Proposed RL Solution for Fighting Skin Diseases: Eczema

Abdoulaye Barro,
Edwige Carole Fosso,
Aimanble Ishimwe Manzi,
Lloyd Acquaye Thompson

January 2019

1 Introduction

Over the years researchers have shown that using Artificial Intelligence concepts like Neural Networks and Reinforcement Learning, has the tendency to understand medical problems even more than experts. The human skin is vital because it is the obvious part to the public. The skin is an outer tissue that has the capacity to protect, regulate and sense the environment. Applications of Reinforcement Learning in the medical field, is on the increase and has seen tremendous ascendancy in scientific publications. There are a number of skin disorders including acne, hives, eczema, vitiligo and skin cancer, some are treatable and others like skin cancers has not seen much of a breakthrough.

1.1 Objective

The main goal of this project is to proposed a solution for fighting skin diseases using Reinforcement Learning, and our focus is on Eczema, which happens to be one of the commonest skin diseases in Africa. We believe this is feasible and when completed, would be a new face for understanding the dynamics for treating other skin cancerous ailments.

2 Literature

In 2007, researchers from Stanford University published a finding on using A.I to identify skin tumors, this turned out to be a breakthrough in the industry. They trained a CNN with over 120,000 datasets of clinical images consisting of 2030 diseases. In the paper "Dermatologist-level classification of skin cancer with deep neural networks", they stated that using state of the art machine learning classifiers are superior to human experts.

3 Methodology

3.1 Environment

In this project the environment is the affected part of the skin, and it could be malignant or benign. This is where the agent lives and takes decisions.

3.1.1 State

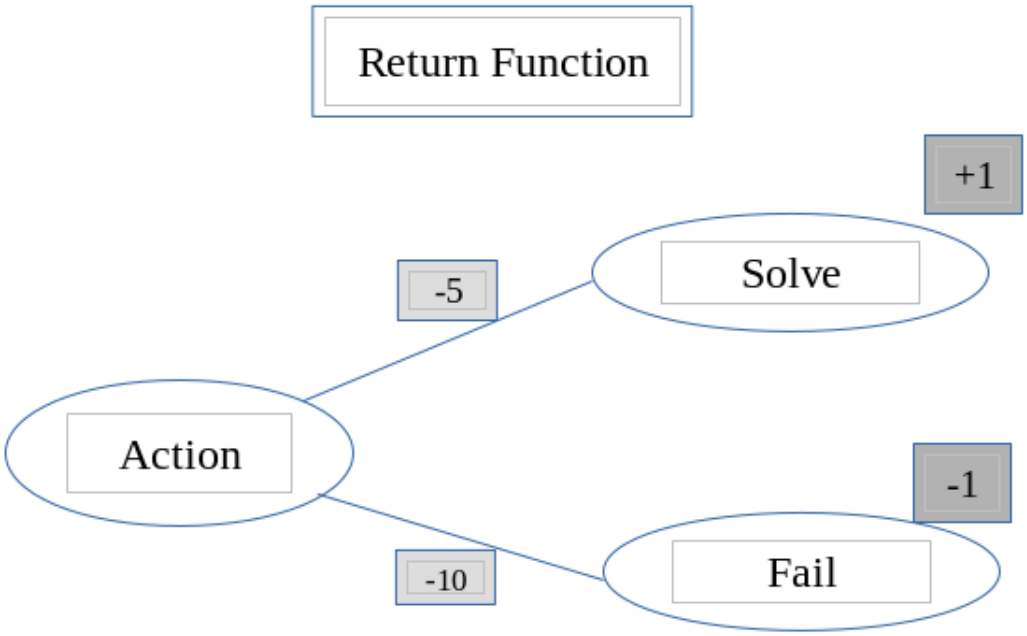
We are identifying the state as the position of the agent as it moves towards the middle of the concentrated area.

3.1.2 Action

The action of the agent would be generated randomly, with a policy that focuses on the direction of the state with the highest affected cell.

3.1.3 Reward

This will be the feedback from our environment to indicate whether the agent is learning according to the policy. The agents gets a Return of (+1)Pass, if it is able to complete the entire trajectory with leave no infection behind. A feedback of (-1)Fail, if the trajectory is completed but it is not able to clear the entire skin area. When the agent meets a single cell and is able to defeat it, then it gets a reward of -5, otherwise a (-10) is sent as a feedback.



4 Feasibility

This project is feasible based on the history of skin treatment, and the breakthrough of using scientific tools, including deep learning frameworks. Reinforcement Learning has the capacity to explore data and bring out intrinsic details.

4.1 Potential Impact

The outcome of this project will enable practitioners to develop an efficient and long term treatment to skin related diseases. Also, this can serve as a baseline for understanding skin cancer with a Reinforcement Learning approach.

5 Limitations

The practical implementation of our project require adequate laboratories, enough medical data to be able to detect and simulate the relationship between skin diseases and their treatment. We also foresee changes in our result since different diseases behave differently and might be a challenge to generalise on the outcome. We will have to work hand in hand with specialists, especially dermatologist in order to get an insight of the biological make up of the skin. Expert domain field knowledge will be mandatory to understand the dynamics of skin treatment and unforeseen assumptions.

6 Conclusion

References

[1] Scherer PE Kruglikov IL. *General theory of skin reinforcement. PLoS ONE 12(8): e0182865.* https://doi.org/10.1371/journal.pone.0182865, 2017.