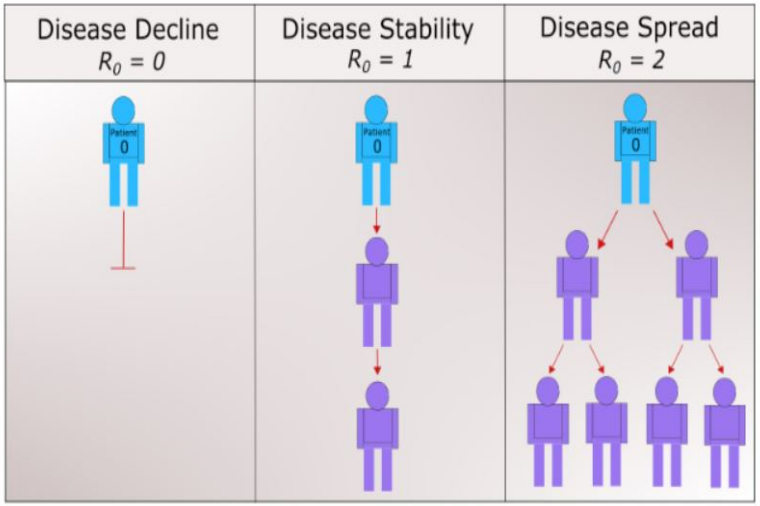
OMM - Primeri

February 13, 2023

Korona



$R0$ - osnovna reproduktivna stopa virusa

$R_0 = c\beta$

c - broj osoba sa kojim zaraženi stupa u kontakt

β - verovatnoća infekcije pri kontaktu

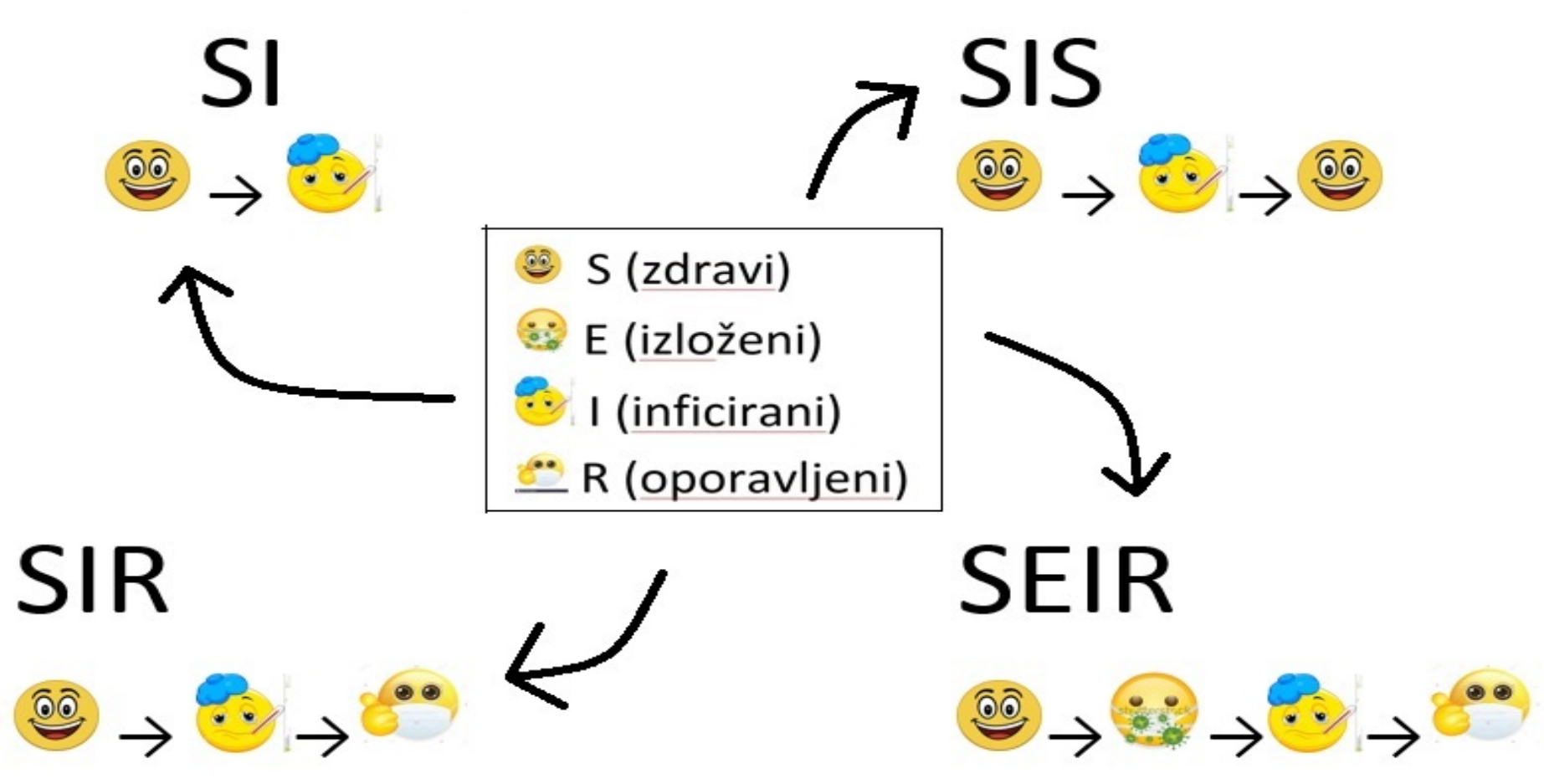
p - deo populacije koji je imun/vakcinisan

