

SUPPLEMENTARY DATA 1: SEARCH STRATEGY

Databases: MEDLINE (via Ovid), EMBASE, Web of Science and IEEEExplore

MEDLINE = 429

“Deep learning” [MESH] or "Machine Learning"[Mesh] OR "Artificial Intelligence"[Mesh]
OR "Neural Networks (Computer)"[Mesh] OR "Support Vector Machine"[Mesh] OR
“Algorithms” [MESH] OR “Bayes theorem” [MESH] OR Markov Chains[MESH] OR
Machine learning OR Artificial Intelligence OR Naive Bayes OR Neural network* OR
support vector machine OR SVM OR random forest* OR boosting OR adaboost OR deep
learning OR (deep or convolutional or bayesian) network* OR bayes classifier OR machine
intelligence OR computational intelligence OR or (nearest adj1 (neighbor or neighbour)) or
“multilayer perceptron” OR computer vision OR hidden markov mode* OR hmm

AND

Surgical performance OR surgical skill OR surgical assessment OR technical skill OR
technical performance OR technical assessment OR surgeon* adj3 performance OR surgeon*
adj3 assess* OR surgeon* adj3 skill

Embase = 388

(“Deep learning” [mesh]" OR "Machine Learning"[mesh]" OR "Artificial Intelligence"
[mesh]" OR "artificial Neural Network[mesh]" OR convolutional neural network [mesh]"

"Support Vector [mesh]" " OR Algorithm [mesh] OR " Bayes theorem" [mesh] OR markov chain[mesh] or OR Machine learning OR Artificial Intelligence OR Naive Bayes OR Neural network* OR support vector machine OR SVM OR random forest* OR boosting OR adaboost OR deep learning OR (deep or convolutional or neural or bayesian) network* OR bayes classifier OR machine intelligence OR computational intelligence OR or (nearest adj1 (neighbor or neighbour)) or “multilayer perceptron” OR computer vision OR hidden markov mode* OR hmm

AND

Surgical performance OR surgical skill OR surgical assessment OR technical skill OR technical performance OR technical assessment OR surgeon* NEAR/3 performance OR surgeon* NEAR/3 assess* OR surgeon* NEAR/3 skill

Web of Science = 595

TS = (Skill Assess* OR Performance assess* OR technical assess*) 445,970

AND

TS = (surgeon OR surgery OR surgical) 1,568,312

AND

TS = (Deep Learning OR Machine learning Or Artificial intelligence OR neural network* OR computer vision OR support vector machine OR Bayesian OR markov chain* OR hidden markov model* OR adaboost) 544,866

1,2,3 = 595

IEEEExplore = 484

((("Abstract": performance OR "Abstract": skill OR "Abstract": assess) AND ("Abstract": surgeon OR "Abstract": surgery OR "Abstract": surgical) AND (machine learning OR automat OR artificial intelligence OR computer vision))

SUPPLEMENTARY DATA 2: MERSQI QUALITY ASSESSMENT

Author	Year	Study Design /3	Sampling /3	Type of Data /3	Validity of evaluation instrument /3	Data analysis /3	Outcomes /3	Total/ 18
BENCHTOP								
Rosen et al ⁷⁶	2001	1	2	3	0	3	1.5	10.5
Rosen et al ⁷⁷	2001	1	2	3	0	3	1.5	10.5
Leong et al ⁷⁸	2007	1	2	3	2	3	1.5	12.5
Varadarajan et al ³⁰	2009	1	2	3	0	3	1.5	10.5
Reiley et al ³¹	2009	1	2	3	0	3	1.5	10.5
King et al ¹⁸	2009	1	2	3	0	3	1.5	10.5
Islam et al ⁵⁸	2011	1	2	3	0	3	1.5	10.5
Tao et al ³²	2012	1	2	3	0	3	1.5	10.5
Kumar et al ³³	2012	1	3	3	3	3	1.5	14.5
Ahmidi et al ²⁶	2012	1	2	3	0	3	1.5	10.5
Islam et al ⁵⁹	2013	1	2	3	0	3	1.5	10.5
Ahmidi et al ³⁴	2013	1	2	3	0	3	1.5	10.5
Oropesa et al ¹⁹	2013	1	2	3	0	3	1.5	10.5
Sharma et al ⁶⁴	2014	1	2	3	2	3	1.5	12.5
Weede et al ²⁰	2014	1	2	3	1	3	1.5	11.5
Watson ²⁷	2014	1	2	3	1	3	1.5	11.5
Zia et al ⁶⁵	2015	1	2	3	3	3	1.5	13.5
Islam et al ⁶⁰	2016	1	2	3	3	3	1.5	13.5
Yamaguchi et al ⁶¹	2016	1	2	3	0	3	1.5	10.5
Zia et al ⁶⁶	2016	1	2	3	2	3	1.5	12.5
Dockter et al ²²	2017	1	2	3	0	3	1.5	10.5
Forestier et al ³⁵	2017	1	2	3	2	3	1.5	12.5
Jiang et al ⁴⁶	2017	1	2	3	0	3	1.5	10.5
French et al ²¹	2017	1	2	3	2	3	1.5	12.5
Brown et al ³⁶	2017	1	2	3	3	3	1.5	13.5
Sun et al ²⁸	2017	1	2	3	0	3	1.5	10.5
Zia et al ⁸⁰	2018	1	2	3	3	3	1.5	13.5

