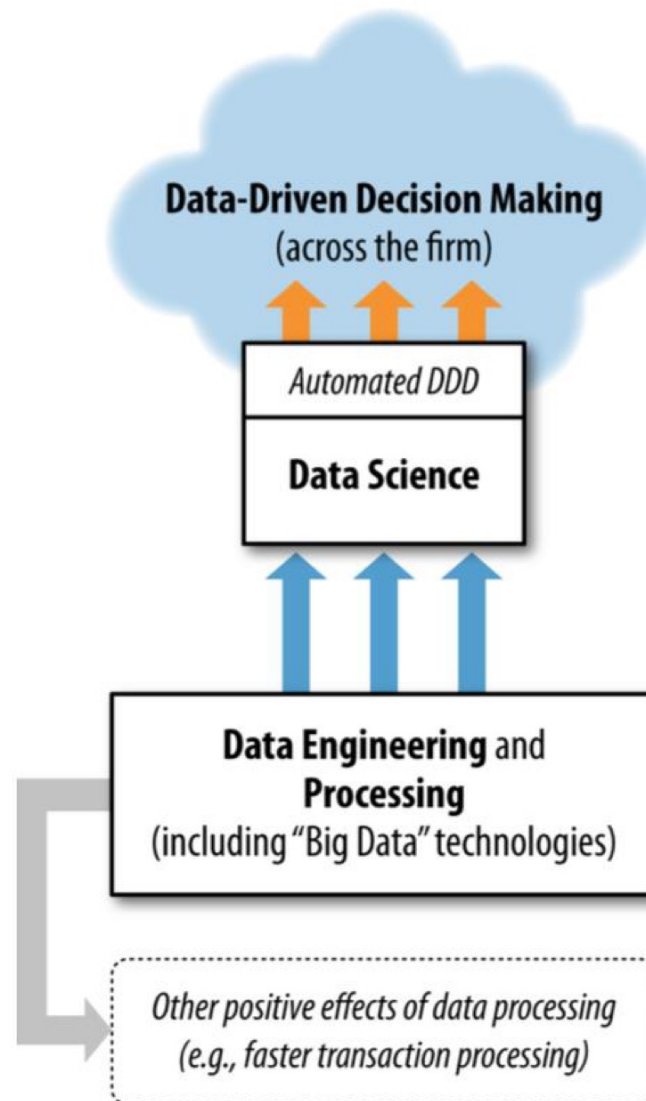
“Data Science is the exploration and quantitative analysis of all available structured and unstructured data to develop understanding, extract knowledge, and formulate actionable results.”

- Microsoft's DAT203.1x Data Science Essentials

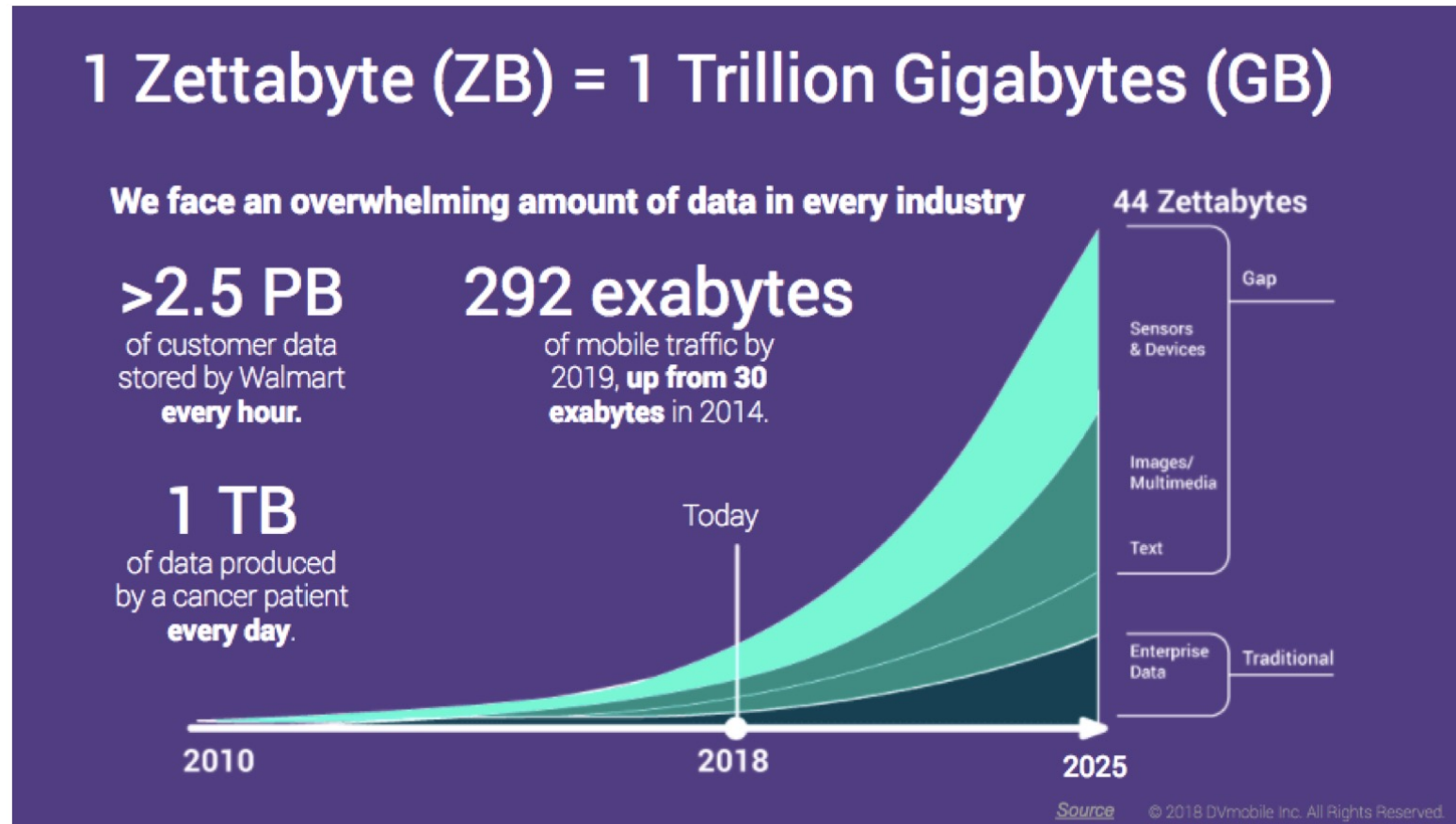
“Data science is the application of computational and statistical techniques to address or gain insight into some problem in the real world.”

- Zico Kolter, Carnegie Mellon University

What is Data Science?

