# Week 6 - 8 Summary

## Week 6

### Research

Week 6 was the week of my birthday in this time I had taken several days off to celebrate with my family and had the unfortunate situation of contracting a cold. During this time, model research and loss function research had been done. Loss functions are made to influence the learning pattern to move towards a goal or a desired outcome. In my model I realised that this is not something we want, however it is a key component of Reinforcement Learning. To counter this, I made something which I call a decision loss. Which takes the output from the Neural Network as a reward of the action chosen and designate it themselves.

### Implementation

This week there was no implementation completed.

## Week 7

### Research

Week 7 ran into some issues. This was that the system that is used to see the world was using in-place operations and was causing the system to crash when going through the learning loop. However, this wasn’t immediately known and time was spent trying to figure out why the system wasn’t working. Now that the problem has been discovered, steps are being put forward to learn how to handle the situation.

### Implementation

In this period, the refinement of the learning loop and implementation of the loss function has been done. In addition, the vision portion of the system has been removed. This means that the agents in the system can no longer see, in addition their ways of communicating with the world has been removed. However, there are some values that remain such as the agent needs and agent life. So with just information on these values the agent is living blind in this world.

However, running the system with the agent being blind has now shown that the agent is able to learn about the environment through interactions. Overtime, the agent learns where food is located and will return to that position.

How does it all work? The loss function that I have created takes the actions and self determined rewards from the Neural Network and trains on these values at every step. Then after a certain doubling time, the number of moves before a training loop doubles. What this does is make is so the agent starts off creating a reward system in the world through its interactions. In the real world we are learning all the time, however this isn’t ideal as it means that all decision are based off a one turn understanding of the world. In reality, this isn’t the case. To create what I determine to be “long term” thinking, the system takes more steps before learning. This means that instead of one turn per decision, it turns into two, then four, then eight, etc. Until the system has come to a point where it no longer is learning as the period of time is longer than our simulation time would be. At this point we can claim that the agent has achieved long term decision making and is at its final state.

However, this has a downfall. Using this type of learning system means that the agents are basing their entire understanding of the world on their interactions made in the beginning. Things introduced later on will have much less of an impact of the mental state of the agent. What is the problem there? If the agents doesn’t learn how to survive in the first few doubling times, it never will. In addition, if the agent learns only one need, it will stick to that forever. Intelligent Creatures are creatures of habit and open to learning.

This is where an explorative feature is included. Rather than always going with the choice made by the Neural Network, there will be a exploration factor. A percentage that constantly is being dropped that makes the action a random action. The random action should make it so the system doesn’t fall into habits early on. The other value, is the hyperparameter of doubling time. This one is currently controlled by me, however, I hope find a way to make this value disappear and become reliant on the agents ability to live. Therefore, when the agent is able to sustain itself, it will increase it’s timespan of learning.

So where are we at this point? The system is working. The agents are able to learn, survive, and meet their needs. The map is currently functional. The social aspect has yet to be introduced due to the vision of the agents causing problems.

## Week 8

### Research

Due to the passing of my grandfather, I have flown to Alberta to help my family through this situation and funeral. During this period, I will have my progress slowed quite a lot. However, I want to find either an alternative to the vision issue that is currently harbouring the system. In addition, I had scheduled to meet with some of the AI professors. However, the meets have been postponed until my return to Victoria. I will try to find the solution on my own during this period.

I also have to look into whether it is worth it to save the best version of the model and ignore learned values that worsen the efficiency of the agent. Or whether learning poor behaviour is something we don’t want to stifle.

By the end of this week. Prototype 2 of the social AI will likely be complete and the goal of the course will have been complete. This means that we can now move into the more complex aspects of social culture and observe behaviour. I have made a list of things we can pursue.

* Creating Social Hierarchy through sociability
* See if tribalism will be replicated through familiarity in observable traits
* Creating family relation
* Removing Hyperparameters
* Making the environment more complex and simplifying the agents
* Agent – Agent communication
* Allowing agents to store resources

These are just ones I have come with on the spot. There was an issue that I have come to see. The system itself is starting to get more and more weighty in terms of computing power requirements.

### Implementation

This week there will be very little coding. However, I will be writing a document that will highlighting all the code we have gotten so far as we are now at a point of having a working prototype of AI Village. That feels so great to type. I want to make sure that I have all the details of the project and reasons of each decision made.