Introduction

neural networks include feed ##for ##ward neural network radial basis function neural network multi ##layer per ##ce ##pt ##ron con ##vo ##lu ##tion ##al neural network rec ##urrent neural network modular neural network sequence sequence models types con ##vo ##lu ##tion ##al neural networks effective image recognition con ##vo ##lu ##tion ##al neural network cnn con ##vo ##lu ##tion ##al neural network type artificial neural network according study mis ##hra 2020 entitled con ##vo ##lu ##tion ##al neural ne two ##rks explained con ##vo ##lu ##tion ##al neural network cnn con ##vn ##et specializes processing

Method

din ##der dog matching web based application using con ##vo ##lu ##tion ##al neural networks efficient ##net ##b ##0 transfer learning undergraduate thesis presented faculty college computer studies laguna state polytechnic university st ##a cruz campus partial fulfillment requirements degree bachelor science computer science lady lou c ag ##apa ##y joshua ferrer lal ##aine mana ##lo supervision mia v villa ##rica december 202 ##2 ii vision laguna state polytechnic university center sustainable development initiatives transforming lives communities mi ss ##ion l ##sp ##u provides quality education responsive instruction distinctive research sustainable extension production services improved quality life quality policy l ##sp ##u delivers quality education responsive instruction distinctive research sustainable extension production services thus committed c on ##tin ##ual improvement meet applicable requirements provide quality efficient effective services university stakeholders highest level satisfaction excellent management system im ##bu ##ed utmost integrity professional ##ism in ng learning found ##a ti ##on professional development iii approval sheet thesis entitled din ##der dog matching web based application using con ##vo ##lu ##tion ##al neural networks efficient ##net ##b ##0 transfer learning prepared submitted lady lou c ag ##apa ##y joshua ferrer lal ##aine mana ##lo partial fulfillment requirements degree bachelor science computer science here ##by recommended approval acceptance app ##ro ve ##d committee oral examination grade _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ accepted approve b ##0 model rc ##hit ##ect ##ure figure 9 shear range image aug ##ment ##ation figure 10 zoom range image aug ##ment ##ation figure 11 horizontal flip image aug ##ment ##ation figure 12 confusion matrix figure 13 accuracy formula figure 14 precision formula figure 15 recall formula figure 16 f1 score formula figure 17 breed class ##ifier prediction figure 18 coat color class ##ifier prediction figure 19 type class ##ifier prediction figure 20 offspring images folder ##s figure 21 offspring images shi ##h t ##zu white shi ##h t ##zu black folder figure 22 ra ##d s l framework con ##vo ##lu ##tion ##al neural network cnn used theoretical framework dickson 2020 stated con ##vo ##lu ##tion ##al neural networks cnn ##s con ##vn ##ets first introduced 1980s yan le ##cu ##n type artificial neural network roughly mimic ##s human vision system figure 1 theoretical framework study 5 architectural framework con ##vo ##lu ##tion ##al neural network based study ph ##ung r ##hee 2019 divided two parts feature extraction classification according sa ##ha 2018 input layer would take input image one dimensional tensor gray ##sca ##le images three dime ns ##ional tensor colored images c on ##vo ##lu ##tion would applied images feature extraction edges color etc use kernel ##s filters con ##vo ##lu ##tion operations feature map reduced version original tensor would generated dimensional ##i ty reduction would applied feature maps operation called pool ##ing decrease computational power required process data training rows matrices would transformed single long column data classification artificial neural network process called flat ##ten ##ing finally flattened vector would used inputs fully pp ##lica ##tion ra di ##ology specialized type linear operation used feature extraction small array numbers called kernel would applied across input would array numbers also called tensor following con ##vo ##lu ##tion ##al la yer ##s would pool ##ing layers according study se ##b 2021 entitled pool ##ing con ##vo ##lu ##tion ##al neural network cnn pool ##ing layers explained pool ##ing con ##vo ##lu ##tion ##al neural networks technique general ##izing features extract ##e con ##vo ##lu ##tion ##al filters moreover applied help network recognize features independent location image po con ##vo ##lu ##tion ##al neural network arc 2018 author stated fully connected layer simply feed forward neural network would form last layers con ##vo ##lu ##tion ##al neural network input layer fully connected layer would flattened output final pool ##ing con vol ##ution ##al layer stated output final pool ##ing con ##vo ##lu ##tion ##al layer would flattened fed input layer fully connected layer flat ##ten ##ing con ##vo ##lu ##tion ##al neural networks defined study je ##ong 2019 entitled intuitive easiest guide con ##vo ##lu ##tion ##al neural network conversion data 1 dimensional array input following layer moreover indicated flattened output pool ##ing con ##vo ##lu ##tion ##al layers would single long feature vector res ##net res ##net residual network one popular con ##vo ##lu ##tion ##al neural networks date introduced et al 2016 study entitled deep residual learning image rec ##og ##ni ##ti ##o n 2015 main reason due problem training deep neural networks accuracy neural network would typically increase increasing number layers result architecture ##s deep neural networks become deeper n ##d deeper years however plateau dec ##rea ##s d res ##net scratch python res ##net made residual blocks residual blocks would simple understand explained perfectly study sa ##ho ##o 2018 entitled residual blocks building blocks res ##net author mentioned typical tr ##ad it ##ional neural network layer would feed next layer however neural network made residual blocks layer would feed next layer directly layers 2 3 hop ##s away could different numbers lay ##e rs res ##net con ##vo ##lu ##tion ##al network popular widely used type res ##net res ##net ##50 architectural ##ly res ##net ##50 contained 50 con ##vo ##lu ##tion ##a a dogs parts data ##set containing 135 dog breeds v ##gg an ##ot type con ##vo ##lu ##tion ##al neural network v ##gg stood visual geometry group proposed simon ##yan z ##isse ##rman 2014 based study entitled deep con ##vo ##lu ##tion ##al networks large scale image recognition similar af ##ore mentioned model architecture v ##gg known popular model architecture use however unlike res ##net made stacked residual blocks v ##gg according study bo ##es ##ch 2021 entitled v ##gg deep con ##vo ##lu ##tion ##al networks v ##gg ##ne need