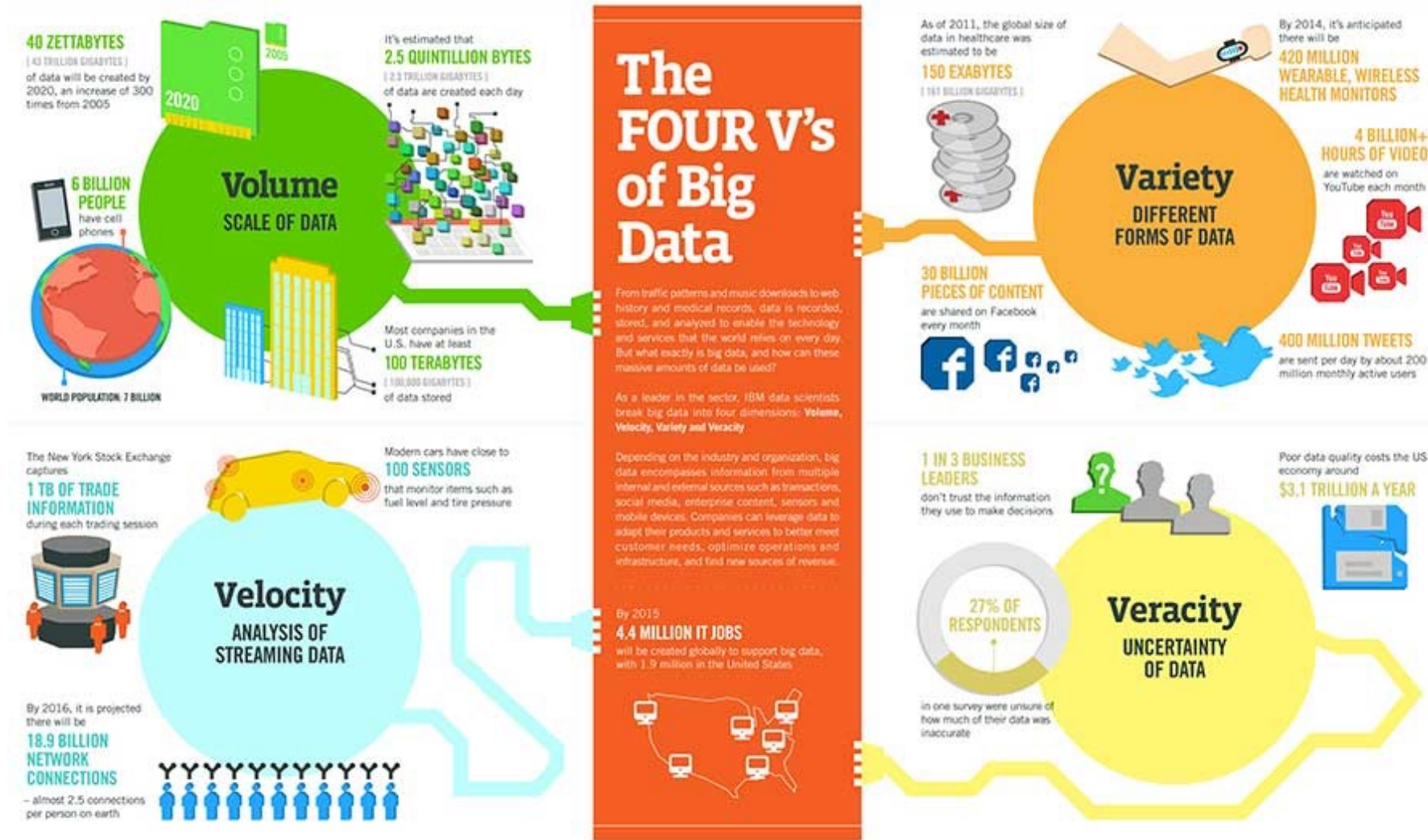


What is Data Science?



- In the past, firms could employ teams of statisticians, modelers, and analysts to explore datasets manually, but the volume and variety of data have far outstripped the capacity of manual analysis.

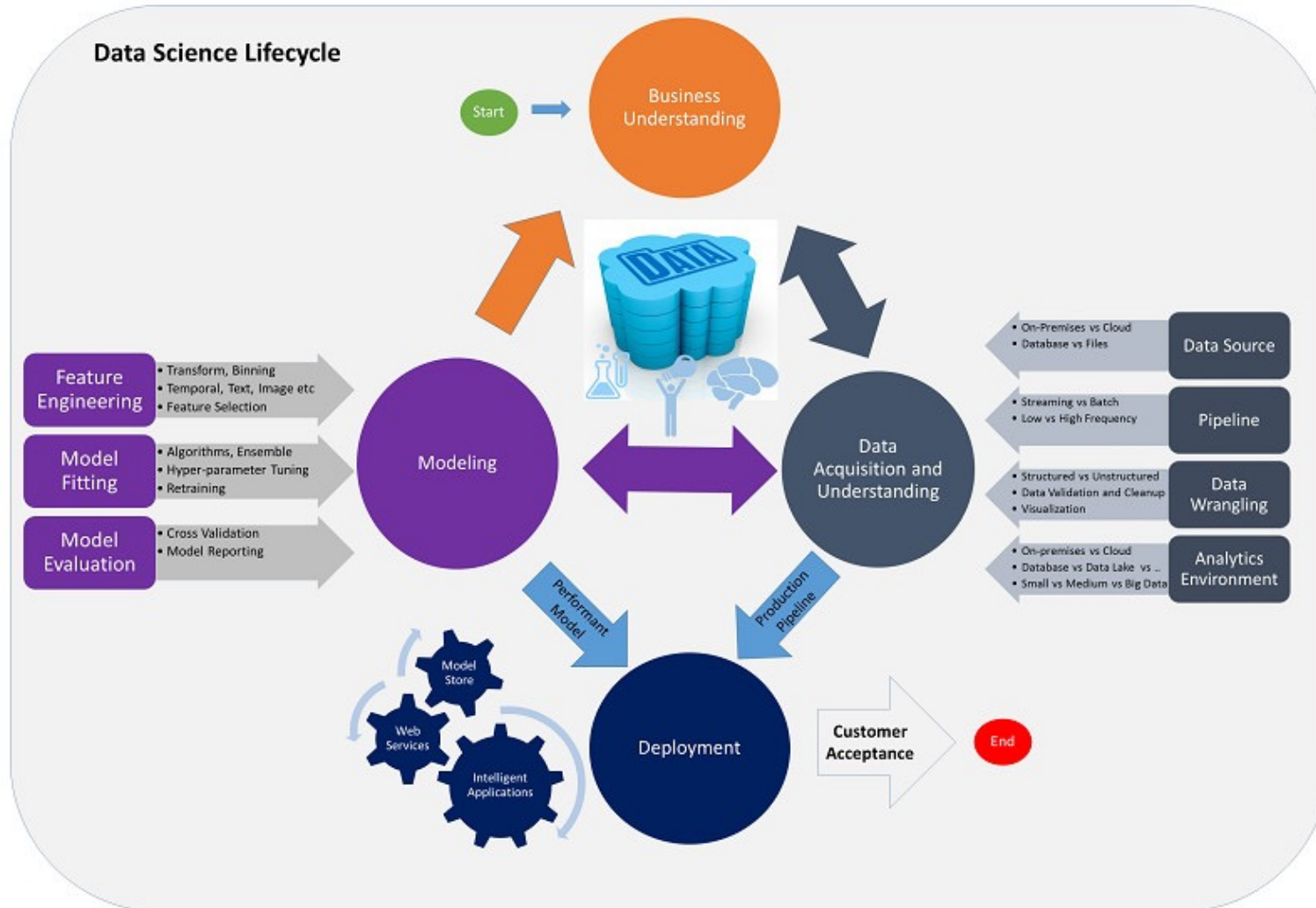
What is Data Science?



What is Data Science?



What is Data Science?



Data science research in Maritime medicine

 20 min

Data science research in Maritime medicine

International Journal of Information Management Data Insights 1 (2021) 100005



Contents lists available at [ScienceDirect](#)

International Journal of Information Management Data Insights

journal homepage: www.elsevier.com/locate/jjime

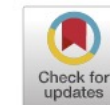


Text mining with sentiment analysis on seafarers' medical documents

Nalini Chintalapudi^a, Gopi Battineni^{a,*}, Marzio Di Canio^b, Getu Gamo Sagaro^a,
Francesco Amenta^{a,b}

^a Telemedicine and Tele pharmacy Center, School of Medicinal and Health Products Sciences, University of Camerino, 62032 Camerino, Italy

^b Research Department, Centro Internazionale Radio Medico (C.I.R.M.), 00144 Rome, Italy



Data science research in Maritime medicine

Text mining with sentiment analysis on seafarers' medical documents

Nalini Chintalapudi^a, Gopi Battineni^{a,*}, Marzio Di Canio^b, Getu Gamo Sagaro^a,
Francesco Amenta^{a,b}

^a Telemedicine and Telepharmacy Center, School of Medicinal and Health Products Sciences, University of Camerino, 62032 Camerino, Italy

^b Research Department, Centro Internazionale Radio Medico (C.I.R.M.), 00144 Rome, Italy



A B S T R A C T

Digital health systems contain large amounts of patient records, doctor notes, and prescriptions in text format. This information summarized over the electronic clinical information will lead to an improved quality of healthcare, the possibility of fewer medical errors, and low costs. Besides, seafarers are more vulnerable to have accidents, and prone to health hazards because of work culture, climatic changes, and personal habits. Therefore, text mining implementation in seafarers' medical documents can generate better knowledge of medical issues that often happened onboard. Medical records are collected from digital health systems of Centro Internazionale Radio Medico (C.I.R.M.) which is an Italian Telemedical Maritime Assistance System (TMAS). Three years (2018–2020) patient data have been used for analysis. Adoption of both lexicon and Naïve Bayes' algorithms was done to perform sentimental analysis and experiments were conducted over R statistical tool. Visualization of symptomatic information was done through word clouds and 96% of the correlation between medical problems and diagnosis outcome has been achieved. We validate the sentiment analysis with more than 80% accuracy and precision.

