APPLIED SCIENCES FACULTY

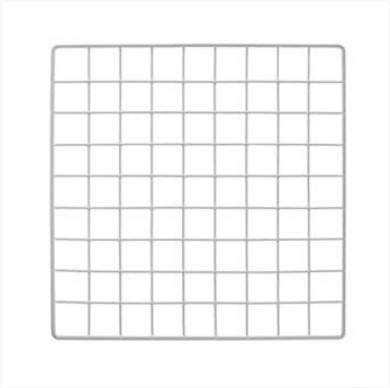
COVID-19

SIMULATION

USING CELLULAR AUTOMATA

SOCIETY

- Data taken from MDPI's(Multidisciplinary Digital Publishing Institute) research on the spread of COVID-19 in the state of Iowa and New York in 2020 during 4 months
- Provides an alternative to investigate virus spread mechanisms.
- Counts the number of people in different states -> visualization.



- Formation of the society:
  - add_people()
  - get_neighbors()
  - main()
- $qt = 0.7 - 0.1(C(t+1) - C(t))/(Ct*0.025)$

HUMAN

age gender coords immunity_coeff current_state
immunity_coefficient () setState() / getState()

$$P(i,j,t) = \frac{1}{8} \times \sum_{\substack{(m,n) \in N_{X(i,j)} \\ m = i \ or \ n = j}} \left\{ P_{X(i,j),X(m,n)}(t) \right\} + \frac{1}{8\sqrt{2}} \times \sum_{\substack{(m,n) \in N_{X(i,j)} \\ m \neq i \ and \ n \neq j}} \left\{ P_{X(i,j),X(m,n)}(t) \right\}$$

State design pattern ...

In State pattern a class behavior changes based on its state. This type of design pattern comes under behavior pattern.
In State pattern, we create objects which represent various states and a context object whose behavior varies as its state object changes.

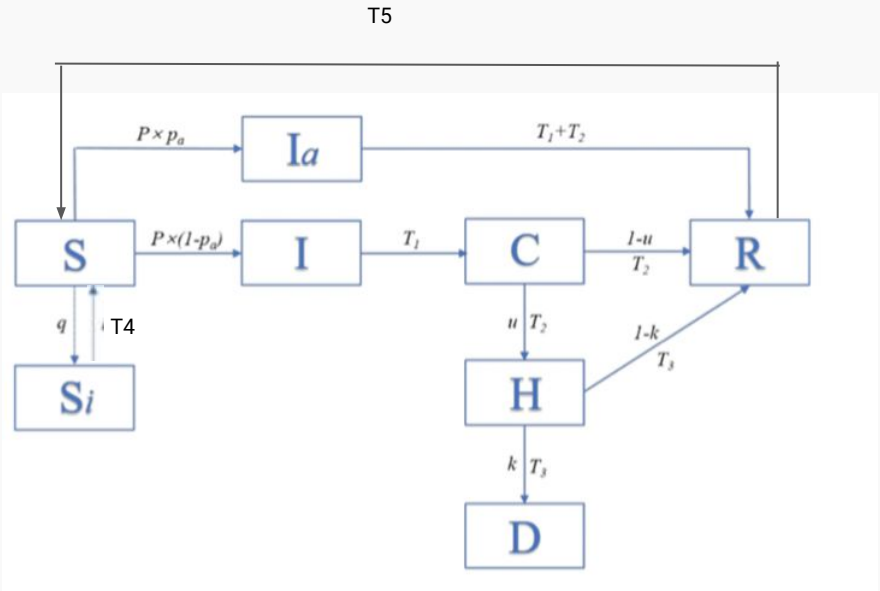
```python
class State(ABC):
    def __init__(self, human, data):
        self.human = human
        self.data = data
        self.time = 0

    def tick(self):
        self.time += 1
```

```python
class Infected(State):
    def __init__(self, human, data):
        super().__init__(human, data)

        self.human.society.infected += 1

    def tick(self):
        super().tick()

        if self.time ≥ self.data["T1"]:
            self.human.society.infected -= 1
            self.human.setState(Confirmed(self.human, self.data))
```

