

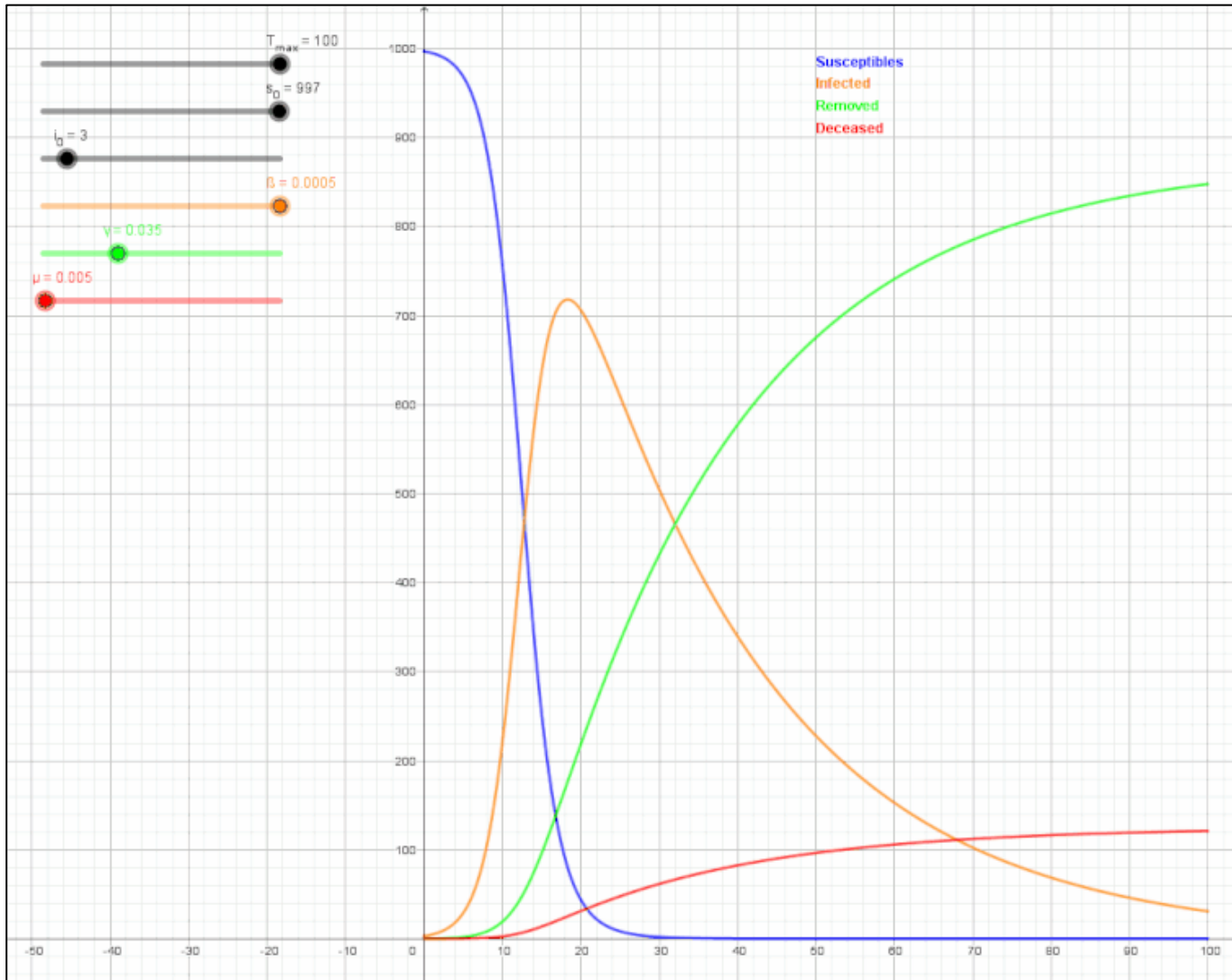


# GA - SIRD

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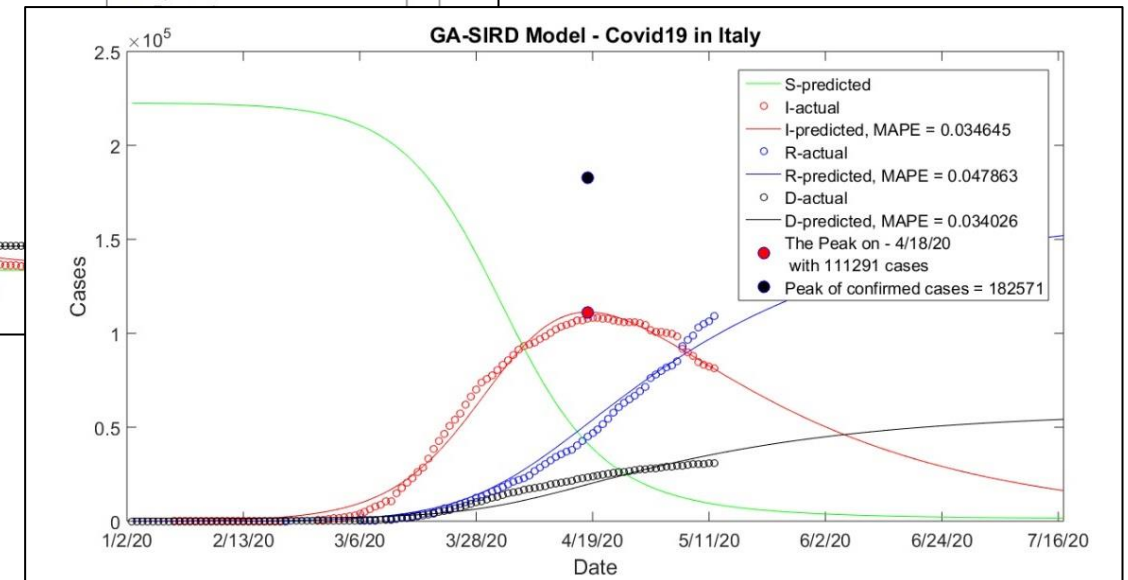
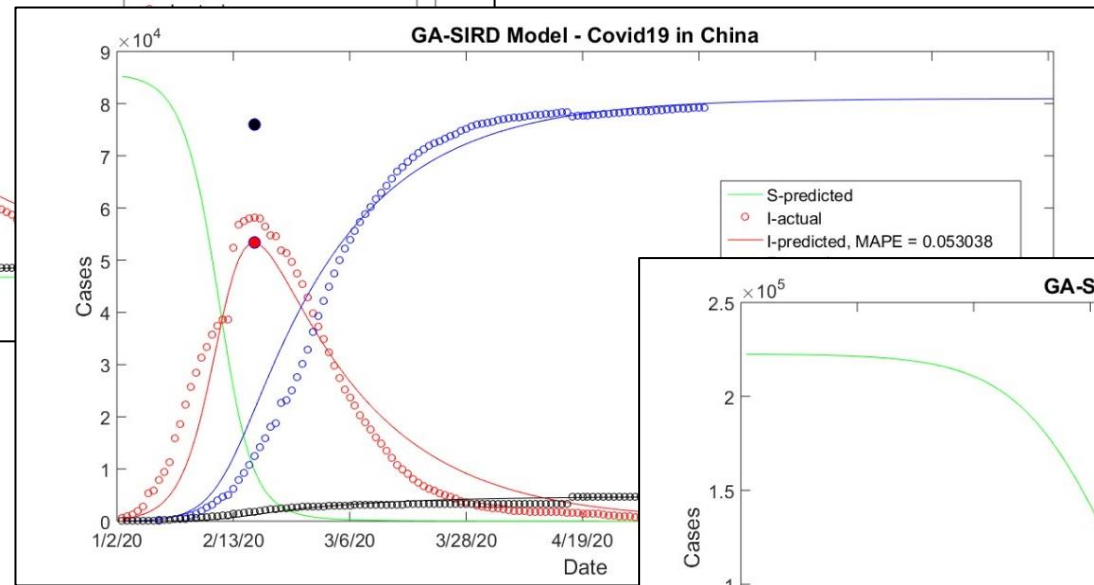
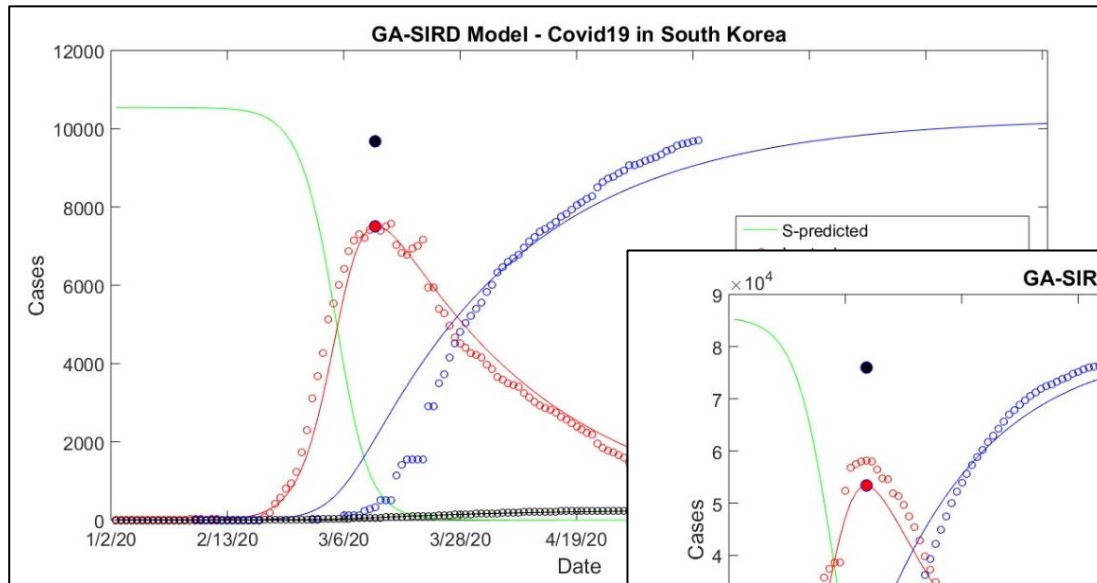
# GA - SIRD



