

Blood pressure features:

SBP=[120,109,130,121,135,140,150, 120,130,110]#x1

DBP=[76,80,82,78,85,87,95,80,93,78]#x2

PULSE=[80,90,95,86,110,107,120,90,100,80]#x3

W=[165,180,170,185,180,187, 190,186,191,169]#y1

H=[60,80,70,85,90,87,85,80,76,66]#y2

AGE=[25,30,43,19,64,75,80,60,55,32]#y3

A. BP as a function of [SBP,DBP,PULSE]

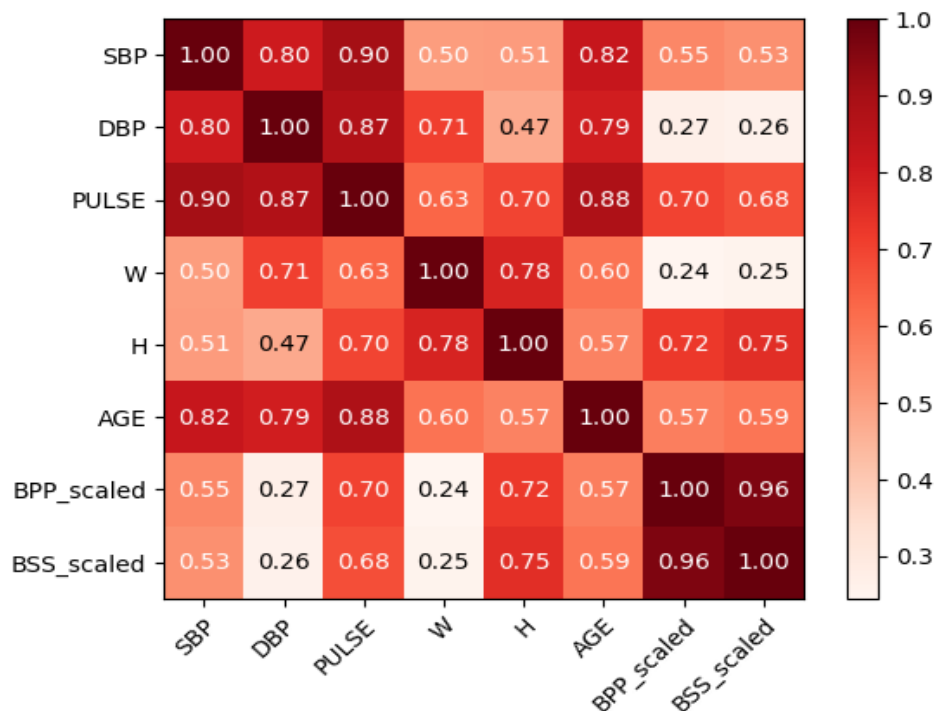
BS as a function of [W,H,AGE]

1. Write down the canonical equations for BP and BS using the first eigen vector.

$$BP = -0.09198526644330304 \cdot SBP - 0.7883578632598987 \cdot DBP + 0.6083013974944014 \cdot PULSE$$

$$BS = -0.6473062134058982 \cdot W + 0.7508287261706019 \cdot H + 0.13134264365829276 \cdot AGE$$