$R_p = \beta(c - cp) = \beta c - \beta cp = R_0 - R_0 p = R_0(1 - p)$

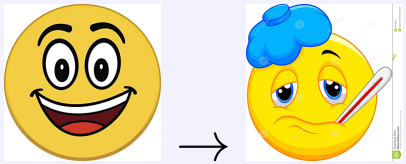
Cilj $R_p < 1 \Rightarrow R_0(1 - p) < 1 \Rightarrow p > 1 - \frac{1}{R_0}$

$1 - \frac{1}{R_0}$ - prag neophodan za sprečavanje širenja bolesti.

Modeliranje zaraznih bolesti



Model SI



$S(t) + I(t) = 1$ - konstantan broj jedinki
λ - koeficijent zaraze
Δt - vremenski interval
$\lambda SI\Delta t$ - verovatnoća da dodje do infekcije za Δt
$S_{t+\Delta t} = S_t - \lambda SI\Delta t$ - promena broja jedinki u S za vreme Δt
$-\lambda SI = \frac{S_{t+\Delta t} - S_t}{\Delta t}$
$\Delta t \to 0 \Rightarrow \frac{dS}{dt} = -\lambda SI$

$I_{t+\Delta t} = I_t + \lambda SI\Delta t$ - promena broja jedinki u I za vreme Δt
$\lambda SI = \frac{I_{t+\Delta t} - I_t}{\Delta t}$
$\Delta t \to 0 \Rightarrow \frac{dI}{dt} = \lambda SI$

Zamenom $S(t) + I(t) = 1 \Rightarrow \frac{dI(t)}{dt} = \lambda I(t)(1 - I(t))$ (DJ sa razdvojenim promenljivim)