Model SIRD bergantung pada nilai awal  $S_0, I_0, R_0, D_0$  dan parameter  $r, a, d$

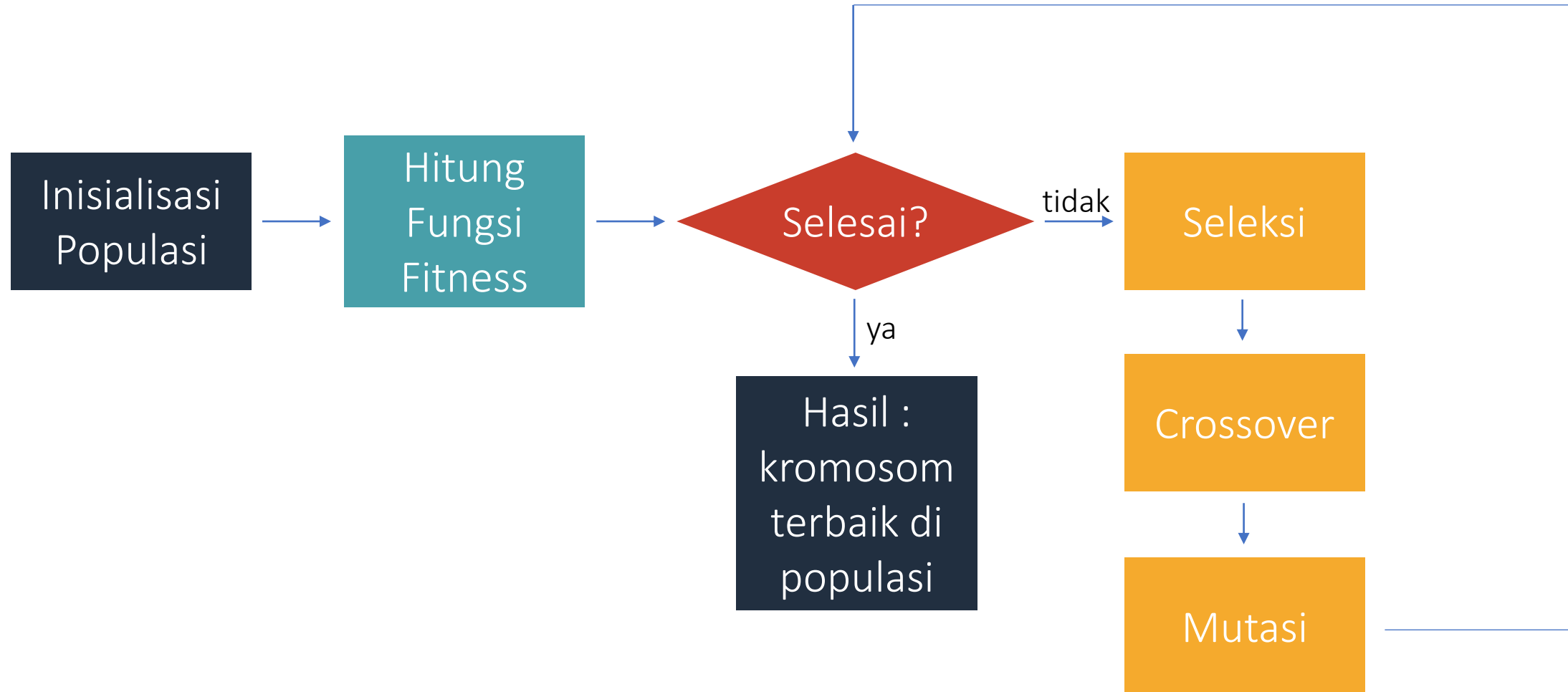
Tujuan dari GA - SIRD adalah menggunakan GA dalam mencari nilai awal dan parameter terbaik untuk model SIRD agar sesuai dengan kondisi nyata yang terjadi pada berbagai daerah