2. Plot the heatmap between the variables and canonical variates using the first eigen vector.

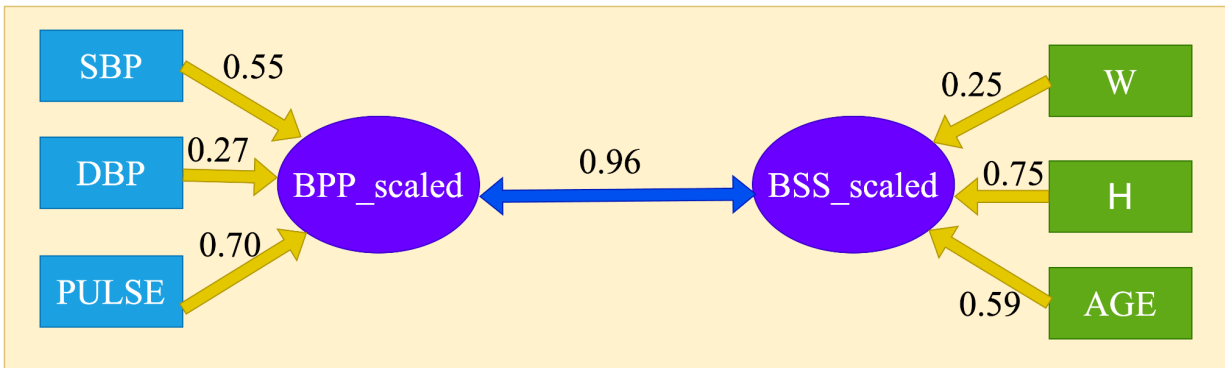


3. What are the canonical loadings and cross loadings of the above pair?

Canonical loadings are for [SBP,DBP,PULSE]= [0.55,0.27,0.70] and [W,H,AGE] = [0.25,0.75,0.59]

Cross loadings are for [SBP,DBP,PULSE]= [0.53,0.26,0.68] and [W,H,AGE] = [0.24,0.72,0.57]

4. Interpret your canonical correlation analysis using the first eigen vector.



In the above diagram, there is noticeable correlation between the variables H (height) and Age with BSS_scaled (a variable related to body size). The positive correlation suggests that an increase in either H or Age is associated with an increase in BSS_scaled. Consequently, given the high correlation between BSS_scaled and BPP_scaled (blood pressure), an increase in BSS_scaled is likely to be accompanied by an increase in BPP_scaled. Moreover, there is an indication that an increase in both SBP (systolic blood pressure) and PULSE is associated with an increase in BPP_scaled, further highlighting the interdependence of these variables in the dataset.