Model SIS

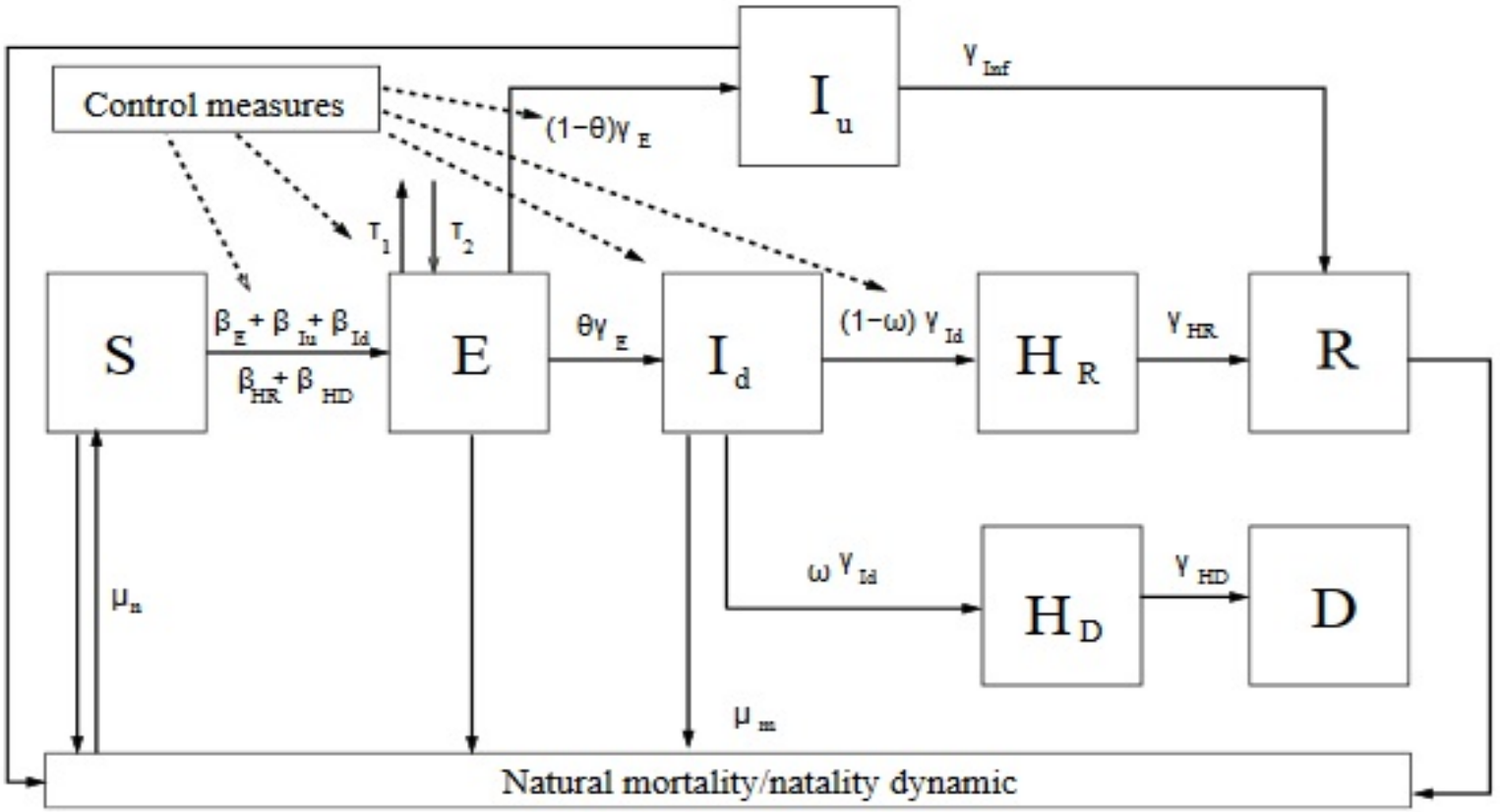
λ - koeficijent zaraze
γ - koeficijent oporavka

$$\frac{dS(t)}{dt} = -\lambda S(t)I(t) + \gamma I(t)$$

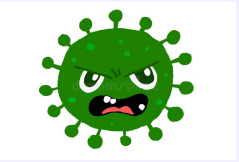
$$\frac{dI(t)}{dt} = \lambda S(t)I(t) - \gamma I(t)$$

(sistem DJ)

Model za koronu???



Model za koronu???