STATES

01
SUSCEPTIBLE(S)

02
Self-isolated(Si)



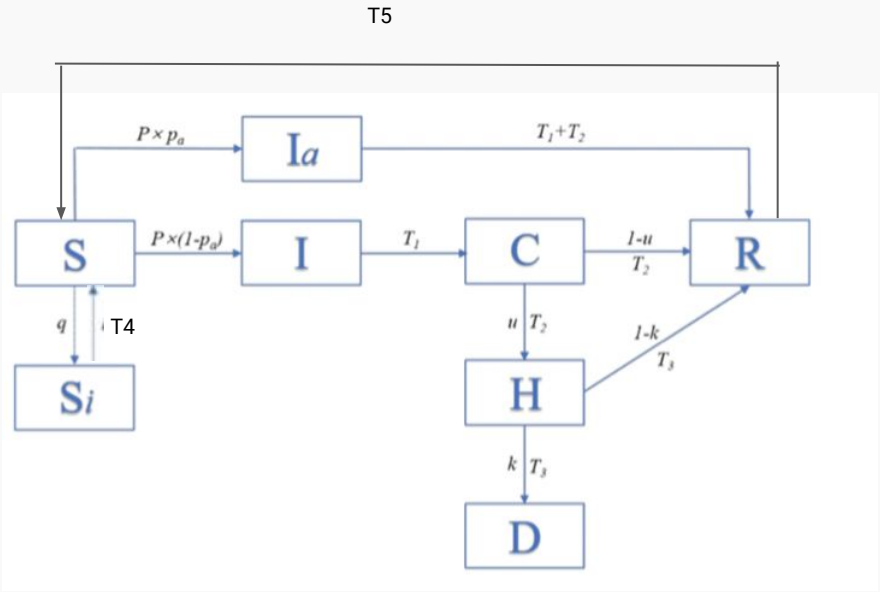
04
Asymptomatic(Ia)

03
Infected(I)

STATES

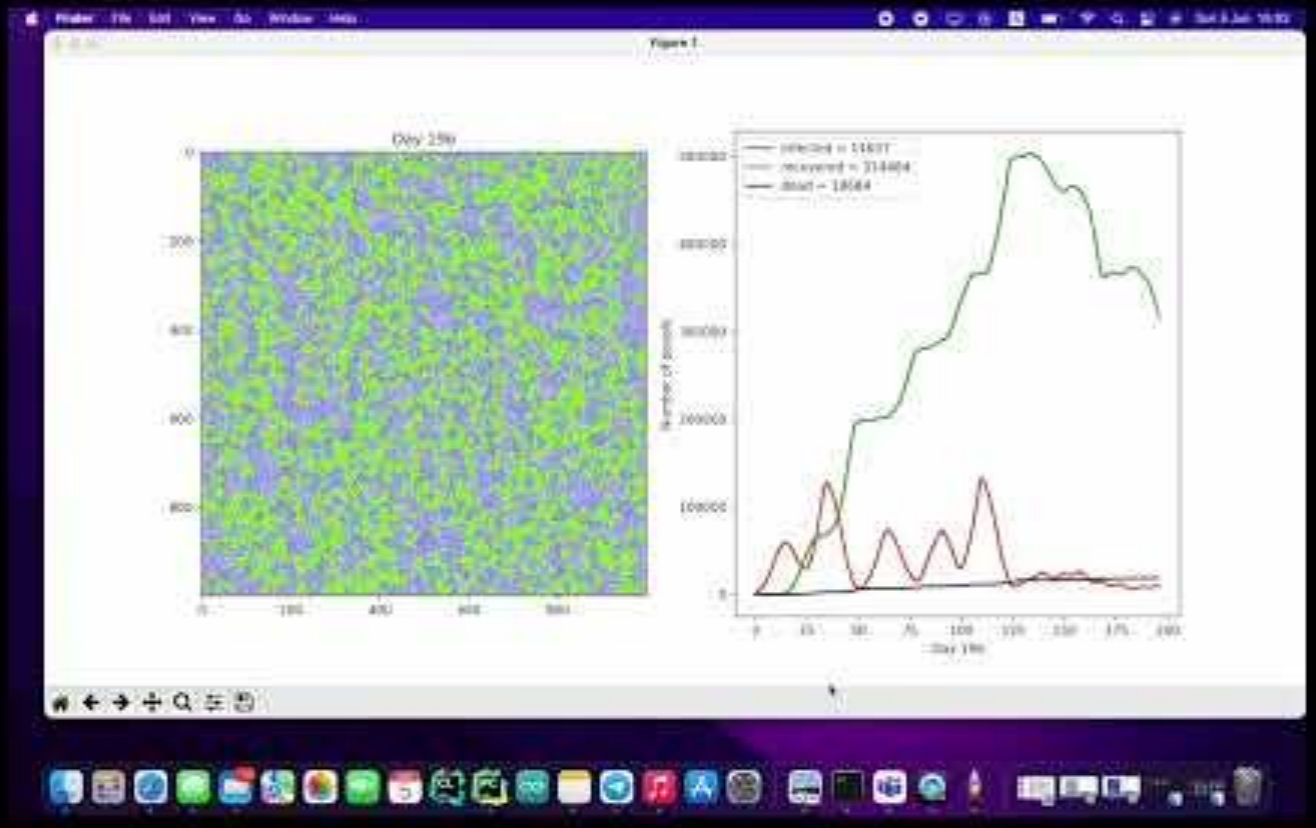
05
Confirmed(C)

06
Recovered(R)



07
Hospitalised(H)

08
Dead(D)



- Empty
- Susceptible
- Self-isolated
- Infected
- Confirmed
- Hospitalized
- Dead
- Asymptomatic
- Recovered

thanks for your attention