All the codes are attached in CCA_class10_11.ipynb

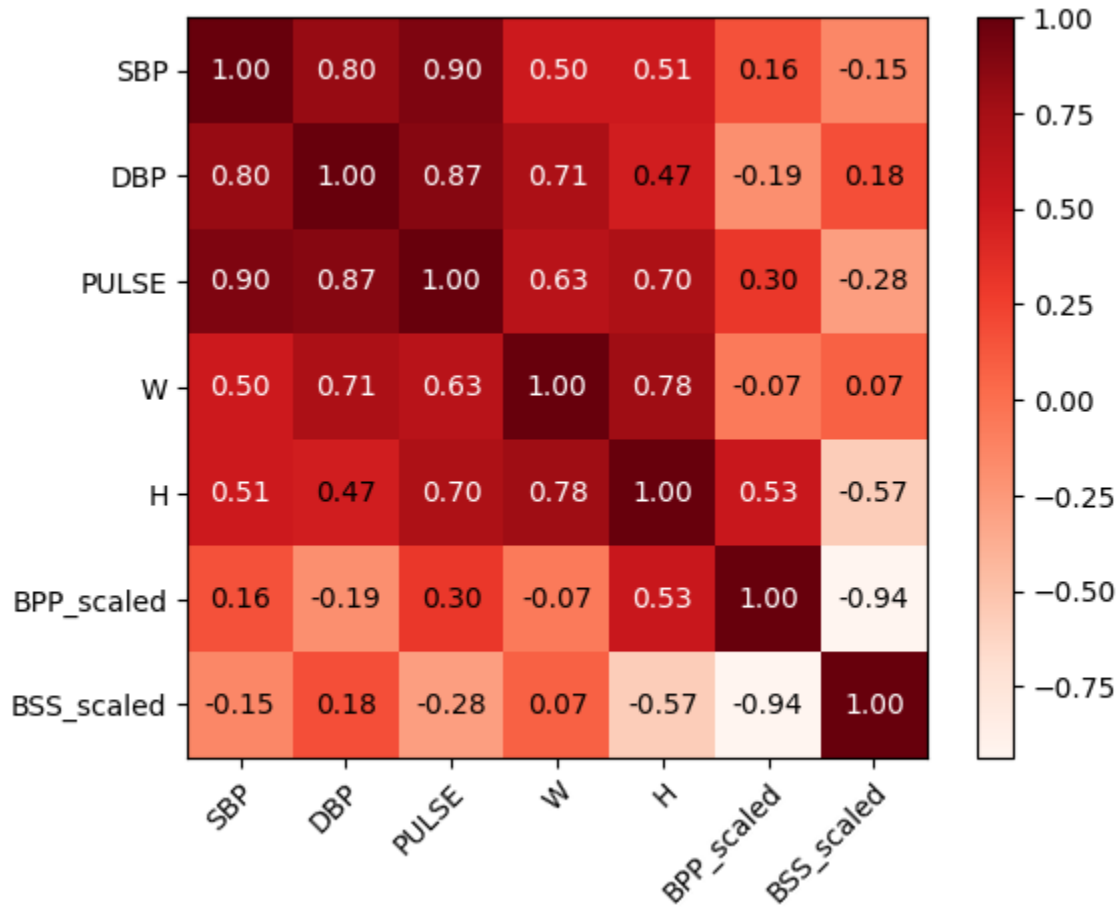
Marks: 10,5,5,10 =20

- B. BP as a function of [SBP,DBP,PULSE]
BS as a function of [W,H]

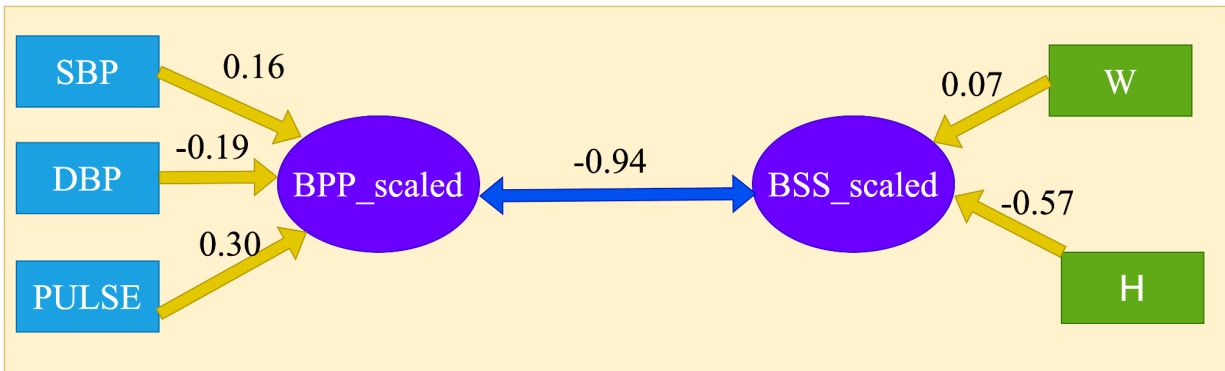
1. Write down the canonical equations for BP and BS using the first eigen vector.

$$\begin{aligned} \text{BP} &= -0.1109167454095677 \cdot \text{SBP} - 0.8439894226211598 \cdot \text{DBP} + \\ & 0.5247659764993826 \cdot \text{PULSE} \\ \text{BS} &= 0.6572731183687855 \cdot \text{W} - 0.7536524715475778 \cdot \text{H} \end{aligned}$$

- Plot the heatmap between the variables and canonical variates using the first eigen vector.



- What are the canonical loadings and cross loadings of the above pair?
 Canonical loadings are for [SBP,DBP,PULSE]= [0.16,-0.19,0.30] and [W,H] = [0.07,-0.57]
 Cross loadings are for [SBP,DBP,PULSE]= [-0.15,0.18,-0.28] and [W,H] = [-0.07,0.53]
- Interpret your canonical correlation analysis using the first eigen vector.



In the above diagram, there is noticeable correlation between the variable H (height) and BSS_scaled (a variable related to body size). The negative correlation suggests that an increase in either H associated with a decrease in BSS_scaled. BPP_scaled and The correlation between SBP & BPP_scaled, DBP & BPP_scaled and PULSE & BPP_scaled are not statistically significant. Consequently, given the high correlation between BSS_scaled and BPP_scaled (blood pressure), an increase in BSS_scaled is likely to be accompanied by a decrease in BPP_scaled.

