人工智慧作業報告簡報

信息工程學院 2021 級 干皓丞 2101212850

Performance Effectiveness of Multimedia Information Search Using the Epsilon-Greedy Algorithm

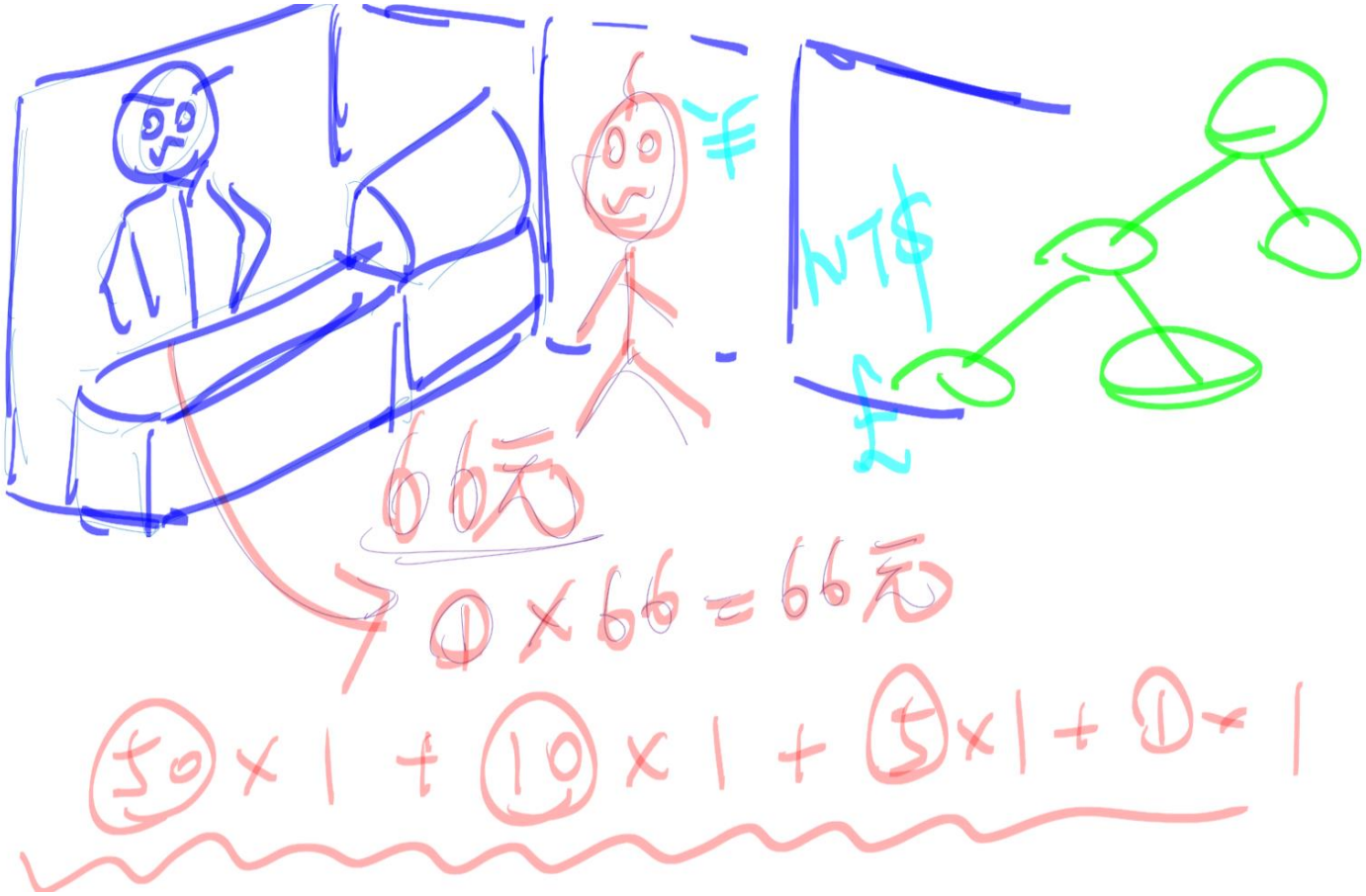
使用 Epsilon-Greedy 演算法進行多媒體資訊搜尋的表現上的效能

(研究者想要看這玩意會不會比較棒)