Result

ut ##ing study improvement ideas ms ce ##zan ##ne dim ##ac ##ula ##nga ##n language critic assistance criticizing construction grammar manuscript mrs rey ##nal ##en c just ##o mm it ##m associate dean college computer studies allowing researchers conduct study lastly thankful effort hard work research team members allotted great amount time went several sl ee ##ples ##s nights finish task time v dedication researchers would like de ##dicate study almighty god guidance blessings research work helped researchers complete research successfully es ##pe ##cia ll ##y hard times study dedicated well family researchers supporting encouraging us nonstop beginning end possible without su ##pp ##or journey get rough kept believing researchers could researchers extend utmost gratitude love thank ag ##apa ##y lady lou c ferrer joshua mana ##lo lal ##aine vi abstract searching dog breeding partner online communities dog breeders typically causes challenges dog owners moreover studies shown dogs usually bred look certain characteristic nowadays general ##l study aims design develop dog matching prototype integrated deep neural networks particularly con ##vo ##lu ##tion ##al neural networks cnn ##s matching dogs included image recognition dog breed coat color type display im ages possible offspring ##s addition study also aimed determine best performing pre trained cnn model integrate transfer learning based model small image data ##set ##s collected google images model evaluation ##s fin ally study also aimed examine prototype performance actual testing throughout prototype development rapid application development ra ##d soft any researchers trying scale width neural network moreover according study et al 2016 entitled deep residual learning image recognition stated many researchers trying scale dept h neural network moreover according study huang et al 2019 entitled gp ##ipe efficient training giant neural networks using pipeline parallel ##ism stated many researchers also trying scale resolution images however none defined balance dimensions proper ratio size input resolution crucial aspect model achieve superior performance there ##fo at ##ing dogs humans live alongside one another thousands years today roles dogs changed according study king et al 2012 entitled breeding dogs beauty behaviour scientists need develop valid reliable behaviour assessments dogs kept companions stated important take physical health behaviour well perceived beauty consideration breeding selecting dogs companions addition according th e study hi ##rst 2019 entitled selective breeding dogs stated interesting useful trait identified dog owners would breed dog hope tr ##ai g image image data ##set ##s study applying zoom range transformation shown figure 41 horizontal flip used basically flip rows columns images horizontally figure 11 horizontal flip image aug ##ment ##ation dog image image data ##set ##s study applying horizontal flip transformation shown figure training generally order train develop neural network model model architecture given input layer hidden layers output layer con ##vo ##lu ##tion ##al neural network input layer would images hidden layers would con ##vo ##lu ##tion ##al layers output layer wo archers reached study researchers conducting research summary study aimed design develop dog matching web application prototype well image display offspring ##s labrador retrieve ##rs pomeranian ##s po ##odle ##s pu ##gs shi ##h t ##zu ##s course study researchers discovered studies res ##net ##50 pre trained model always out ##per ##formed pre trained models large data ##set ##s researchers used moreover intense reading various literature regarding deep learning particularly artificial neural networks researchers learned artificial intelligence ai si