# Contoh Hasil GA - SIRD





# GA (Algoritma Genetika)



# Kromosom dan Populasi

Kromosom :  $x = (x_1, x_2, \dots, x_7) \in \mathbb{R}^7$

$$x_1 = S_0$$

$$x_2 = I_0$$

$$x_3 = R_0$$

$$x_4 = D_0$$

$$x_5 = r$$

$$x_6 = a$$

$$x_7 = d$$

Populasi terdiri dari 50 kromosom

# Fungsi Fitness

$$x = (x_1, x_2, \dots, x_7)$$

$$S_0, I_0, R_0, D_0, r, a, d$$

$$\hat{I}_k, \hat{R}_k, \hat{D}_k \text{ untuk } k = 1, \dots, n$$

$$\begin{aligned} S_{k+1} &= S_k - rS_k I_k \\ I_{k+1} &= I_k + rS_k I_k - (a + d)I_k \\ R_{k+1} &= R_k + aI_k \\ D_{k+1} &= D_k + dI_k \end{aligned}$$

$$Fitness(x) = RMSE(x) = \sqrt{\frac{\sum_{k=1}^n (\hat{I}_k - I_k)^2 + (\hat{R}_k - R_k)^2 + (\hat{D}_k - D_k)^2}{3n}}$$

# Crossover

$$x = (x_1, x_2, \dots, x_7)$$



$$x = (x_1, x_2, \dots, x_7)$$



Hitung  $Fitness(x)$

$$y = (y_1, y_2, \dots, y_7)$$



$$x' = \left( \frac{x_1 + y_1}{2}, x_2, \dots, x_7 \right)$$



Hitung  $Fitness(x')$



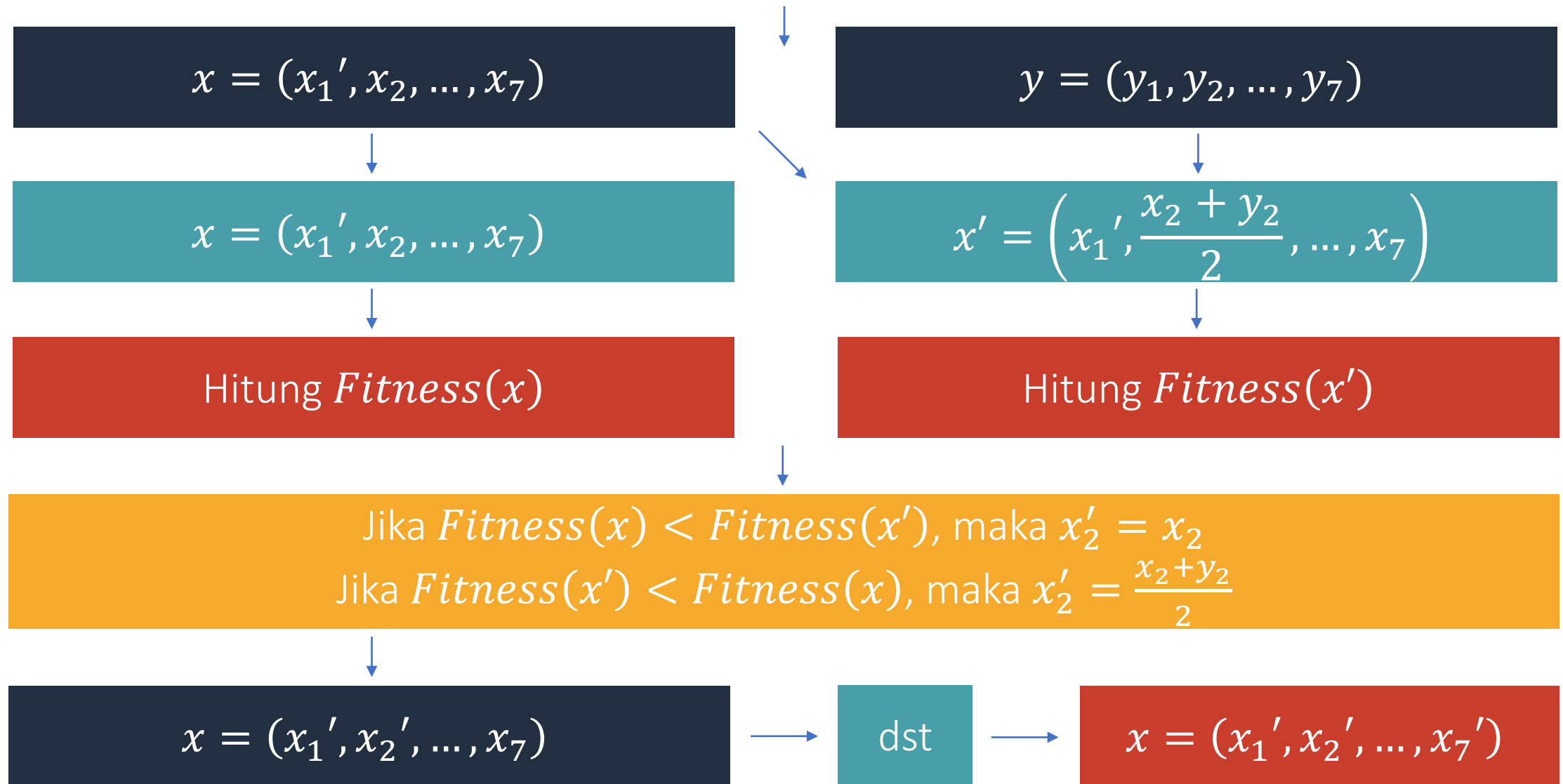
Jika  $Fitness(x) < Fitness(x')$ , maka  $x'_1 = x_1$   
Jika  $Fitness(x') < Fitness(x)$ , maka  $x'_1 = \frac{x_1 + y_1}{2}$