https://ieeexplore.ieee.org/document/8999097

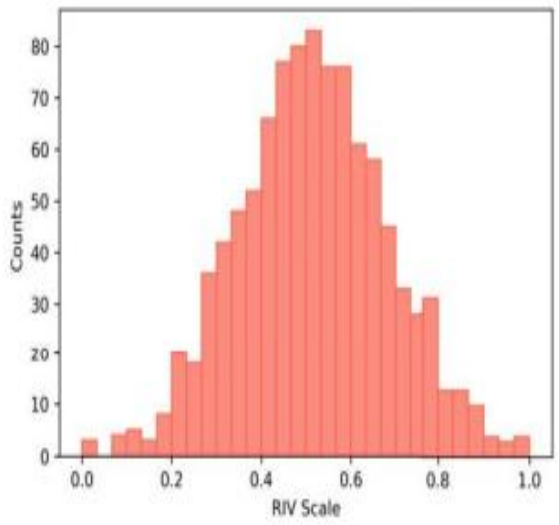
Published in: 2019 18th IEEE International Conference On Machine Learning And Applications (ICMLA)

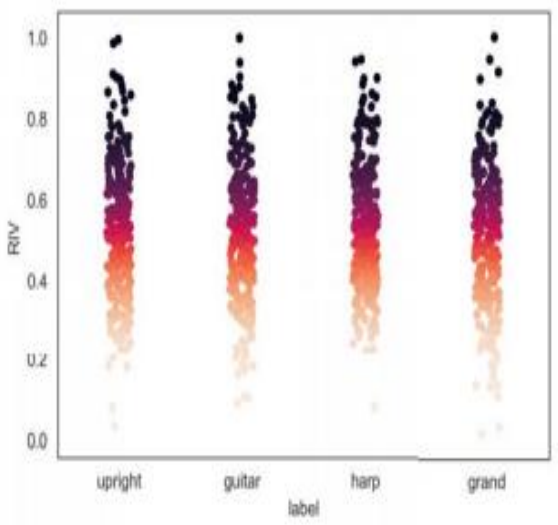
Motivation 动机

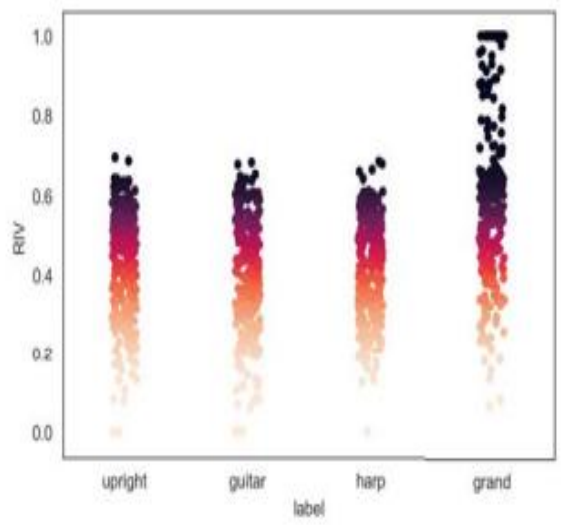


在此該研究團隊是想要利用貪心算法來處理多媒體搜尋的問題，也就是所謂的多媒體信息檢索 (MIR; multimedia information retrieval)