Data science research in Maritime medicine

Text mining with sentiment analysis on seafarers' medical documents

Nalini Chintalapudi^{a,*}, Gopi Battineni^{a,*}, Marzio Di Canio^b, Getu Gamo Sagaro^a,
Francesco Amenta^{a,b}

^a Telemedicine and Telepharmacy Center, School of Medicinal and Health Products Sciences, University of Camerino, 62032 Camerino, Italy

^b Research Department, Centro Internazionale Radio Medico (C.I.R.M.), 00144 Rome, Italy

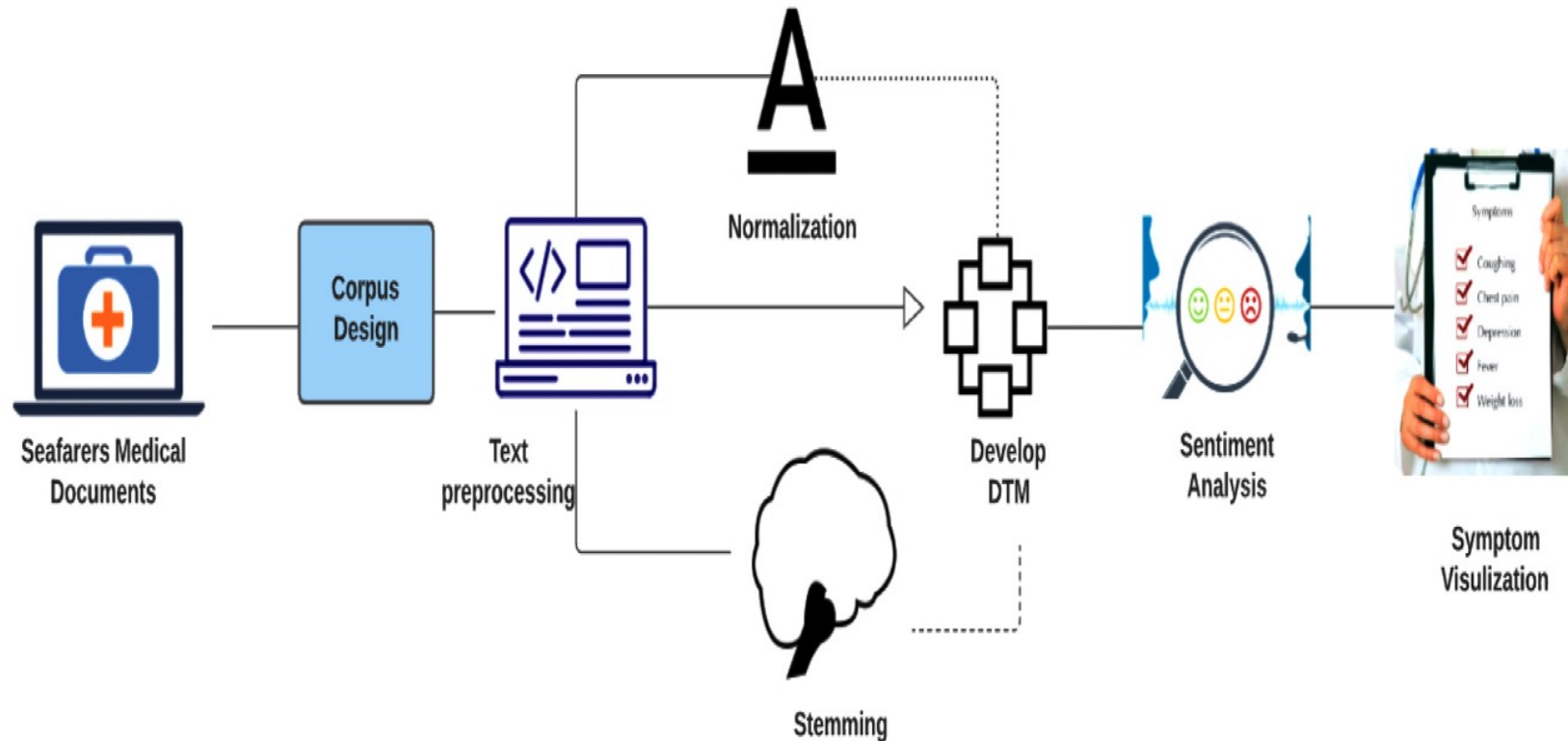


Fig. 1. An experimental framework.

Data science research in Maritime medicine

Text mining with sentiment analysis on seafarers' medical documents

Nalini Chintalapudi^a, Gopi Battineni^{a,*}, Marzio Di Canio^b, Getu Gamo Sagaro^a,
Francesco Amenta^{a,b}

^a Telemedicine and Telepharmacy Center, School of Medicinal and Health Products Sciences, University of Camerino, 62032 Camerino, Italy

^b Research Department. Centro Internazionale Radio Medico (C.I.R.M.). 00144 Rome. Italy



Table 1

Sample medical abstracts in C.I.R.M repository.

Year	Case Number	Medical abstract
#2018	# 237	# Day 7/4, A Lituan Tankist, Slipping from The Ladder, While Going into The Deck, Falling With The Right Side Of The Thigh / Seat (Bringing A Significant Ecchymosis On That Side) And Rolling Was Throwing The Head Not In The Way Violent, Bringing Exercises On The Skin And A Small Ecchymosis In One Eye. He Did Not Report the Fact, Because, Other Than The Dams, He Felted Well, In His Say. Yesterday, 8/4, I Received What Happened, Because I Had Headache And As Sensations Of Pressure / Pulsations. Mass Of Bags Of Ice Water. Some Heads Sometimes Slows Down And Sometimes And Stronger.
#2018	# 1352	# For Approximately A Week Has Present Abscess In The Inguinal Region Sin, Which Has Increased In Volume In The Last Days And Is Dolent To The Touch. Vital Parameters In The Standard.
#2019	#126	# Commander Informed That The Patient Disassembling From The Guard Shift Eaten A Sandwich Immediately Accusing After Acute Epigastric Pain. Patient Declares To Be The Carrier Of Iatule Hernia. A Buscopan Supposition Has Been Administered With Improvement Of Pain Symptomatology.
#2019	#2786	# A Favorable Opinion Is Required To Transfer Patient Sorentini Giulio, 58 Years, With Tracheo-Esophageal Fistula, From Crotone To Genoa, By Plane. The Patient Paz Would Be Accompanied By The Doctor.
#2019	#1985	# Captain Communicates Symptoms Of Maritime On Board, Lament Of Ocular Inflammation For More Than Twenty (20) Days. We Are Asked By A Medical Council
#2020	#36	# Gastro enteric Symptoms With Fever In Resolution After Drinking Water Not Certainly Drinkable
#2020	#101	# 29-Year Maritime Affected By About A Week Not Better Specified High Airway Infective Syndrome (Refer Cool), Dry Cough And Thermal Rise. 37.1 C
#2020	#1173	#30 Years Present Abdominal Skin Rash That Does Not Improve with Anti-Fungal Pomata. We Have No Images

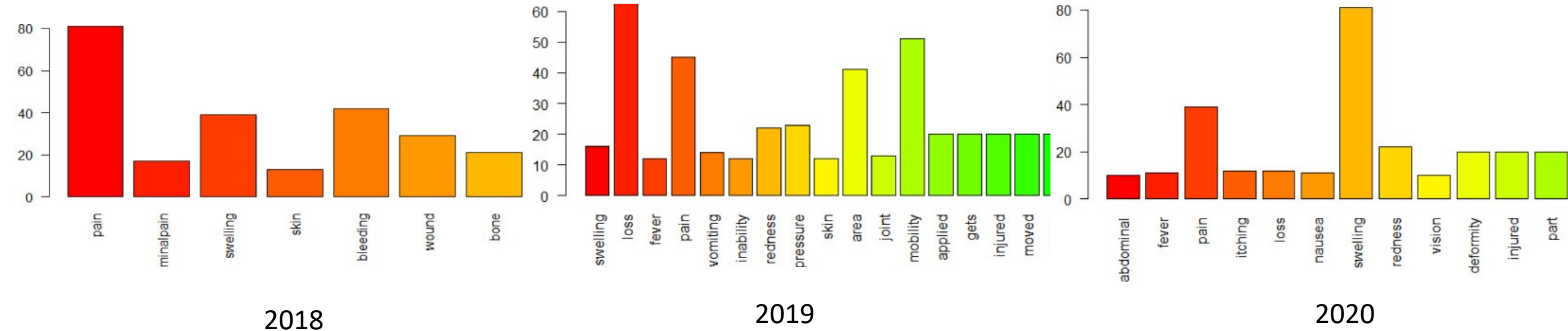
Data science research in Maritime medicine

Text mining with sentiment analysis on seafarers' medical documents

Nalini Chintalapudi^a, Gopi Battineni^{a,*}, Marzio Di Canio^b, Getu Gamo Sagaro^a,
Francesco Amenta^{a,b}

^a Telemedicine and Telepharmacy Center, School of Medicinal and Health Products Sciences, University of Camerino, 62032 Camerino, Italy

^b Research Department, Centro Internazionale Radio Medico (C.I.R.M.), 00144 Rome, Italy



^b *Research Department, Centro Internazionale Radio Medico (C.I.R.M.), 00144 Rome, Italy*