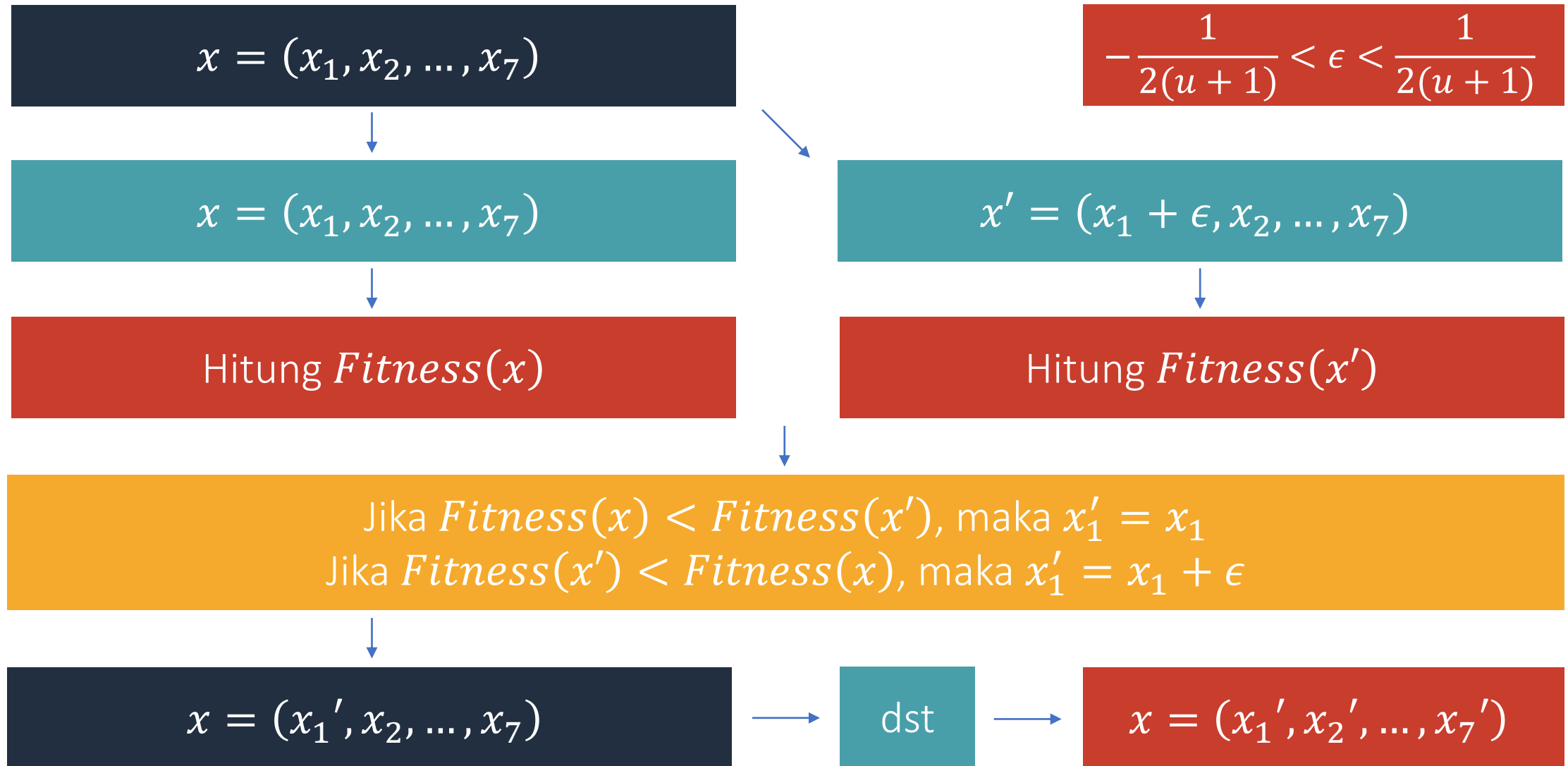
$$x = (x'_1, x_2, \dots, x_7)$$



# Crossover

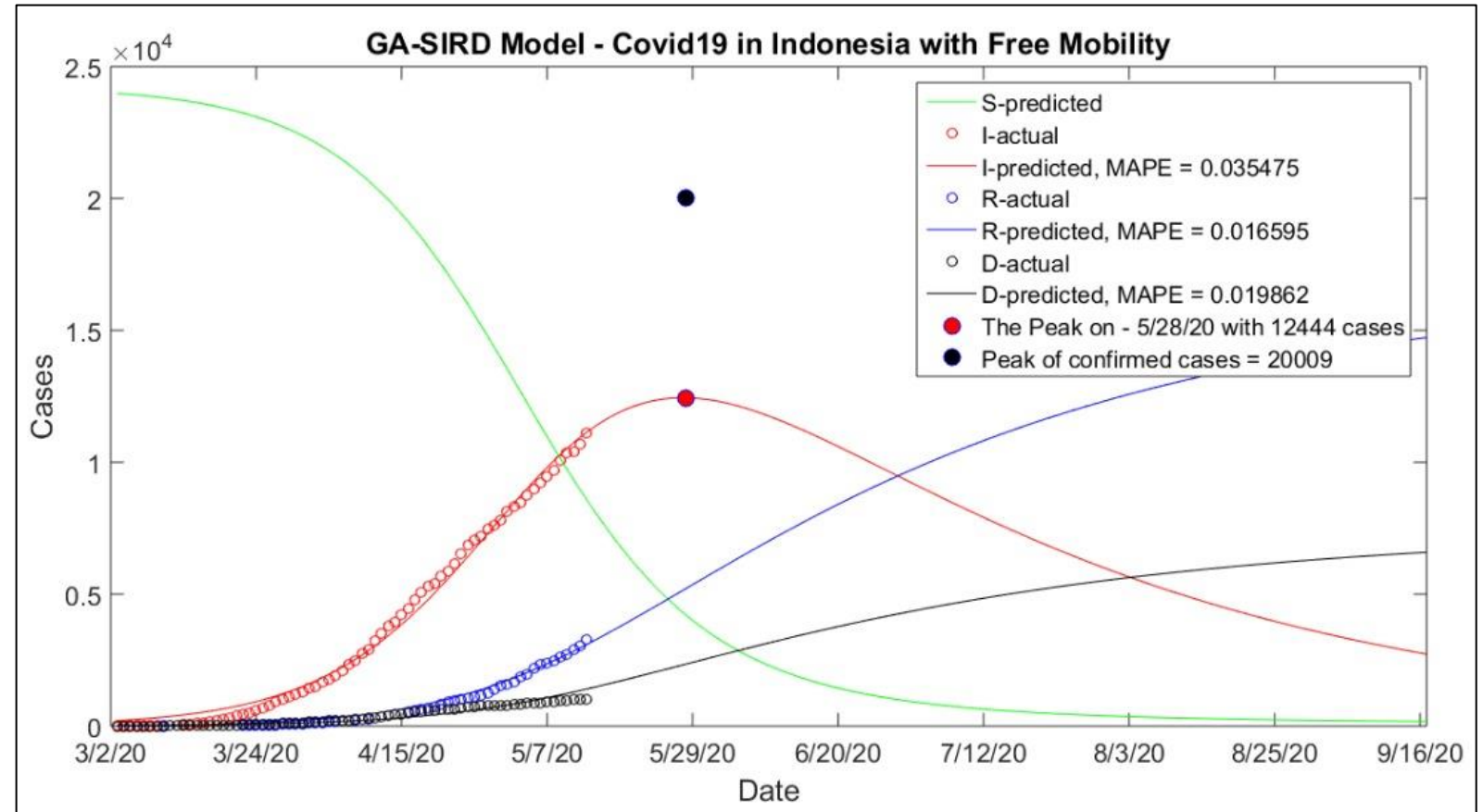






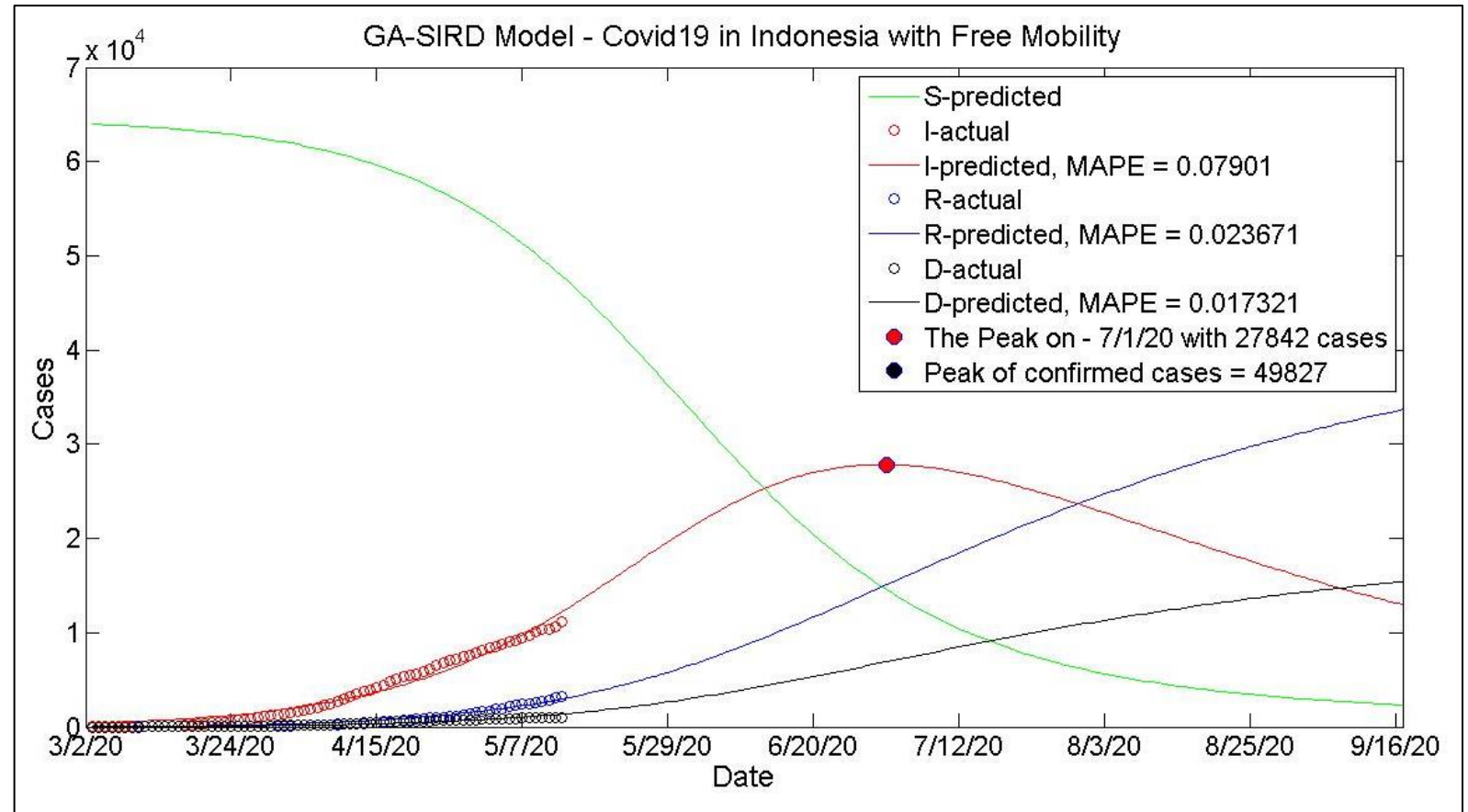
# Hasil GA - SIRD Indonesia (Best)

$$\begin{aligned}S_0 &= 24000 \\I_0 &= 190.9575921 \\R_0 &= 0 \\D_0 &= 27.71731586 \\r &= 3.86489 \times 10^{-6} \\a &= 0.011782318 \\d &= 0.005247983\end{aligned}$$