$$
\begin{aligned}
\frac{\mathrm{d}S^{(i)}}{\mathrm{d}t}(t) &= -\frac{S^{(i)}(t)}{N^{(i)}}\left(m_E^{(i)}(t)\beta_E^{(i)}E^{(i)}(t) + m_{I_u}^{(i)}(t)\beta_{I_u}^{(i)}I_{\mathrm{u}}^{(i)}(t) + m_{I_d}^{(i)}(t)\beta_{I_d}^{(i)}I_{\mathrm{d}}^{(i)}(t)\right) \\
&\quad -\frac{S^{(i)}(t)}{N^{(i)}}\left(m_{H_R}^{(i)}(t)\beta_{H_R}^{(i)}H_R^{(i)}(t) + m_{H_D}^{(i)}(t)\beta_{H_D}^{(i)}H_D^{(i)}(t)\right) \\
&\quad -\mu_m^{(i)}S^{(i)}(t) + \mu_n^{(i)}\left(S^{(i)}(t) + E^{(i)}(t) + I_{\mathrm{u}}^{(i)}(t) + I_{\mathrm{d}}^{(i)}(t) + H_R^{(i)}(t) + R^{(i)}(t)\right), \\
\frac{\mathrm{d}E^{(i)}}{\mathrm{d}t}(t) &= \frac{S^{(i)}(t)}{N^{(i)}}\left(m_E^{(i)}(t)\beta_E^{(i)}E^{(i)}(t) + m_{I_u}^{(i)}(t)\beta_{I_u}^{(i)}I_{\mathrm{u}}^{(i)}(t) + m_{I_d}^{(i)}(t)\beta_{I_d}^{(i)}I_{\mathrm{d}}^{(i)}(t)\right) \\
&\quad +\frac{S^{(i)}(t)}{N^{(i)}}\left(m_{H_R}^{(i)}(t)\beta_{H_R}^{(i)}H_R^{(i)}(t) + m_{H_D}^{(i)}(t)\beta_{H_D}^{(i)}H_D^{(i)}(t)\right) \\
&\quad -\mu_m^{(i)}E^{(i)}(t) - \gamma_E E^{(i)}(t) + \tau_1^{(i)}(t) - \tau_2^{(i)}(t), \\
\frac{\mathrm{d}I_{\mathrm{d}}^{(i)}}{\mathrm{d}t}(t) &= \theta^{(i)}(t)\gamma_E E^{(i)}(t) - (\mu_m^{(i)} + \gamma_{I_d}^{(i)}(t))I_{\mathrm{d}}^{(i)}(t), \\
\frac{\mathrm{d}I_{\mathrm{u}}^{(i)}}{\mathrm{d}t}(t) &= (1-\theta^{(i)}(t))\gamma_E E^{(i)}(t) - (\mu_m^{(i)} + \gamma_{\mathrm{Inf}})I_{\mathrm{u}}^{(i)}(t), \\
\frac{\mathrm{d}H_R^{(i)}}{\mathrm{d}t}(t) &= (1-\omega^{(i)}(t))\gamma_{I_d}^{(i)}(t)I_{I_d}^{(i)}(t) - \gamma_{H_R}H_R^{(i)}(t), \\
\frac{\mathrm{d}H_D^{(i)}}{\mathrm{d}t}(t) &= \omega^{(i)}(t)\gamma_{I_d}^{(i)}(t)I_{I_d}^{(i)}(t) - \gamma_{H_D}^{(i)}(t)H_D^{(i)}(t), \\
\frac{\mathrm{d}R^{(i)}}{\mathrm{d}t}(t) &= \gamma_{H_R}^{(i)}(t)H_R^{(i)}(t) - \mu_m^{(i)}R^{(i)}(t), \\
\frac{\mathrm{d}D^{(i)}}{\mathrm{d}t}(t) &= \gamma_{H_D}^{(i)}(t)H_D^{(i)}(t),
\end{aligned}
$$

