

# Assignment 8: Agent-Based Models

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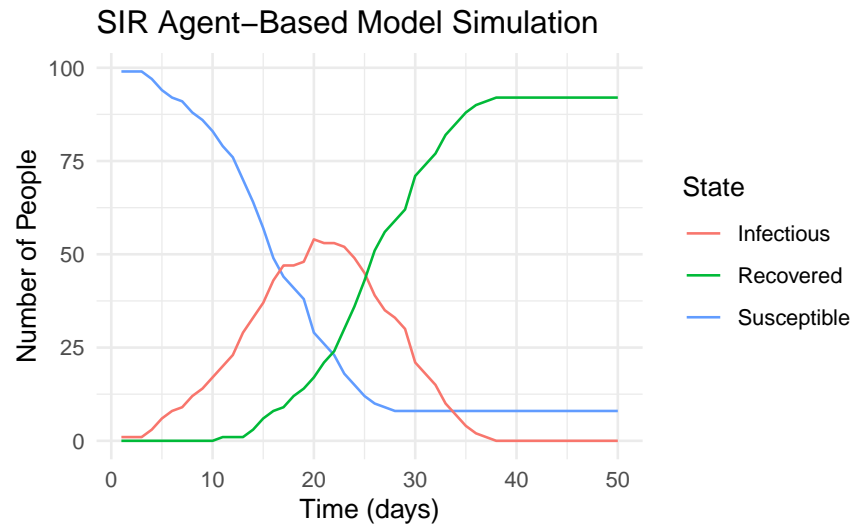
## Exercise 1

```
if (file.exists("results_ex1.rds")) {  
  results_ex1 <- readRDS("results_ex1.rds")  
} else {  
  results_ex1 <- run_abm()  
  saveRDS(results_ex1, "results_ex1.rds")  
}
```

- i. S, I, R
- ii. population\_size = 100
- iii. time\_steps = 50

## Exercise 2

```
library(ggplot2)  
  
ggplot(results_ex1, aes(x = time)) +  
  geom_line(aes(y = S, color = "Susceptible")) +  
  geom_line(aes(y = I, color = "Infectious")) +  
  geom_line(aes(y = R, color = "Recovered")) +  
  labs(  
    title = "SIR Agent-Based Model Simulation",  
    x = "Time (days)",  
    y = "Number of People",  
    color = "State"  
  ) +  
  theme_minimal()
```

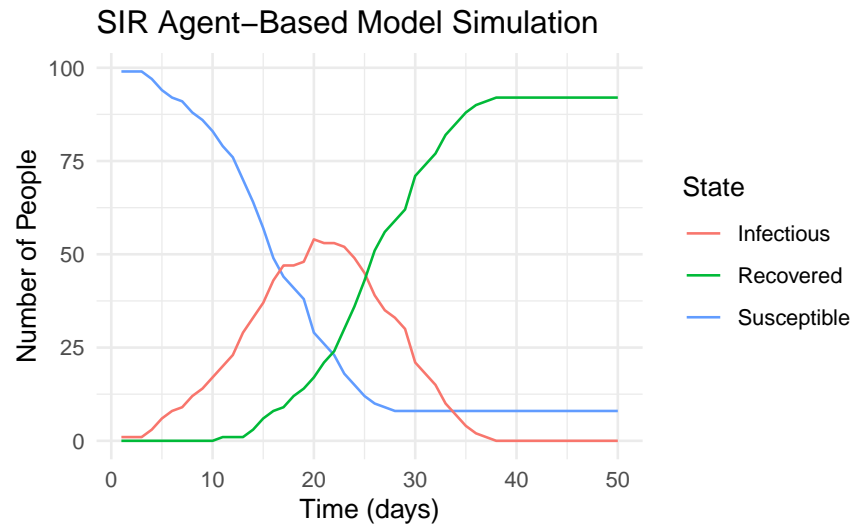


### Exercise 3

```
plot_sir <- function(.data, title) {
  library(ggplot2)

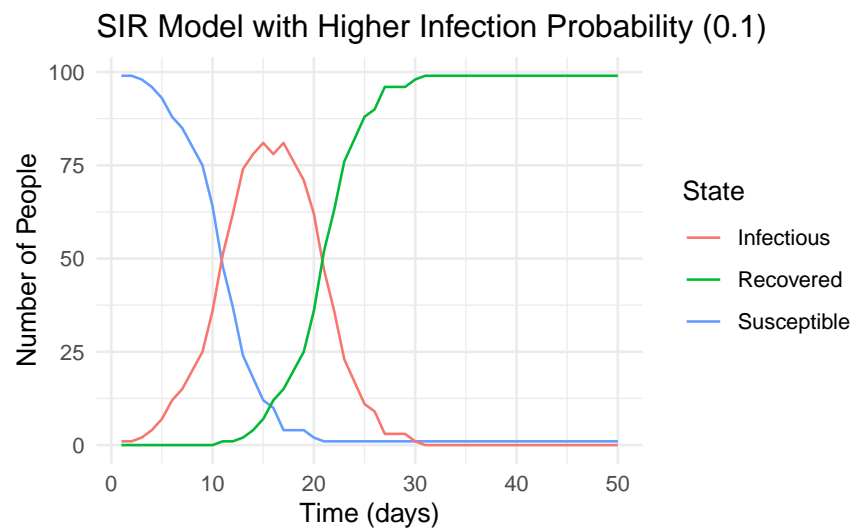
  ggplot(.data, aes(x = time)) +
    geom_line(aes(y = S, color = "Susceptible")) +
    geom_line(aes(y = I, color = "Infectious")) +
    geom_line(aes(y = R, color = "Recovered")) +
    labs(
      title = title,
      x = "Time (days)",
      y = "Number of People",
      color = "State"
    ) +
    theme_minimal()
}

plot_sir(results_ex1, "SIR Agent-Based Model Simulation")
```



## Exercise 4

```
if (file.exists("results_ex4.rds")) {
  results_ex4 <- readRDS("results_ex4.rds")
} else {
  results_ex4 <- run_abm(base_prob_infection = 0.1)
  saveRDS(results_ex4, "results_ex4.rds")
}
plot_sir(results_ex4, "SIR Model with Higher Infection Probability (0.1)")
```



**Exercise 5**

**Exercise 6**

**Exercise 7**

**Exercise 8**

**Exercise 9**