Intuition 直觉







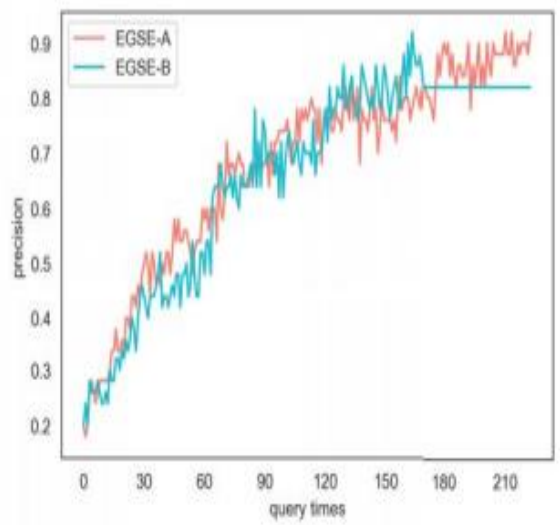
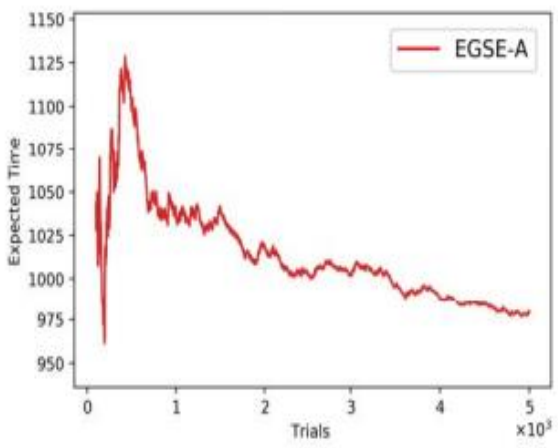
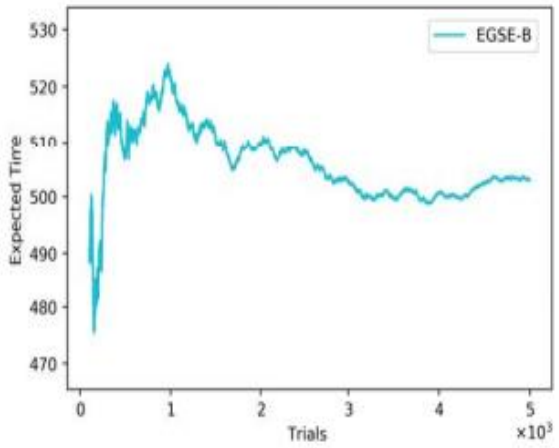
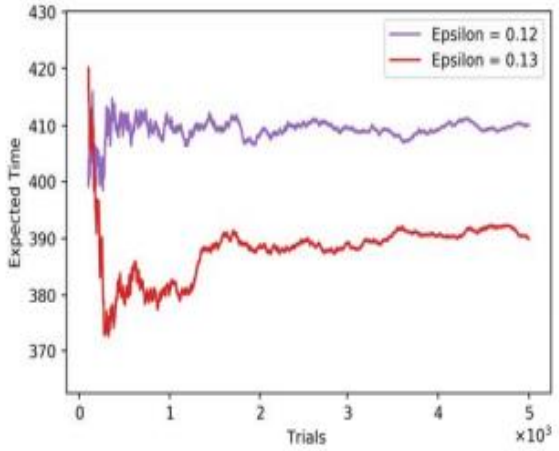


Fig. 3. Distribution of Initial RIV Scores. Fig. 4. Distribution of Initial RIV Scores for Each Category (EGSE-B). Fig. 5. Distribution of RIV Scores for Each Category When Hidden Object X is Discovered (EGSE-B). Fig. 6. Evolution of Query Precisions against Query Times. Settings: $N = 1000, M = 50, \epsilon = 0.1$.

Justification 理由







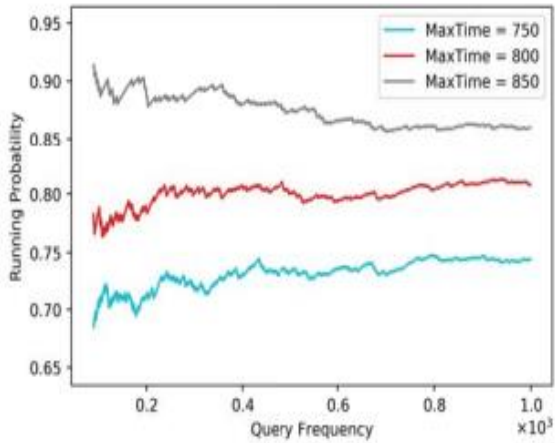


Fig. 7. Expected Discovery Time of EGSE-A. Fig. 8. Expected Discovery Time of EGSE-B. Settings: N = 10000, M = 100, ϵ = 0.1. Fig. 9. Expected Discovery Time of EGSE-B with $\epsilon = \{0.12, 0.13\}$. Fig. 10. Probability of Discovering the Most Relevant Object in EGSE-B with Time Constraints.

Framework 框架

研究團隊在 Reinforcement Learning 框架下，使用Epsilon-Greedy 演算法進行研究。

Algorithm 1 EGSE-A: Search Space Exploration with Constant Probability

Require: epsilon E, length of result list M, query max counter C

Initialize terminating condition $\Delta \leftarrow False$,
Initialize query counter $\Theta \leftarrow 0$,
Initialize exploration proportion $R \leftarrow E \times M$,
Initialize exploitation proportion $K \leftarrow (1 - E) \times M$,
while Δ == **False** **do**
    Retrieve and parse new user query Q
    Determine $S_1 = \{O_i \mid$ objects with the highest relevant scores$\}_{i=1}^{k}$, where $|S_1| = K$
    Determine $S_2 = \{O_j \mid O_j \in S_1^{\complement}\}_{j=1}^{R}$, where $|S_2| = R$
    Present M-list := $S_1 \cup S_2$ to user
    Capture object click information from user
    Increment the score of clicked objects
    $\Theta \leftarrow \Theta + 1$
    if $\Theta == C$ **then**
        $\Delta \leftarrow True$