Data science research in Maritime medicine

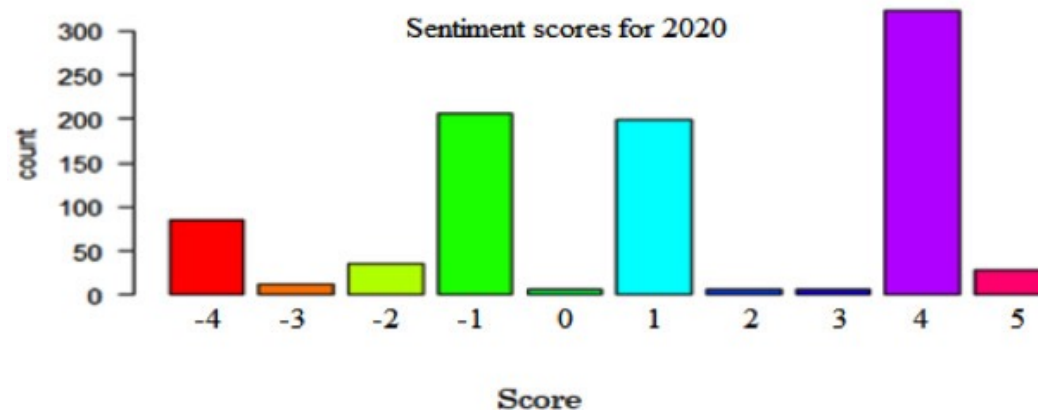
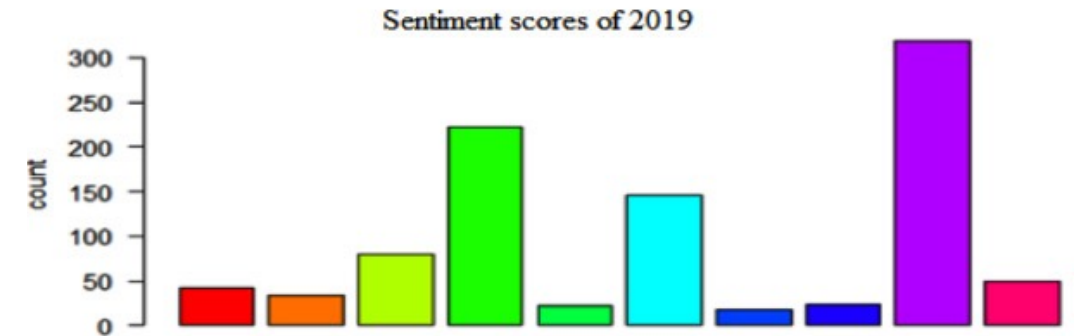
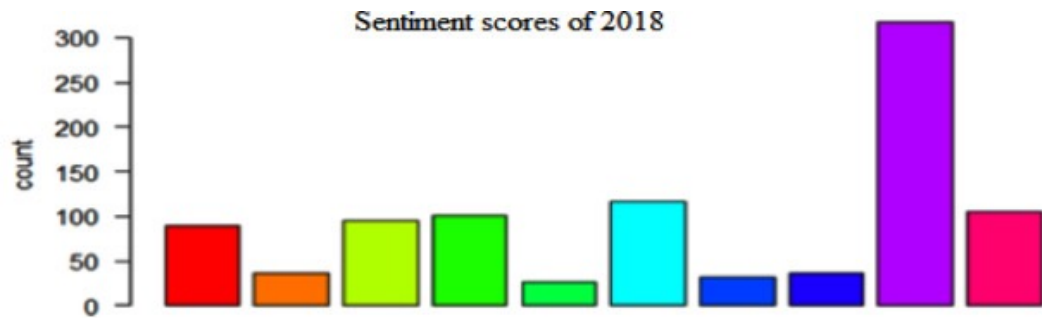
Text mining with sentiment analysis on seafarers' medical documents



Nalini Chintalapudi^a, Gopi Battineni^{a,*}, Marzio Di Canio^b, Getu Gamo Sagaro^a,
Francesco Amenta^{a,b}

^a Telemedicine and Telepharmacy Center, School of Medicinal and Health Products Sciences, University of Camerino, 62032 Camerino, Italy

^b Research Department, Centro Internazionale Radio Medico (C.I.R.M.), 00144 Rome, Italy



Data science research in Maritime medicine



Article

Fall Detection for Shipboard Seafarers Based on Optimized BlazePose and LSTM

Wei Liu ¹, Xu Liu ¹, Yuan Hu ^{2,*}, Jie Shi ¹, Xinqiang Chen ¹ , Jiansen Zhao ¹, Shengzheng Wang ¹
and Qingsong Hu ²

Data science research in Maritime medicine

Article

Fall Detection for Shipboard Seafarers Based on Optimized BlazePose and LSTM

Wei Liu ¹, Xu Liu ¹, Yuan Hu ^{2,*}, Jie Shi ¹, Xinqiang Chen ¹ , Jiansen Zhao ¹, Shengzheng Wang ¹
and Qingsong Hu ²

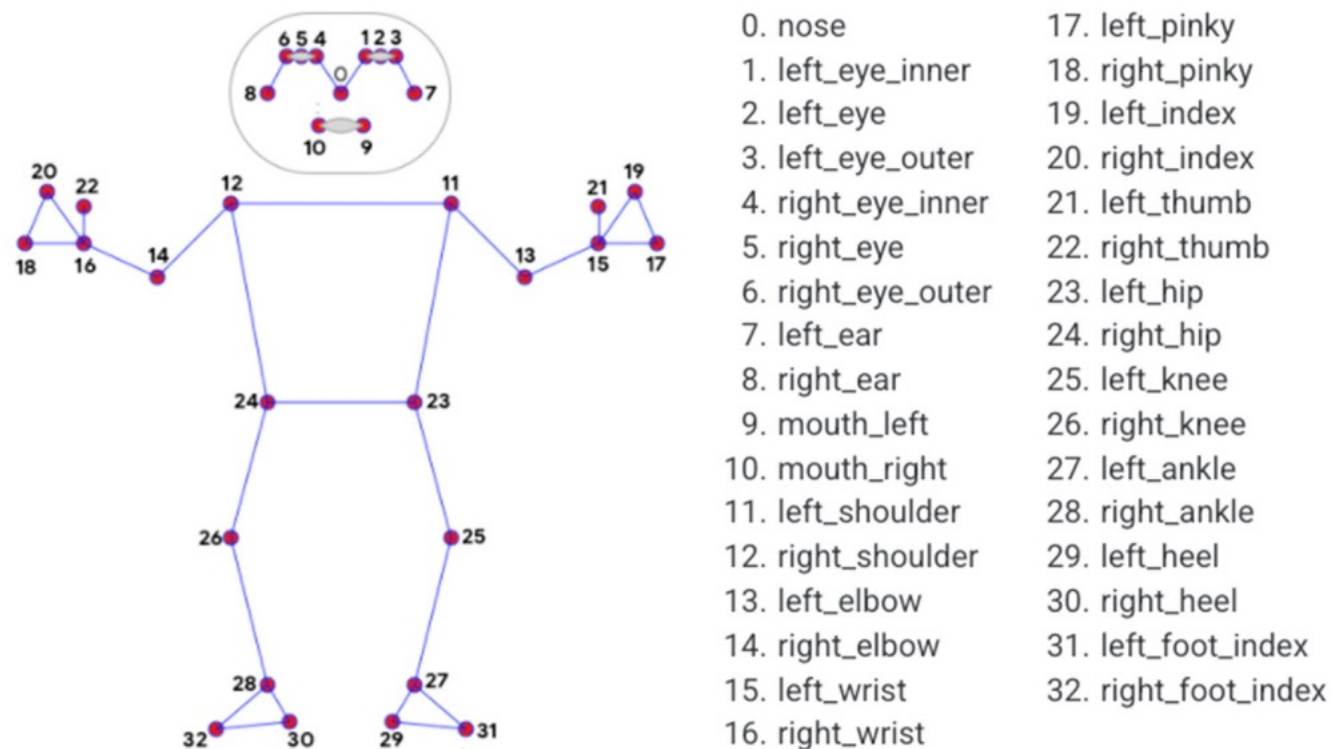


Figure 3. Human body key point topology map of BlazePose.