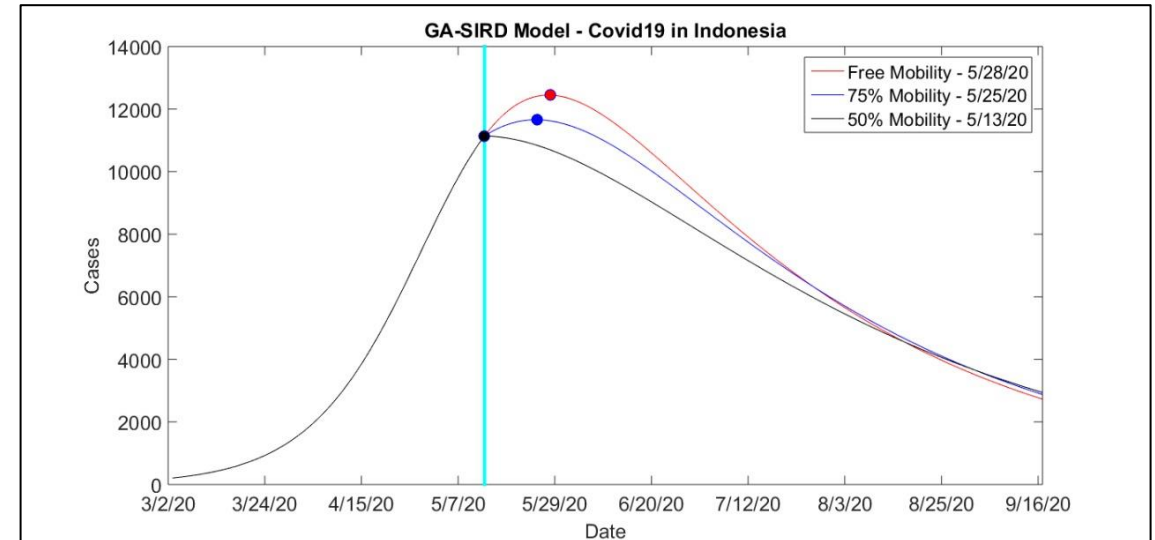
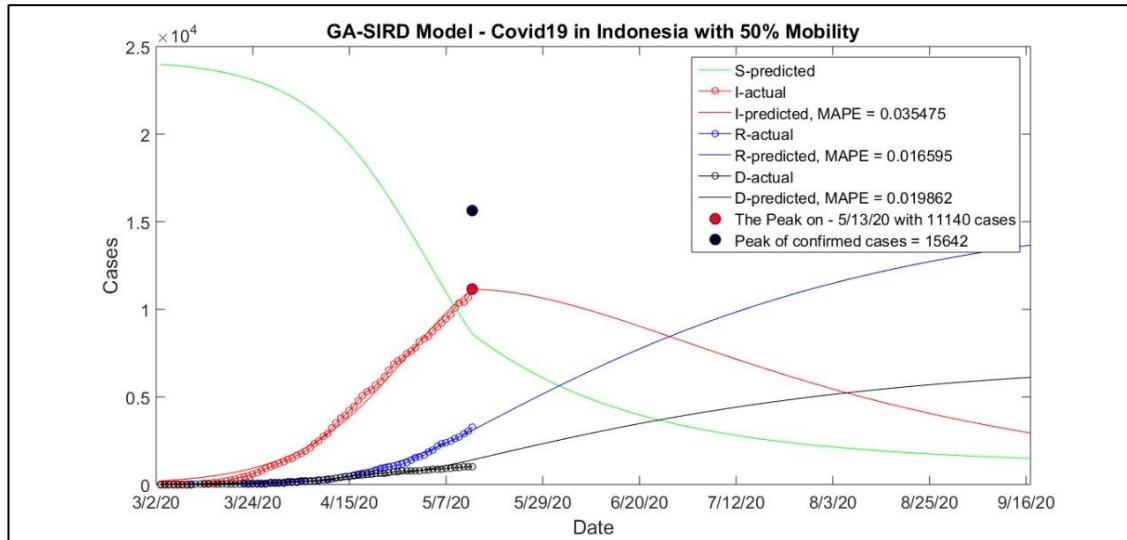
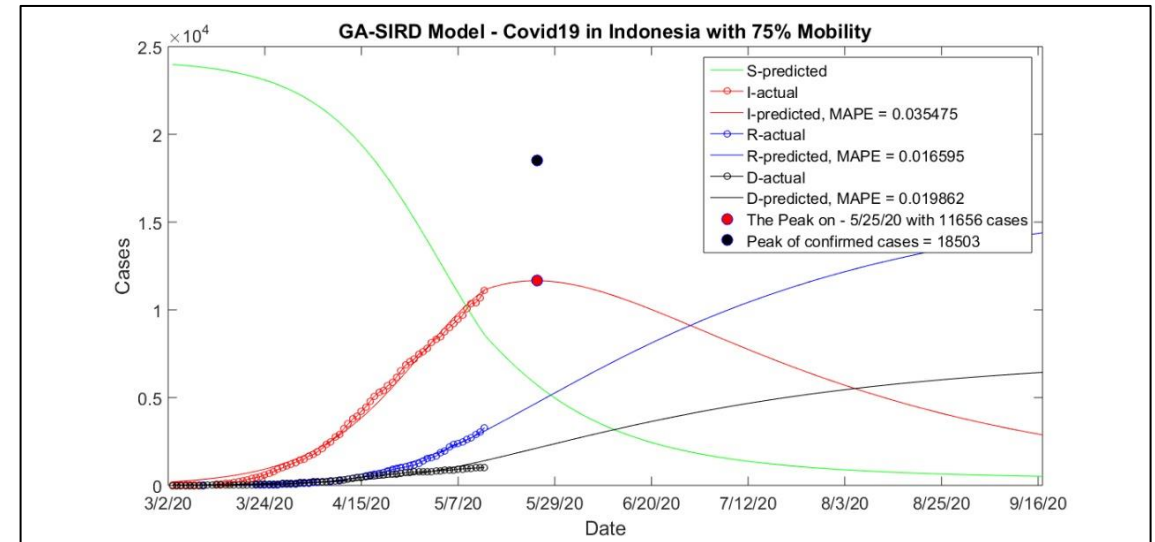
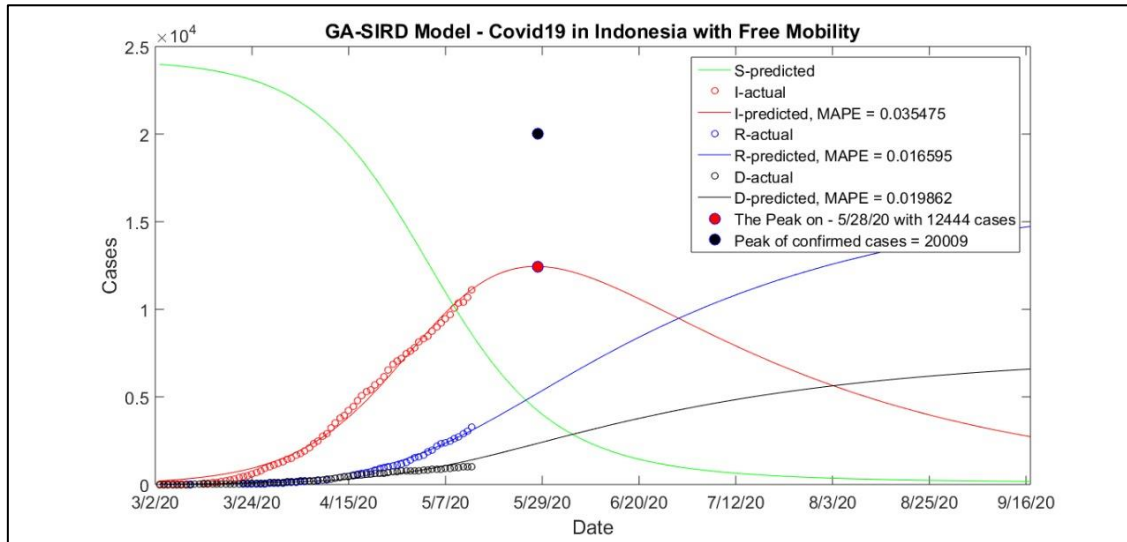


# Hasil GA - SIRD Indonesia (Umum)

$$\begin{aligned}S_0 &= 64000 \\I_0 &= 399.654968 \\R_0 &= 0 \\D_0 &= 6.445172427 \\r &= 1.09148 \times 10^{-6} \\a &= 0.011245318 \\d &= 0.005149349\end{aligned}$$