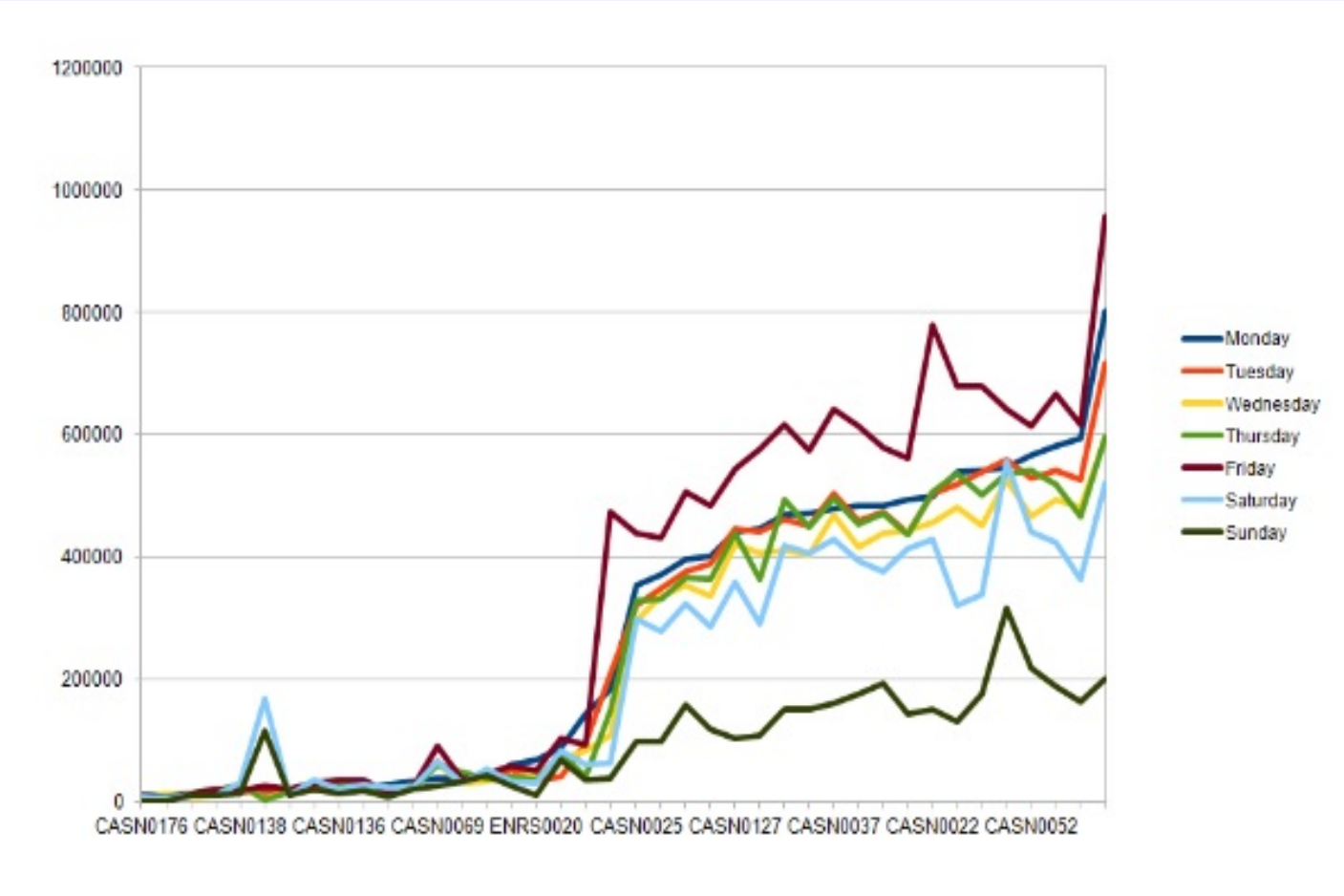
Optimization of ATMs filling-in with cash

Credit Agricole Bank, Serbia (145 bankomata, 65 van banke, 24x7,)

Trošak dostave 

Trošak osiguranja 

Trošak zamrznutog novca 



Plata/penzija? Praznik? Neradni dani? Centar/periferija?
Doba dana? Dan u nedelji? Dan u mesecu? Mesec u godini?