Data science research in Maritime medicine

Article

Fall Detection for Shipboard Seafarers Based on Optimized BlazePose and LSTM

Wei Liu ¹, Xu Liu ¹, Yuan Hu ^{2,*}, Jie Shi ¹, Xinqiang Chen ¹ , Jiansen Zhao ¹, Shengzheng Wang ¹
and Qingsong Hu ²

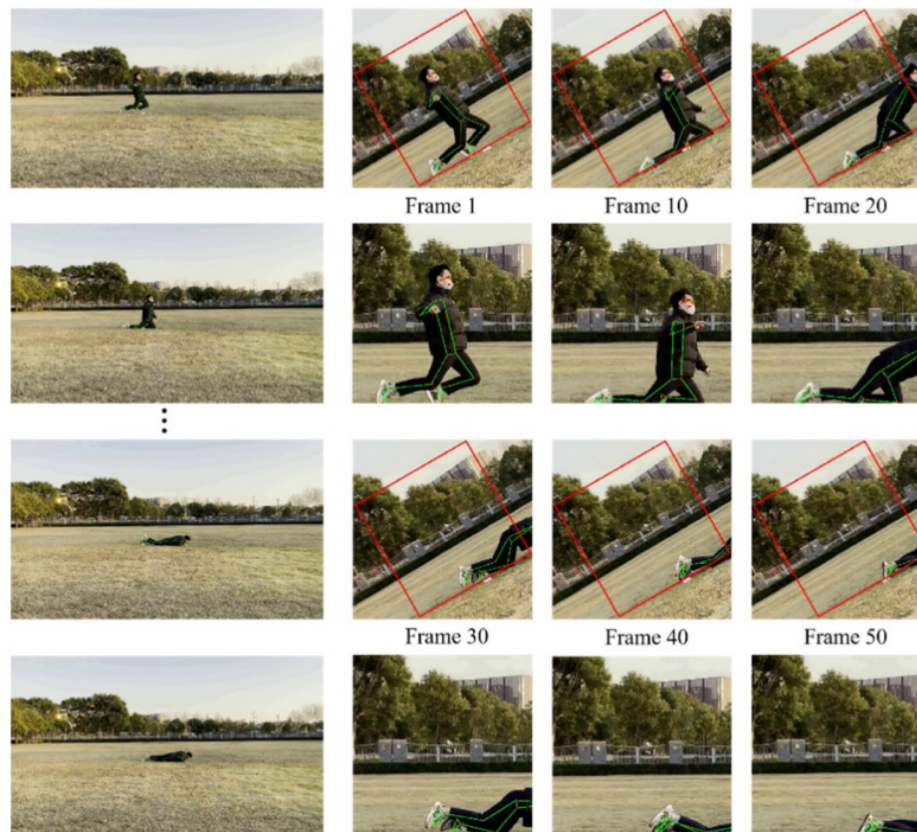


Figure 4. The detection process of BlazePose human key point information extraction network.

Confidential And Proprietary © H LAB Co Ltd. Do Not Distribute.

Data science research in Maritime medicine

Article

Fall Detection for Shipboard Seafarers Based on Optimized BlazePose and LSTM

Wei Liu¹, Xu Liu¹, Yuan Hu^{2,*}, Jie Shi¹, Xinqiang Chen¹ , Jiansen Zhao¹, Shengzheng Wang¹
and Qingsong Hu²

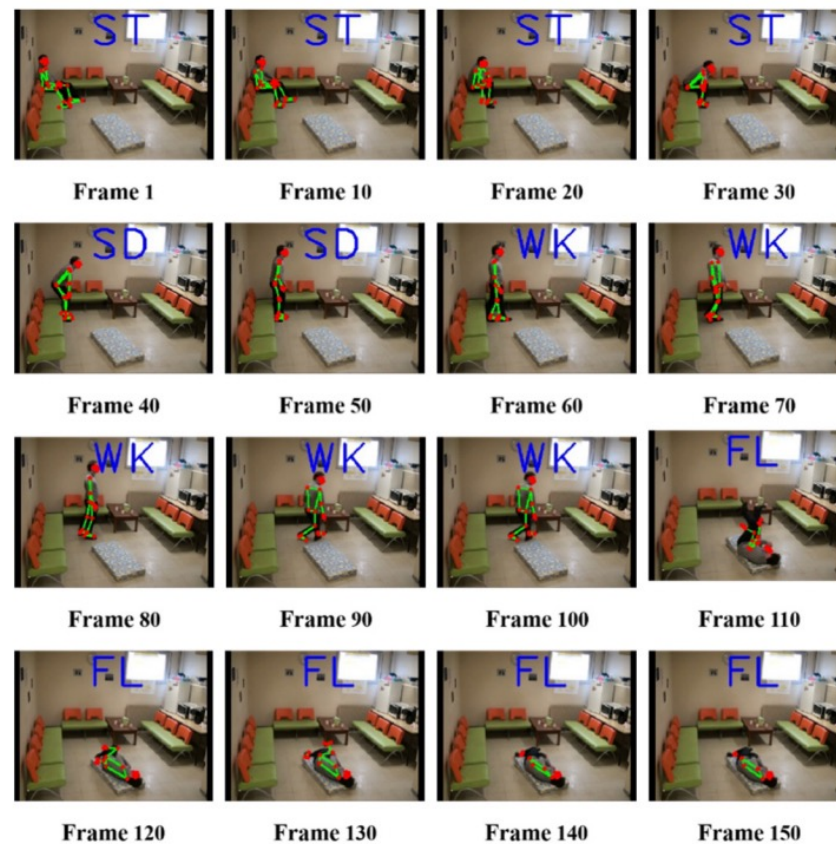


Figure 11. Detection results. (Note: ST, sitting; SD, standing; WK, walking; FL, falling).

Data science research in Maritime medicine

Article

Fall Detection for Shipboard Seafarers Based on Optimized BlazePose and LSTM

Wei Liu ¹, Xu Liu ¹, Yuan Hu ^{2,*}, Jie Shi ¹, Xinqiang Chen ¹ , Jiansen Zhao ¹, Shengzheng Wang ¹ and Qingsong Hu ²



Figure 12. Detection results.

Data science research in Maritime medicine

Journal of Physics: Conference Series

PAPER • **OPEN ACCESS**

A YOLOv3-based non-helmet-use detection for seafarer safety aboard merchant ships

To cite this article: Mingliang Zhong and Fei Meng 2019 *J. Phys.: Conf. Ser.* **1325** 012096

Data science research in Maritime medicine

A YOLOv3-based non-helmet-use detection for seafarer safety aboard merchant ships