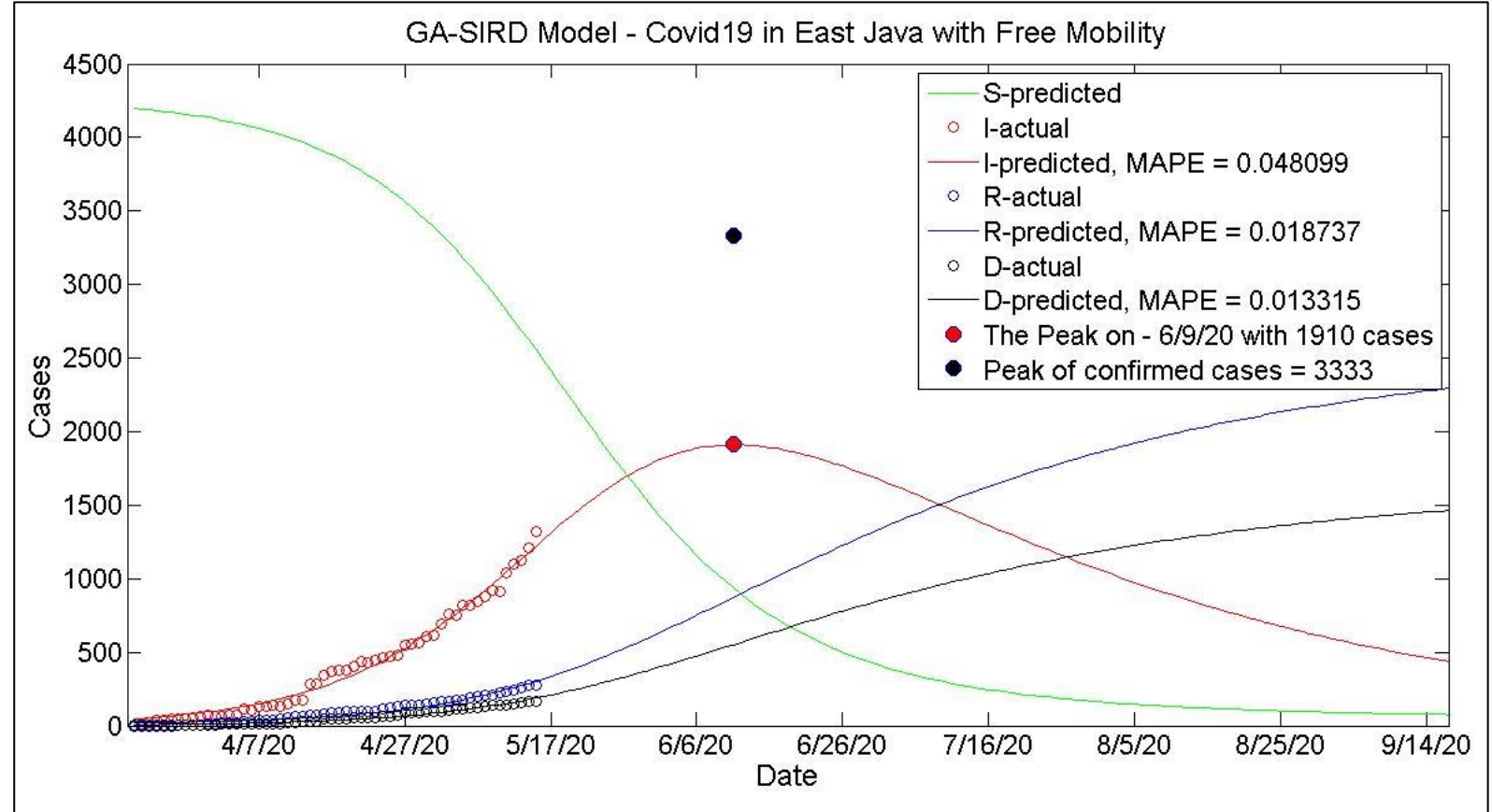


# Hasil GA - SIRD Indonesia (Faktor $r$ )



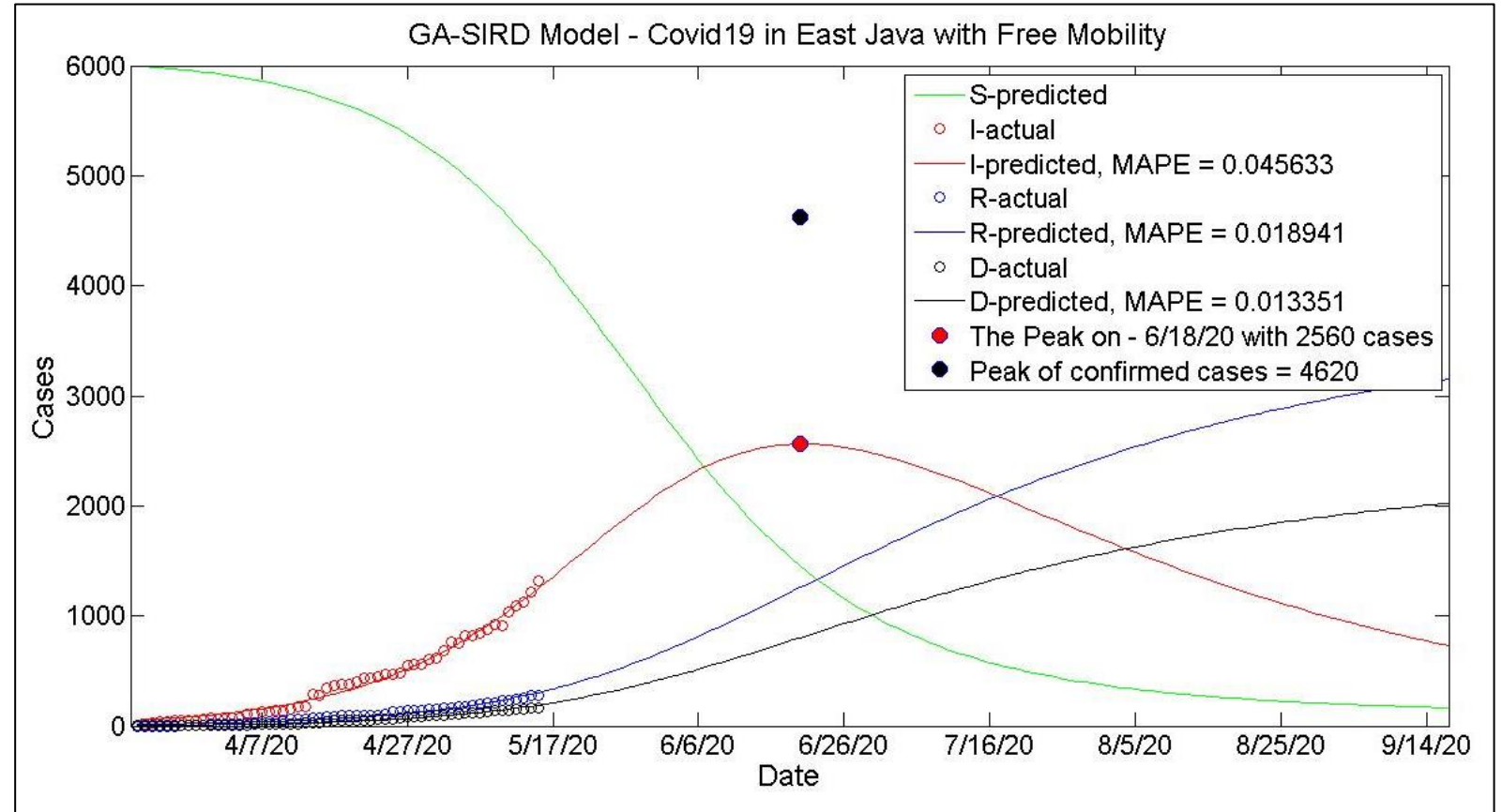
# Hasil GA - SIRD Jatim (Best)

$$\begin{aligned}S_0 &= 4200 \\I_0 &= 44.17831986 \\R_0 &= 18.94426504 \\D_0 &= 6.449407548 \\r &= 2.20065 \times 10^{-5} \\a &= 0.012674929 \\d &= 0.008118461\end{aligned}$$