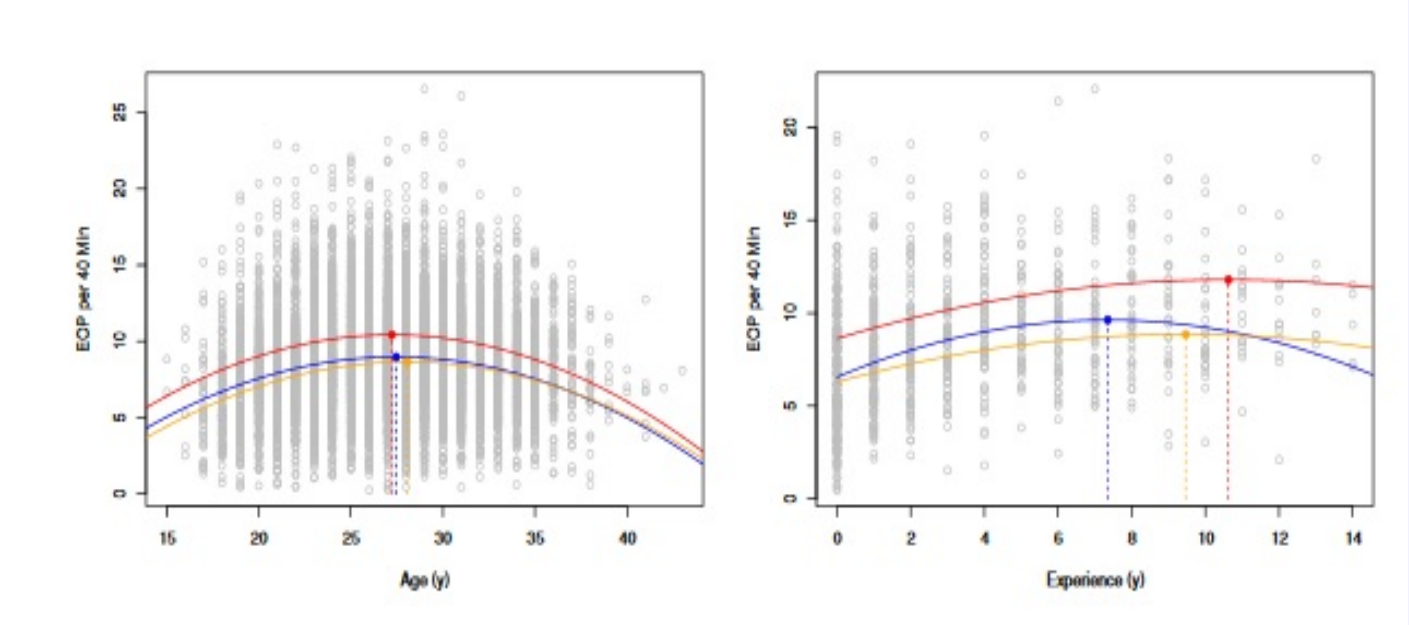
Predictive Models for Basketball Players Performance

Xpheres Basketball Management
(44 promenljive, 5227 profesionalnih igrača, sezone 2000-2015, 6 liga (Euroliga, Eurocup, ACB, Argentina, ABA, ProA))

Kriva učinka, vrhunac i optimalna starost u profesionalnoj muškoj košarci ?