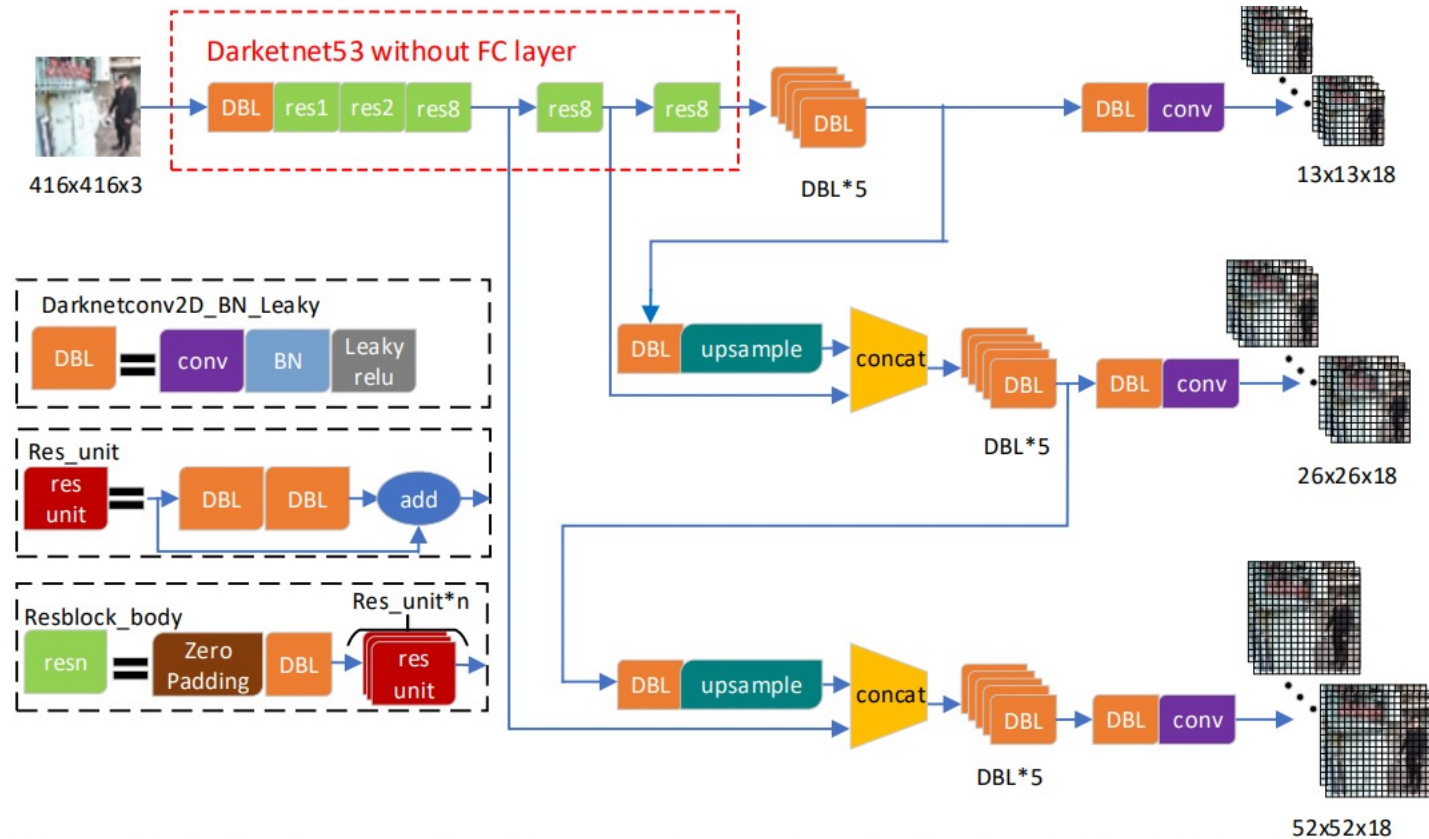


Figure 3. YOLOv3 network architecture diagram inspired by Levio (levio123@163.com)

Data science research in Maritime medicine

A YOLOv3-based non-helmet-use detection for seafarer safety aboard merchant ships

important because all risks happen in an instant.



(a)



(b)



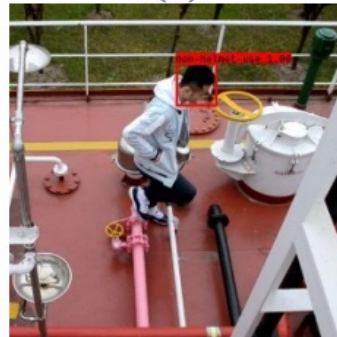
(c)



(d)



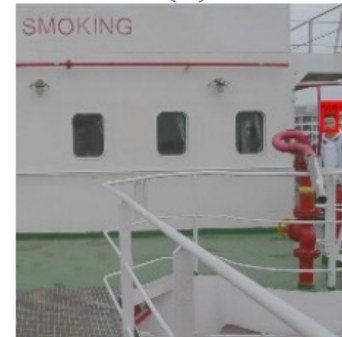
(e)



(f)



(g)



(i)

Figure 7. Images testing results: (a-d) testing results in engine room, (e-f) testing results on deck

Data science research in Maritime medicine

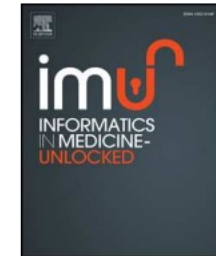
Informatics in Medicine Unlocked 16 (2019) 100149



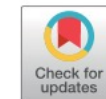
Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Informatics in Medicine Unlocked

journal homepage: www.elsevier.com/locate/imu



Screening of anxiety and depression among the seafarers using machine learning technology



Arkaprabha Sau^{a,*}, Ishita Bhakta^b

^a Group A, Central Civil Services, Directorate General of Factory Advice Service and Labour Institute, Ministry of Labour & Employment, Govt. of India, India

^b Department of Computer Science and Engineering, West Bengal University of Technology, BF 142, Sector 1, Salt Lake, Kolkata, 700064, West Bengal, India

Data science research in Maritime medicine

Screening of anxiety and depression among the seafarers using machine learning technology

A B S T R A C T

Background: Seafarers are vulnerable to suffer from various mental health disorders, most commonly anxiety and depression. So, periodic screening for anxiety and depression, is necessary for health and well-being. Machine learning technology can be used as a quick and automated screening procedure to identify the at risk seafarers for early referral to psychological counselling and treatment.

Objectives: To compare performance of different machine learning algorithms for screening of anxiety and depression among the seafarers.

Methods: Total 470 seafarers were interviewed at Haldia Dock Complex, India, after taking necessary permission and ethical clearance. Various socio demographic, occupational, and health related information were collected. Then status of anxiety and depression was assessed by Hospital Anxiety and Depression Scale. Five machine learning classifier i.e. Catboost, Logistic Regression, Naïve Bayes, Random Forest, and Support Vector Machine, were evaluated using Python.

Result: Catboost appeared to be the best one for this purpose with accuracy and precision 82.6% and 84.1% respectively.

Conclusion: This research emphasizes the application of machine learning technology in the field of automated screening for mental health illnesses. Using this technology, time consuming, anxiety and depression screening procedure can be replaced by an automated computer based technique with reasonable amount of accuracy.

Data science research in Maritime medicine

Screening of anxiety and depression among the seafarers using machine learning technology

Employment_Status	Job_Profile	Type_Vessel	Rank_Sailor	age	marital_status	family_type	education	PCI	duration_service	htn	DM	IHD	BMI	Anxiety_Depression
contractual	Engine	Non-ship	Non-Officer	36	married	joint	X	7200.00	8	Yes	No	no	18.83	No Anxiety-No Depression
contractual	Engine	Non-ship	Non-Officer	33	single	joint	XII	7666.67	4	No	No	no	19.60	No Anxiety-No Depression
permanent	Deck	Ship	Non-Officer	46	married	nuclear	XII	10000.00	20	No	No	no	18.83	Only Depression
permanent	Deck	Ship	Non-Officer	48	married	joint	Grad	12400.00	19	No	No	no	19.15	No Anxiety-No Depression
contractual	Deck	Non-ship	Non-Officer	40	married	nuclear	XII	7000.00	10	Yes	Yes	no	25.40	Only Anxiety
contractual	Deck	Non-ship	Non-Officer	44	married	joint	XII	6400.00	9	Yes	Yes	yes	25.22	Anxiety and Depression
permanent	Engine	Non-ship	Non-Officer	48	married	nuclear	XII	15000.00	20	No	Yes	yes	18.51	No Anxiety-No Depression
permanent	Deck	Non-ship	Non-Officer	34	married	joint	X	16000.00	9	No	No	no	18.59	No Anxiety-No Depression

Fig. 1. Sample Data Set with features and label.

Data science research in Maritime medicine

Screening of anxiety and depression among the seafarers using machine learning technology

