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EFORT Abstract Submission

General Orthopaedics
Bone and joint tumours

EFORT12-2247

SWARMS SEARCH FOR CANCEROUS LESIONS: Artificial Intelligence Use for Accurate Identification of Bone Metastasis on Bone Scans.

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Have you previously submitted this study for another congress?: No
Presentation Method - Preference: Oral or E-Poster

INTRODUCTION: The skeleton is the third most common target of metastatic cancer and can be one of the earliest sites affected, especially in individuals with breast or prostate cancer **(1).**Operative treatment may be required for an impending or existing fracture. The goals of surgery are to provide local tumor control and allow immediate weight-bearing and function. Detailed preoperative evaluation is required to assess the local extent of bone destruction. Bone Scans (BS) is the most widely used method for evaluating skeletal metastases. We are using a computer program based on -Stochastic Diffusion Search (SDS)- which is an Artificial Intelligence algorithm for the first time to interpret Bone Scans.

OBJECTIVES: To optimise the interpretation of Bone Scans using a computer programme based on an Artificial Intelligence algorithm- Stochastic Diffusion Search (SDS)-.

METHODS: The mechanism of SDS algorithm is best explained by using the Mining Game metaphor **(3)** in which every miner resembles an SDS agent. The search area is divided into hills. The goal of the agents will be o find a hill with the maximum amount of gold. At the end of each day, the miners congregate and each unhappy miner selects another miner at random for communication (happiness is proportional to amount of gold found). If the chosen miner is happy, he shares the location of his hill and thus both now maintain it as their hypothesis, h; if not, the unhappy miner selects a new hill hypothesis to mine at random. As this process is isomorphic to SDS, miners will naturally self-organize to congregate over hill(s) of the mountain with high concentration of gold.
In this paper 14 Bone scans were used. All of the original scans were interpreted by a specialist radiologist to provide the study with the control data. The original & post processing scans were then examined by 23 junior doctors (2-3 years post-graduate). Every subject had to clear identify all the metastatic lesions on every BS.

RESULTS: The results did show that 17 out of 23 of the subjects (74%) did identify all the metastatic lesions on all original BS, whereas 21 out of 23 (91%) did identify all the lesions on all the SDS processed BS. SDS algorithm exhibits a promising ability to recognize cancerous regions. The SDS algorithm clearly identified the metastatic lesions in the bone scans and produced accurate and easily interpretable results, revealing areas of high uptake, including areas difficult to identify using the conventional methods of interpreting the BS.

CONCLUSION: The reproducibility and the accuracy of the SDS algorithm can be utilized in developing a standardized system to interpret the bones scans with greater confidence.
This technology can be effectively employed to develop programs for teaching and training medical students and junior doctors.

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Disclosure of Interest: None Declared

Keywords: Artificial Intelligence , Bone Scan, Lytic Lesions, Pattern Recognistion, Stochastic Diffusion Search Algorthim, Swarm Intelligence