Zia et al³⁷	2018	1	2	3	2	3	1.5	12.5
Miller et al⁶⁷	2018	1	2	3	0	3	1.5	10.5
Uemura et al²³	2018	1	2	3	0	3	1.5	10.5
Sgouros et al⁶²	2018	1	2	3	0	3	1.5	10.5
Oquendo et al²⁴	2018	1	2	3	3	3	1.5	13.5
Wang et al³⁸	2018	1	2	3	2	3	1.5	12.5
Wang et al³⁹	2018	1	2	3	1	3	1.5	11.5
Fard et al⁴⁰	2018	1	2	3	1	3	1.5	11.5
Nguyen et al²⁹	2019	1	2	3	0	3	1.5	10.5
Gorantla et al⁶⁹	2019	1	2	3	0	3	1.5	10.5
Ershad et al⁴¹	2019	1	2	3	0	3	1.5	10.5
Kowalewski et al²⁵	2019	1	2	3	2	3	1.5	12.5
Funke et al⁶⁸	2019	1	2	3	0	3	1.5	10.5
Fawaz et al⁴²	2019	1	2	3	0	3	2	11
Anh et al⁴³	2020	1	2	3	0	3	1.5	10.5
Khalid et al⁴⁴	2020	1	2	3	0	3	1.5	10.5
Loukas et al⁶³	2020	1	2	3	0	3	1.5	10.5
Zhang et al⁸¹	2020	1	2	3	0	3	1.5	10.5
Kelly et al⁷⁹	2020	1	3	3	2	3	1.5	13.5
Gahan et al⁷⁰	2020	1	2	3	2	3	1.5	12.5
Brown et al⁴⁵	2020	1	2	3	1	2	1.5	10.5
SIMULATION								
Megali et al⁵⁰	2006	1	2	3	0	3	1.5	10.5
Ahmidi et al⁵¹	2012	1	2	3	2	3	1.5	12.5
Zhu et al⁸³	2015	1	2	3	3	3	1.5	13.5
Poursartip et al⁵²	2017	1	2	3	2	3	1.5	12.5
Topalli et al⁵³	2019	1	2	3	0	3	1.5	10.5
Winkler-Schwartz et al⁵⁴	2019	1	2	3	0	3	1.5	10.5
Peng et al⁵⁵	2019	1	2	3	1	3	1.5	11.5
Bissonnette et al⁸²	2019	1	3	3	1	3	1.5	12.5
Siyar et al⁵⁶	2020	1	2	3	0	3	1.5	10.5

Mirchi et al⁵⁷	2020	1	2	3	0	3	1.5	10.5
REAL								
Ahmidi et al⁴⁹	2015	1	2	3	0	3	1.5	10.5
Jin et al⁷¹	2018	1	2	3	2	3	1.5	12.5
Hung et al⁴⁷	2018	1	2	3	2	3	3	14
Baghdadi et al⁷²	2019	1	2	3	2	3	1.5	12.5
Kim et al⁷⁴	2019	1	2	3	3	3	1.5	13.5
Azari et al⁷⁵	2019	1	2	3	3	3	1.5	13.5
Lee et al⁷³	2020	1	2	3	2	3	1.5	12.5
Chen et al⁴⁸	2020	1	2	3	0	3	1.5	10.5