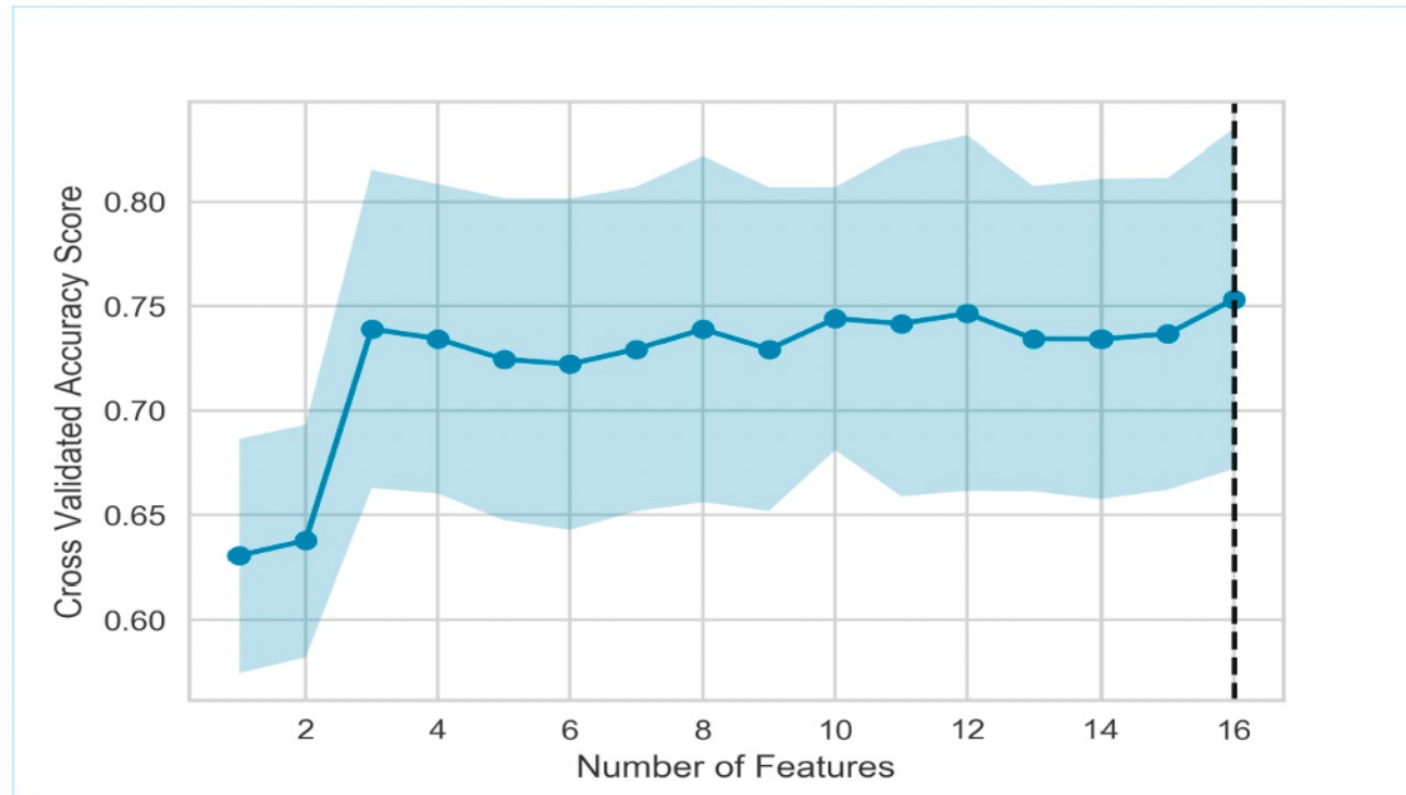


Fig. 2. Recursive feature elimination with accuracy score.

Data science research in Maritime medicine

Screening of anxiety and depression among the seafarers using machine learning technology

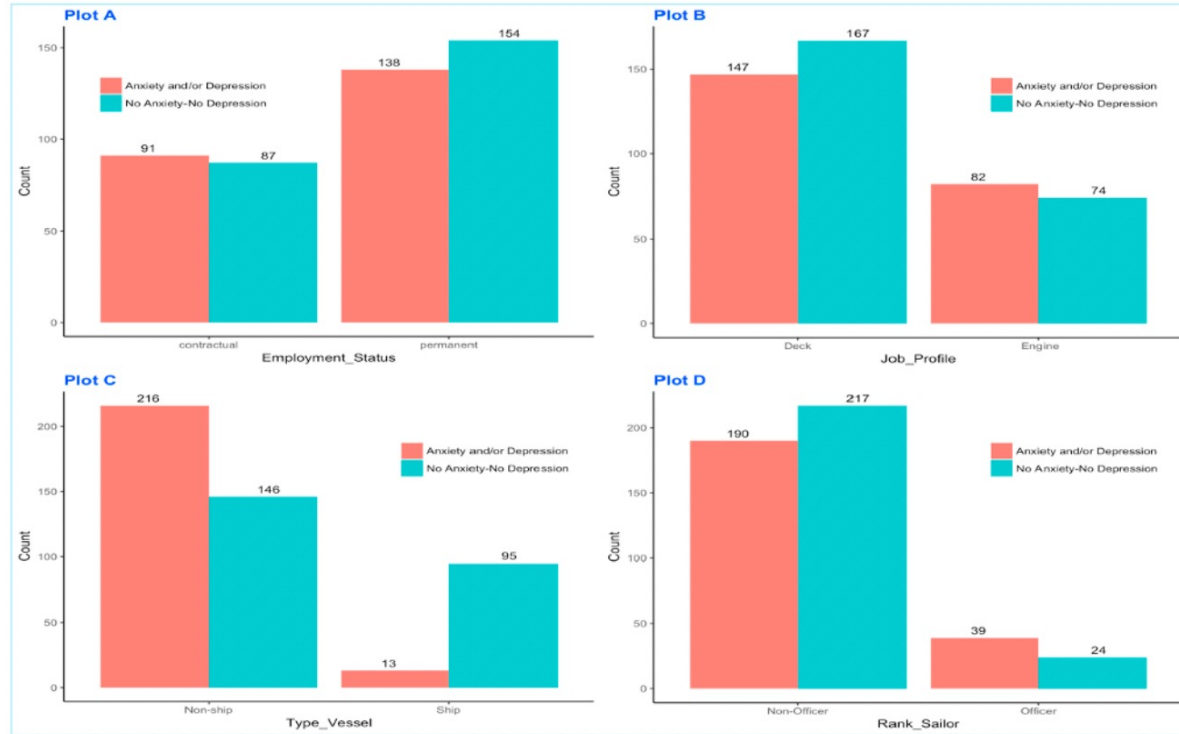


Fig. 4. Distribution of the categorical features (Employment status, job profile, type of vessel where posted, rank) according to Anxiety-Depression status.

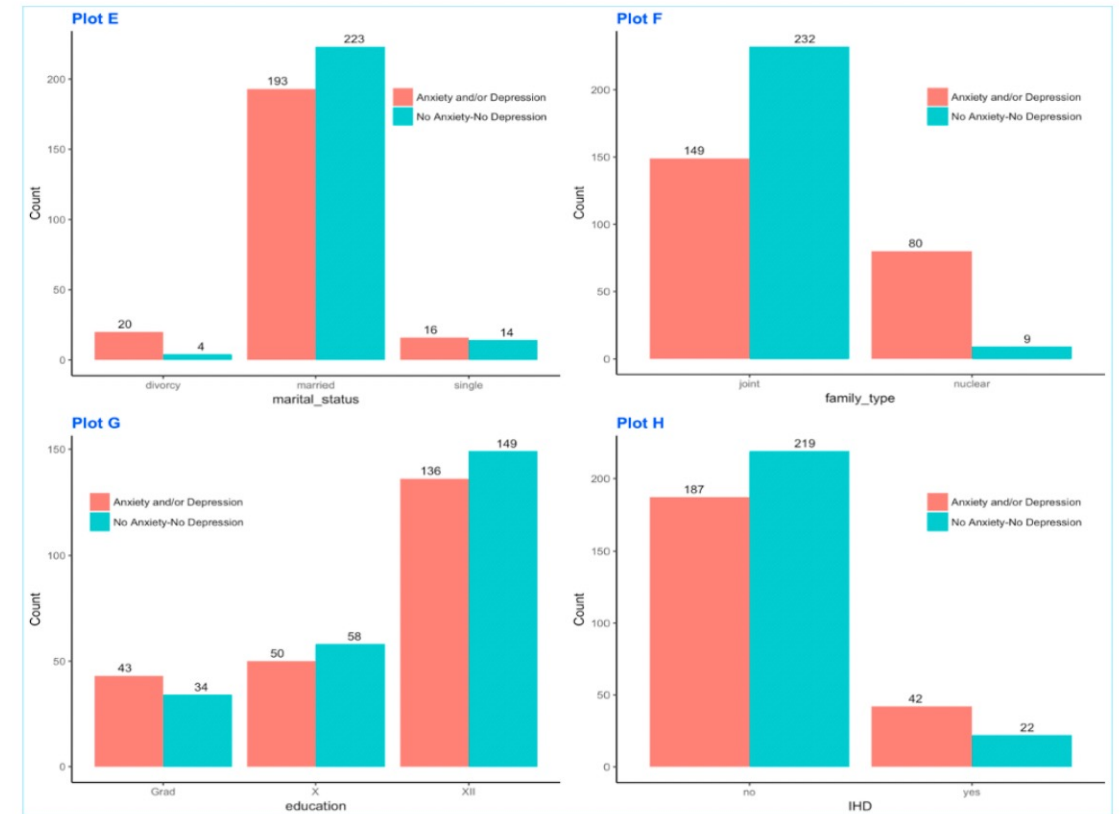


Fig. 5. Distribution of the categorical features (Marital status, family type, education and IHD i.e. ischemic heart disease) according to Anxiety-Depression status.