Discussion

nova tion college computer studies goal college computer studies graduates expected become globally competitive innovative computing professionals im bu ed utmost integrity contributing country national development goal program educational objective bachelor science computer science bsc graduates computing professionals proficient researchers designing developing innovative solutions designed enable students achieve follow g time graduate 1 apply knowledge computing solutions fundamental complex problems pp rop ria te abstraction conceptual ization computing models 2 communicate effectively recognize legal ethical prof ess iona l issues governing utilization computer technology engage independent learning development computing professional 3 ability apply design develop evaluate systems components processes mathematical foundation algorithm ic principles computer science theories 4 developed culture research technology advancement 5 demonstrated good leadership team player contribute nation building engage life lo partial fulfillment requirement degree bachelor science computer science date signed _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ research contribution mia v villa rica di thesis adviser mark p bernardino msc subject specialist iana miranda ab lan technical editor ce zan ne dim ac ula nga n language critic victor est ali lla jr stat istic ian rey nal en c mm lp chairman rey nal en c mm lp dean associate dean dr ri na j arc iga l director chairperson research development iv acknowledge ments study would possible without ass stance support encouragement individuals researchers would like convey heart felt gratitude following individuals contributions completion study mrs mia v villa rica thesis adviser never ending thoughtful ness patience love extended led researchers completion study mrs iana miranda ab lan technical editor patience gui ce given researchers checking manuscript mr mark p bernardino msc specialization expert sharing knowledge suggestions regarding study researchers mr victor est ali lla jr stat istic ian con tri b ware development methodology used throughout model evaluation several class ific ion metric used prototype actual testing dog images fed prototype examine image recognition dogs paired purposely examine possible offspring images integration efficient net b 0 learned parameter weights per formed pre trained models evaluation perfectly 100 00 accuracy precision recall f1 score results indicate simpler cnn perform better smaller data set moreover results prototype actual testing returned promising results b results dog matching application novel method dog matching recommended key words dog matching transfer learning deep neural networks con vo lu tion al neural network cnn rapid application development ra image recognition efficient net b 0 vii table contents chapter introduction introduction research problem research objectives theoretical framework conceptual framework scope limitations study significance study 1 2 3 4 6 8 9 chapter ii review related literature review related literature artificial intel li gen c e ai deep learning artificial neural network ann con vo lu tion al neural network cnn res net v gg efficient net transfer learning image classification evaluation metric dog breeding synthesis 10 10 11 12 13 15 17 18 20 22 24 24 chapter iii methodology research methodology research design fact finding technique algorithm analysis data model generation model evaluation image recognition offs p ring image display 28 28 29 33 37 43 45 48 viii development methodology prototype actual testing software used 49 51 53 cha pt er iv results discussion results discussion system overview research objective 1 research objective 2 research objective 3 56 56 57 63 65 chapter v summary conclusions recommendations summary conclusions recommendations summary conclusions recommendations 68 68 68 69 references 70 ix list tables table 1 scope breeds coat colors types table 2 summary collected breed images data set table 3 summary collected coat color images data set table 4 summary collected types images data set table 5 train test split col le cted data set table 6 parameters pre trained models table 7 model evaluation results pre trained models table 8 actual testing results image recognition 30 31 32 33 38 63 64 65 x list figures figure 1 theoretical framework study figure 2 conceptual framework study figure 3 screens hot labrador retrieve r images figure 4 screens hot black labrador retrieve r images figure 5 screens hot american labrador retrieve r images figure 6 res net 50 model architecture figure 7 v gg 16 model architecture figure 8 efficient net ware development methodology model figure 23 image rec og ni ti actual testing images figure 24 offspring image display actual testing images figure 25 screens hot google cola b development environment figure 26 screens hot visual studio code id e figure 27 log page figure 28 create account page 1 figure 29 create account page 2 figure 30 create account page 3 figure 31 home page 4 6 30 31 32 35 36 37 40 40 41 43 44 44 45 45 46 47 47 48 49 49 52 53 54 55 57 58 59 60 61 xi figure 32 offspring button option figure 33 offspring images display figure 34 models evaluation graph figure 35 white shi h zu white po odle possible offspring images figure 36 black pu g black shi h zu possible offspring images 62 62 64 66 67 xii list app end ices technical background data set screens hot hardware software resources application depend encies b communication letter forms iso forms defense rating sheets summary recommendations c curriculum vita e xiii definition terms throughout prototype development design researchers able id ent term ino logies en ume rated technical operational terms could useful better understanding study technical terms term ino logies used design development developed prototype defined section artificial intelligence ai refers branch computer science simulate human intelligence processes use machines especially computer systems artificial neural network ann refers computational model consisting input hidden output layers connected nodes simulate human brain con vo lu tion refers fi lt ration information input data pr du ce feature map con vo lu tion neural network con vo lu tion al neural network cnn refers type artificial