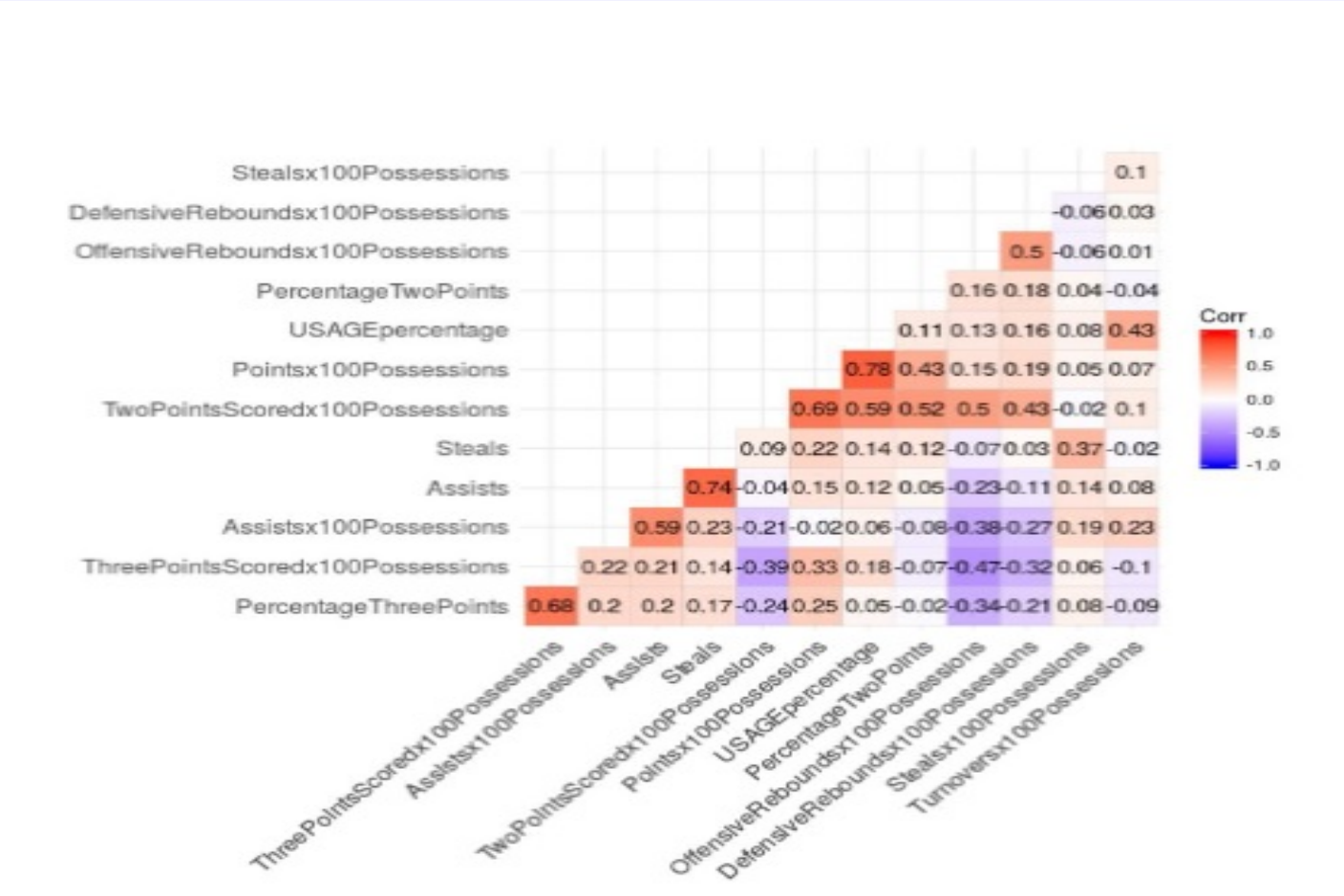
Koji su najvažniji faktori za predviđanje budućih ishoda (uspešne profesionalne karijere) košarkaša?

Procena učinka igrača na osnovu položaja, starosti, veština, lige ?



centar krilo bek

Minuti u igri? Pozicija? "Rupe" u podacima? Klasteri?


StealsPer100Possessions
DefensiveReboundsPer100Possessions
OffensiveReboundsPer100Possessions
PercentageTwoPoints
USAGEpercentage
PointsPer100Possessions
TwoPointsScoredPer100Possessions
Steals
Assists
AssistsPer100Possessions
ThreePointsScoredPer100Possessions
PercentageThreePoints
0.1
-0.06 0.03
0.5 -0.06 0.01
0.16 0.18 0.04 -0.04
0.11 0.13 0.16 0.08 0.43
0.78 0.43 0.15 0.19 0.05 0.07
0.69 0.59 0.52 0.5 0.43 -0.02 0.1
0.09 0.22 0.14 0.12 -0.07 0.03 0.37 -0.02
0.74 -0.04 0.15 0.12 0.05 -0.23 -0.11 0.14 0.08
0.59 0.23 -0.21 -0.02 0.06 -0.08 -0.38 -0.27 0.19 0.23
0.22 0.21 0.14 -0.39 0.33 0.18 -0.07 -0.47 -0.32 0.06 -0.1
0.68 0.2 0.2 0.17 -0.24 0.25 0.05 -0.02 -0.34 -0.21 0.08 -0.09
Corr
1.0
0.5
0.0
-0.5
-1.0
ThreePointsScoredPer100Possessions
AssistsPer100Possessions
Assists
Steals
TwoPointsScoredPer100Possessions
PointsPer100Possessions
USAGEpercentage
PercentageTwoPoints
OffensiveReboundsPer100Possessions
DefensiveReboundsPer100Possessions
StealsPer100Possessions
TurnoversPer100Possessions