Data science research in Maritime medicine

Screening of anxiety and depression among the seafarers using machine learning technology

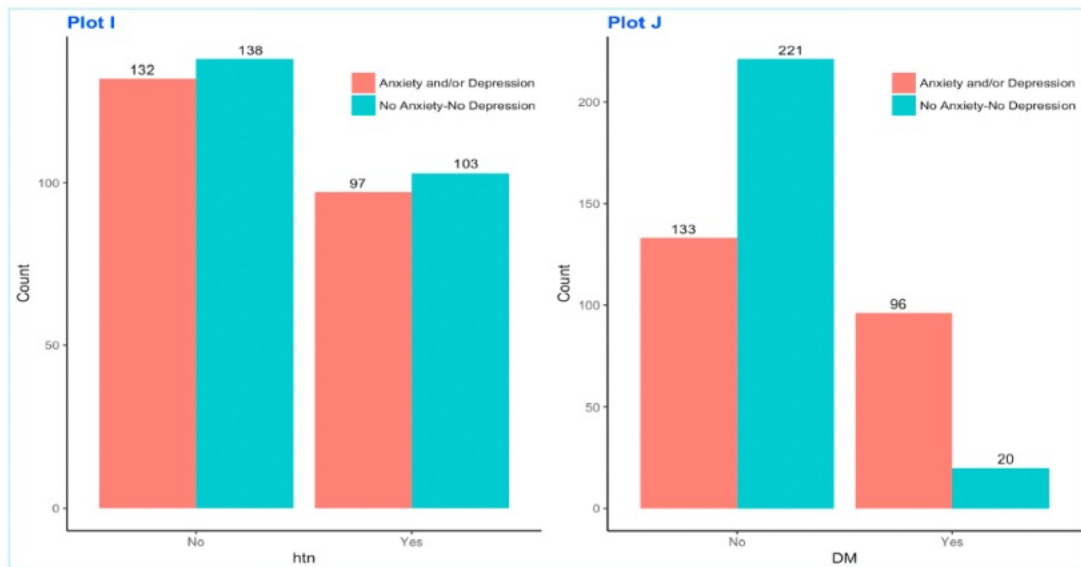


Fig. 6. Distribution of Hypertension (htn) and Diabetes Mellitus (DM) according to Anxiety-Depression status among the sailors.

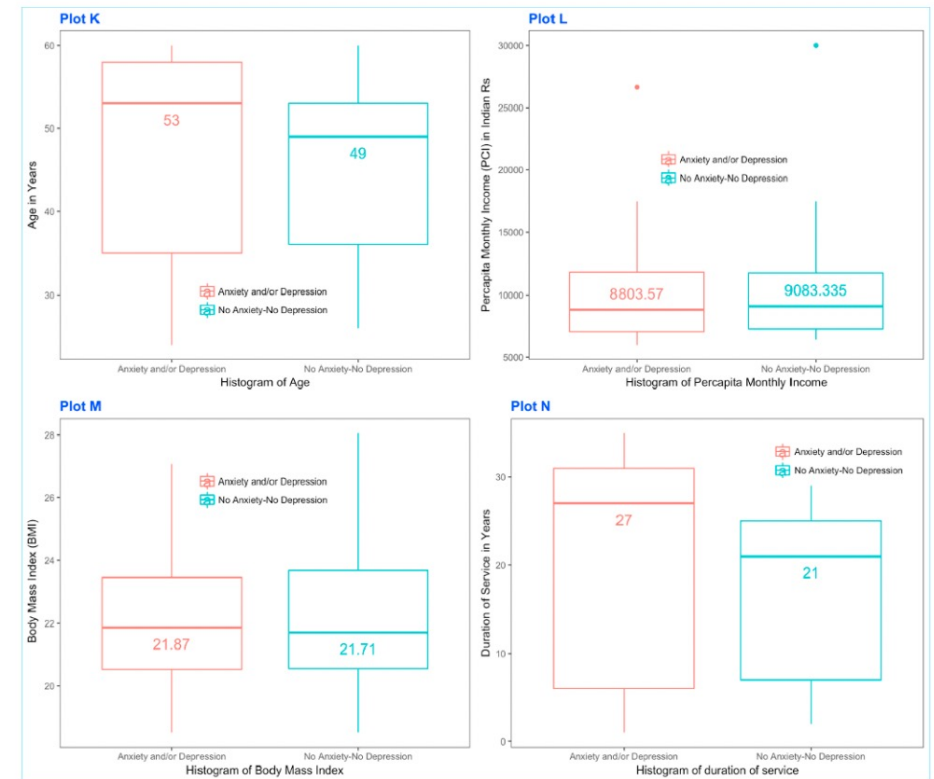


Fig. 7. Distribution of continuous features (Age, Per Capita Income, BMI and Service duration).

Data science research in Maritime medicine

Screening of anxiety and depression among the seafarers using machine learning technology

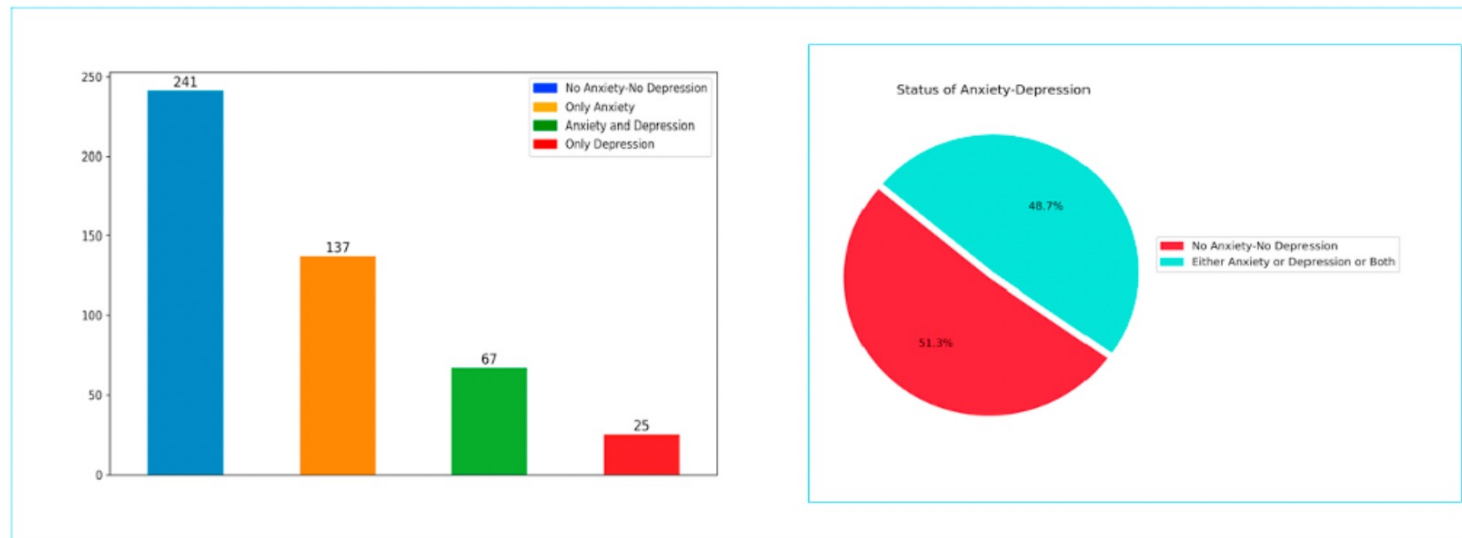


Fig. 8. Prevalence of Anxiety-Depression among the sailors (n = 470).

Data science research in Maritime medicine

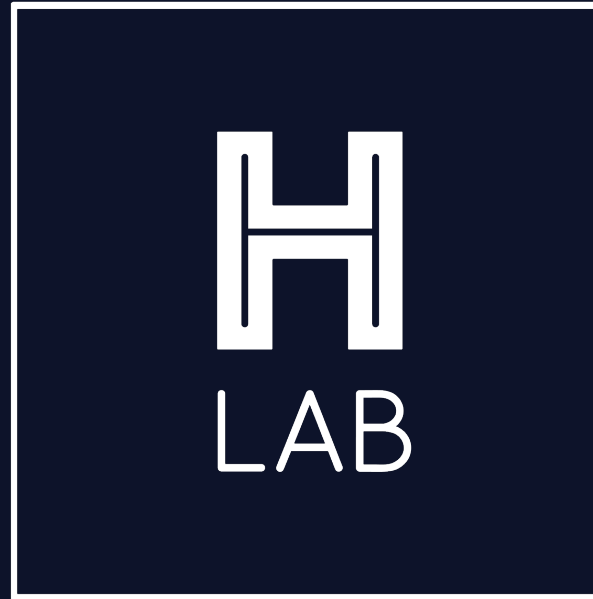
Screening of anxiety and depression among the seafarers using machine learning technology

Table 2
Evaluation of 5 Classifier on training set with 10 fold cross validation.

Classifier	Accuracy	Precision	ROC Area
Catboost	82.6%	84.1%	0.882
Random Forest	81.2%	81.2%	0.868
Logistic Regression	77.8%	78.0%	0.855
Naïve Bayes	75.8%	76.1%	0.847
SVM	76.1%	76.9%	0.759

Table 3
Evaluation of 5 Classifier on test dataset.

Classifier	Accuracy	Precision
Catboost	89.3%	89.0%
Logistic Regression	87.5%	84%
SVM	82.1%	80.7%
Naïve Bayes	82.1%	76.9%
Random Forest	78.6%	80.7%



REENGINEERING
THE HEALTHCARE SYSTEM



REENGINEERING
THE HEALTHCARE SYSTEM

Confidential and proprietary of © H LAB Co Ltd. Do not redistribute.