Algorithm 2 EGSE-B: Search Space Exploration with Variable Probability

Require: epsilon E, length of result list M, query max counter C

Initialize terminating condition $\Delta \leftarrow False$,
Initialize query counter $\Theta \leftarrow 0$,
Initialize exploration proportion $R \leftarrow E \times M$,
Initialize exploitation proportion $K \leftarrow (1 - E) \times M$,
Initialize previously presented M-list for Query Q_i as $S_i \leftarrow \emptyset$, for all possible i
while Δ == **False** **do**
    Retrieve and parse new user query Q_i
    Determine $S_1 = \{O_l \mid$ objects with the highest relevant scores$\}_{l=1}^{k}$, where $|S_1| = K$
    if $|(S_1 \cup S_i)^{\complement}| \geq R$ **then**
        Determine $S_2 = \{O_j \mid O_j \in (S_1 \cup S_i)^{\complement}\}_{j=1}^{R}$, where $|S_2| = R$
    else
        Determine $S_2 = (S_1 \cup S_i)^{\complement}$, where $|S_2| = |(S_1 \cup S_i)^{\complement}|$
    Present M-list := $S_1 \cup S_2$ for query Q_i to user
    $S_i \leftarrow S_i \cup S_1 \cup S_2$
    Capture object click information from user
    Increment the score of clicked objects
    $\Theta \leftarrow \Theta + 1$
    if $\Theta == C$ or $(S_1 \cup S_i)^{\complement} == \emptyset$ **then**
        $\Delta \leftarrow True$

Result 结果

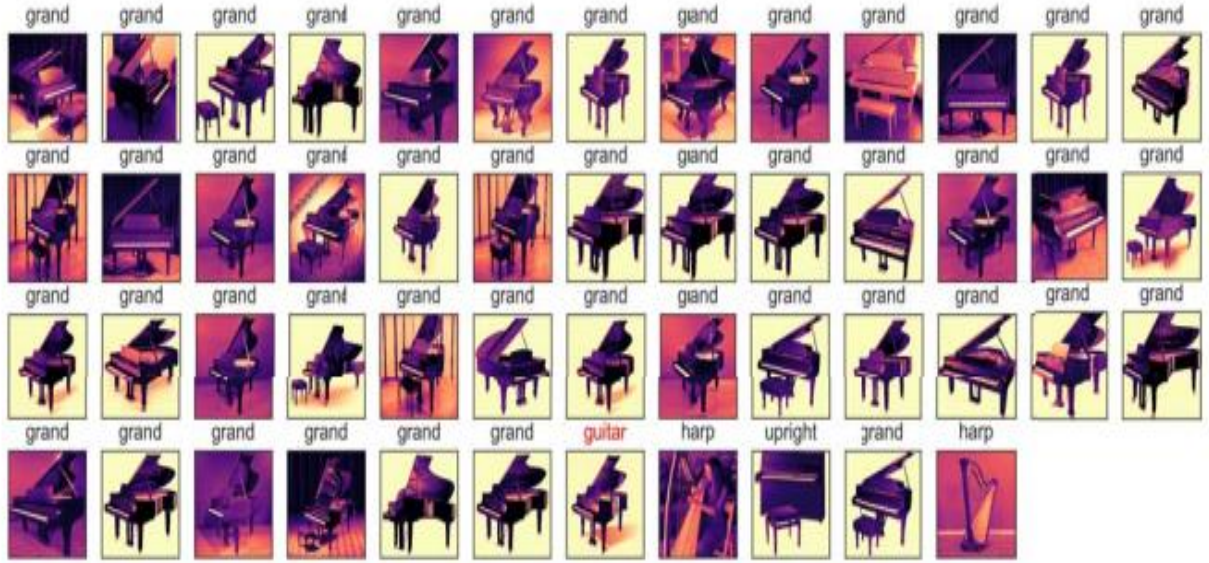


Fig. 1. Sample Images from Dataset (Size = 50). Fig. 2. Final Returned M-list using EGSE-A. Settings: $N = 1000, M = 50, \epsilon = 0.1$.