

Computer Science

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1 Internal Assessment

1.1 Research/literature

1.1.1 Answer Evaluation Using Machine Learning PAPER:READ

1. Introduction

- due to the fact that checking answers requires high concentration and often leads to mistakes and also there are human biases which would hopefully be removed (this needs good training data though)
- Automated answer grading is also significantly more efficient than doing it manually

2. Algorithm

- The Model uses multiple hidden layers
- For each layer they are using the ReLU activation function defined as $f(x) = \max(0, x)$
- Their algorithm will also take the length of the answer into account with the teacher giving an ideal answer length

3. Methodology

- They scan the input and use ocr to to split the answer into keywords
- Steps to evaluate Answer
 - Provide Answer Sheet in image
 - Provide keywords
 - The system will separate words from the given answer
 - check num.of words to desired length

- check amount of keywords

4. Results

- Manual evaluation takes ~60 seconds, automated takes ~15 seconds therefore 300% more time efficient
- The system is about 17-87.5% accurate compared to manual marking
- The automated system was generally either the same or slightly lower

1.1.2 Automatic Short Answer Marking

PAPER:READ

1. Introduction

- They are using short (3 mark) GCSE questions which are long enough to have many answers
- They use machine learning to write linguistic patterns for each question based on sample answers

1.1.3 Automatic Examination Grading Using Deep Learning Categorisation Techniques

PAPER:READ

- It is using exams from the Chinese version of the SAT (TOEFL)
- They used the ResNet-18 ConvNet on the ImageNet pre-training dataset based on image data
- They convert the problem into a multi-class task
 - label the dataset as a single image with a score-range label
- Dataset construction
 - They signed a confidentiality agreement with a high school
- results
 - in general an accuracy of about 85% was achieved over a 10 scores error and approx. 95% over a 20 scores error
 - for each subject there are different accuracies
 - * the accuracy is highest for chinese, english

1.1.4 Regression or classification in Norwegian

PA-

PER:READAGAIN

- they use the ASK corpus of Norwegian learner language with CEFR labels
- they compare using CNNs and Gated-RNNs
- The dataset contains norwegian learner essays from two different language tests
- the dataset contains information about mistakes, corrections, paragraphs and sentences
- reported metrics are macro and micro F1
- a disadvantage with using regression is that the distance between different classes is not always known
- they will further experiment with pretrained word embeddings
- they used a wide range of NN models for both CNN and RNN

1.1.5	Neural Networks for Automated Essay Grading	PAPER:READAGAIN
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2 Intro to programming

2.1 DESIGN IS THE MOST IMPORTANT PART OF CODING

just spend 10 minutes working out what ur going to do

3 Control Systems

3.1 Definition

- Any computer that manages, commands, directs or regulates the behavior of other devices or systems
 - They usually take in input, process it and output some output
 - open loop vs. closed loop i.e. the main two types of control systems

3.1.1 Open Loop systems

- input -> controller -> output -> Actuator -> Process

3.1.2 Closed Loop systems

- must have some sort of sensor & feedback loop
- Sensor -> Controller -> Actuator -> Process = change in condition which the sensor will respond to and change the input
- e.g. heating system

3.2 Examples

- automatic door openers
- central heating system
- washing machines
- in factories
- traffic lights
- lifts in buildings
- GPS systems
- most modern cars
- device drivers within oses
- intelligent devices e.g. alexa, siri, cortana, google assistant

3.3 Types of Sensors

- motion detectors
 - ultrasound
 - IR
- climate control sensors
 - thermostat
 - humidity
 - light
- security

- heat
 - smoke
 - sound
- process
 - pressure
 - pH
 - motion
 - position (camera)
- intelligent systems
 - voice
 - touch
 - tilt/accelerometers
 - biometrics
 - motion/gestures

3.4 Types of Actuators

- temperature
 - heating/cooling
- motion
 - motors
 - servos
 - hydraulics
 - pumps
- noise/vibration
 - buzzer
 - siren
- analogue displays
 - dials

- meters
 - guages
- displays/light
 - screens
 - bulbs
 - LEDs