**An Overview on Google’s Brain and its Applications**

**Google’s Machine Translation**

**Project Proposal**

1. **Abstract (A summary of the research topic)**

* An overview of how Google’s Neural Machine Translation functions and how artificial intelligence, machine learning, and neural network are related to Google’s Neural Machine Translation.

1. **Introduction of Artificial Intelligence:**

* Background and history

1. John McCarthy first introduced the term and he wrote an AI program in IPL

* How does AI work?

1. Knowledge Representation

* How facts become information, then become knowledge in AI

1. Reasoning

* What is reasoning
* How is it implemented? (tree algorithm, first order logic, and neural network)

1. Learning

* What is learning
* How does artificial intelligence system learn? (Reward Function)
* Applications and Products
  + 1. Introduce some applications that are being used in real life such as its application in intelligent tutor systems and electronic games.

1. **Introduction of Machine Learning**

* What is Machine learning and why do we need Machine learning

1. Find patterns in a big data to make predictions
2. The relationship with artificial intelligence

* Clarify its not just a database problem
* Explain how machine learning is related to artificial intelligence
* Applications of Machine Learning

1. List of different areas that machine learning has helped people in real life. (Robotics, medicine, etc.)
2. A few examples of Machine Learning Applications. (Learning Associations, classification, regression, unsupervised learning, reinforcement learning)
3. **Introduction of Neural Network**

* Explain the difference and similarities between biological neural network and artificial neural Network

1. Show details about neurons, activation energy, etc.

* Explain how artificial neural network work in simple terms.

1. Data training and data training algorithm

* What data training is.
* The difference between supervised and unsupervised training.
* How training algorithm works.

1. Error calculations (Error calculation formulas)

* Show some examples of error calculations and what these errors indicate.

1. Termination Conditions

* When the training process would stop.
* RNNs
  + What is RNNs
    - What is different between a RNNs and traditional neural network.
      * Gap/Loops
  + Success in speech recognition, language modeling, translation, image captioning.
  + LSTMs networks
    - Capable of learning long-term dependencies
    - Google LSTMs
* Applications (medical image screening, fingerprint identification, and hand-written digit recognition, etc.)

1. **Google Brain**

* Explain what Google Brain is and what they do

1. Google Brain’s history
2. Research Areas

* Show different research areas and introduce their work on neural machine translation.

1. **Neural Machine Translation**

* Neural Machine Translation (NMT)

1. Introduce and explain what NMT is.
2. Explain the weaknesses of NMT.

* Slower training and inference speed.
* Ineffectiveness in dealing with rare words.
* Sometimes failure to translate all words in the source sentence.
* Google Neural Machine Translation system (GNMT)

1. The difference between GNMT and NMT and how GNMT improves the weaknesses that presented in NMT.
2. Explain the strength of GNMT
   * + To improve inference time
     + To effectively find rare words (sub-word units)
     + Faster training
     + Translate all word at one time
     + stacked Long Short-Term Memory residual connection
3. Google Translate
   * + Implementation on Google translate(improvement)
     + Languages supported by GNMT
4. Model Architecture
   * + Three components an encoder network, a decoder network, and an attention network
     + stacked Long Short-Term Memory – (residual connection)
5. **(5%) Summary and conclusions**

Potential research:

-Improvement: GNMT can still make significant error than humans.

-Better neural networks.

-Apply to different fields.

1. **(5%) References**

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