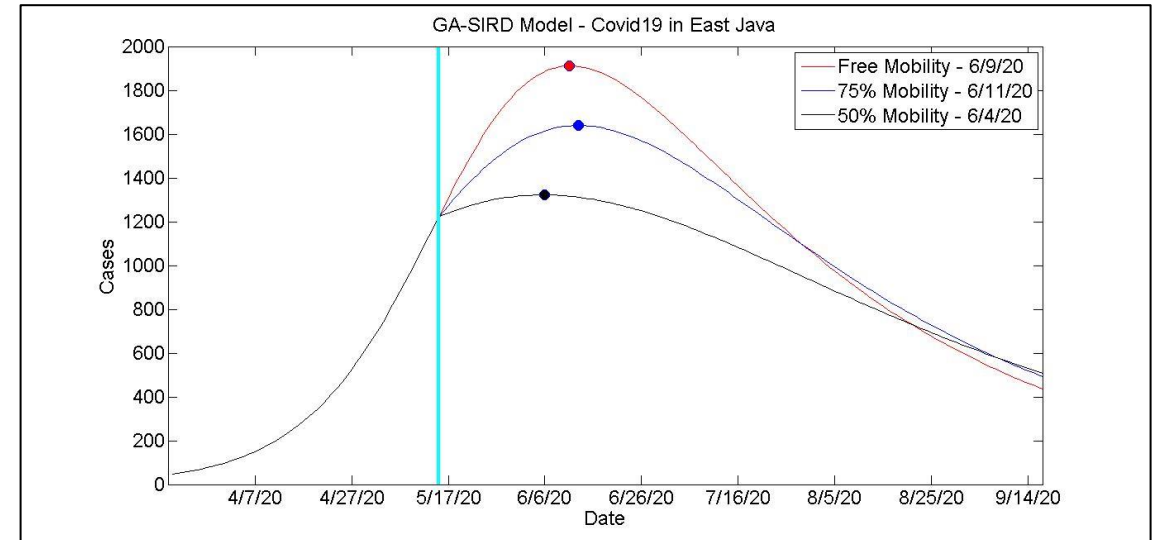
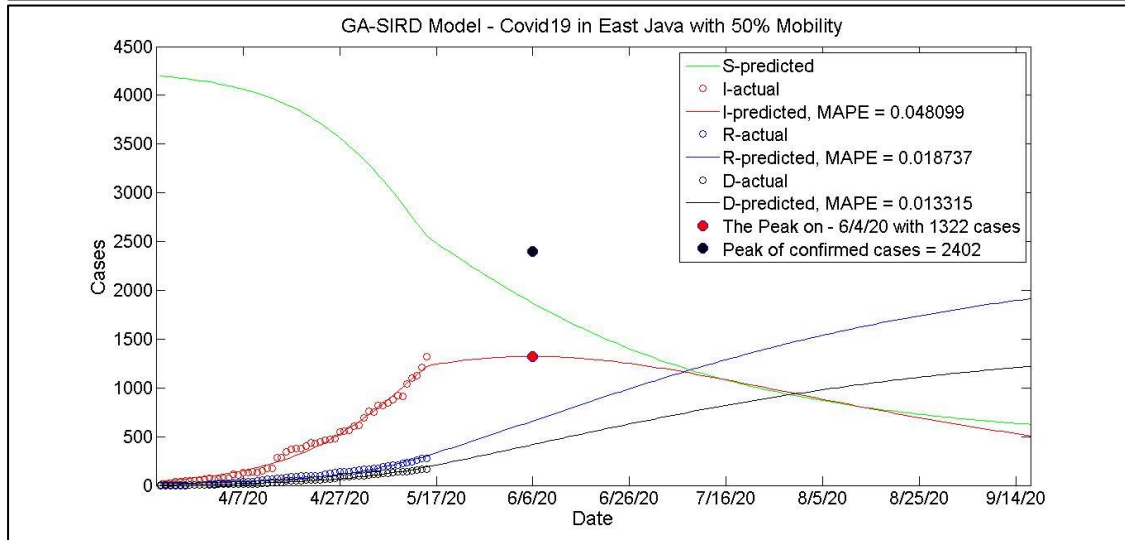
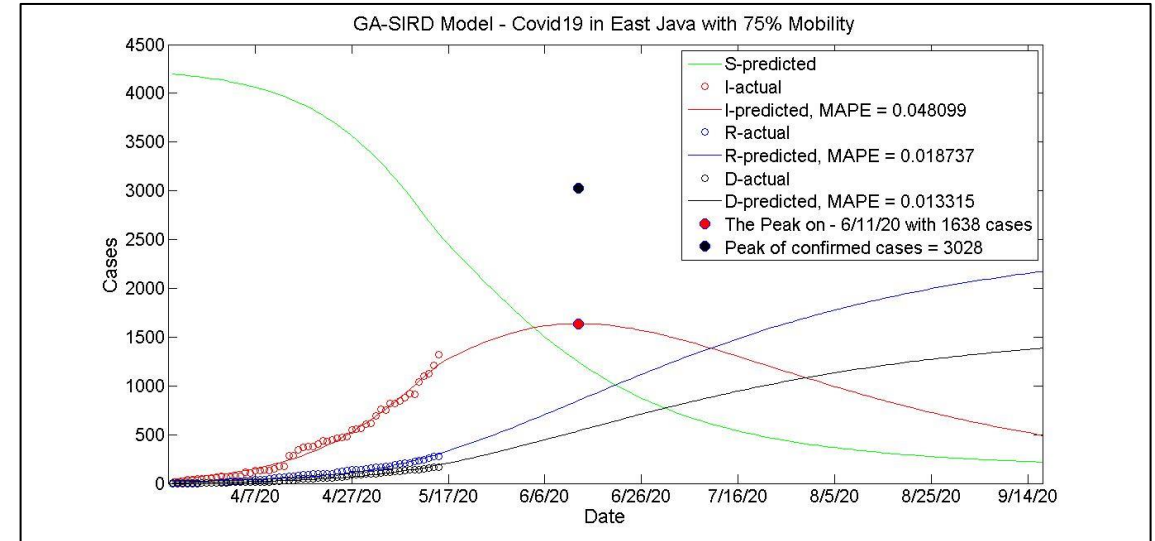
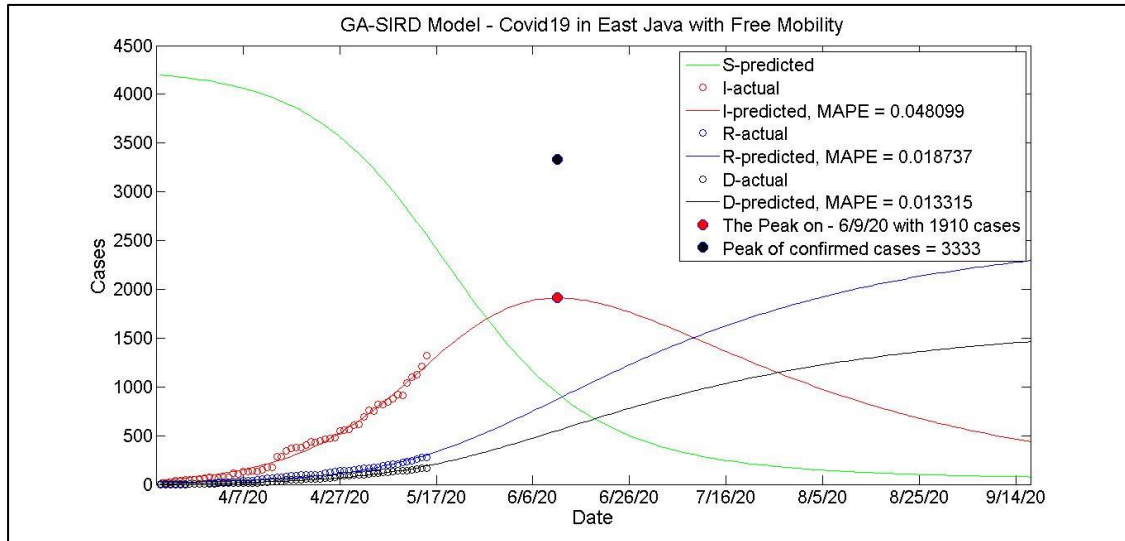
# Hasil GA - SIRD Jatim (Umum)

$$\begin{aligned}S_0 &= 6000 \\I_0 &= 50.51979662 \\R_0 &= 16.68169542 \\D_0 &= 4.794765333 \\r &= 1.45012 \times 10^{-5} \\a &= 0.012843582 \\d &= 0.008259518\end{aligned}$$





# Hasil GA - SIRD Jatim (Faktor $r$ )





# Terima Kasih