All the codes are attached in CCA_class10_11.ipynb

Marks: 10,5,5,10 =20

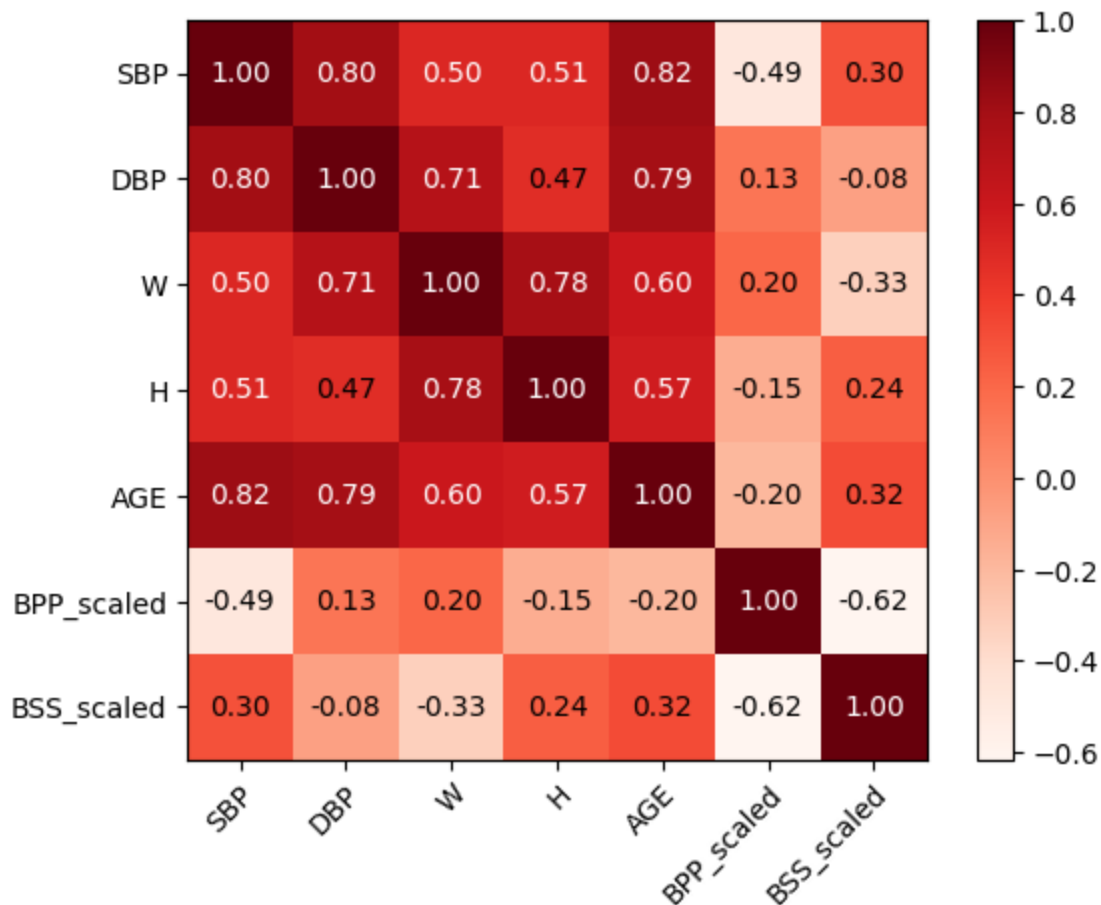
- C. BP as a function of [SBP,DBP]
 BS as a function of [W,H,AGE]

1. Write down the canonical equations for BP and BS using the **second** eigen vector.

$$BP = -0.49288059527208294 * SBP + 0.870096959427073 * DBP$$

$$BS = -0.8243380694889201 * W + 0.5472114099069936 * H + 0.1450048966720802 * AGE$$

2. Plot the heatmap between the variables and canonical variates using the **second** eigen vector.

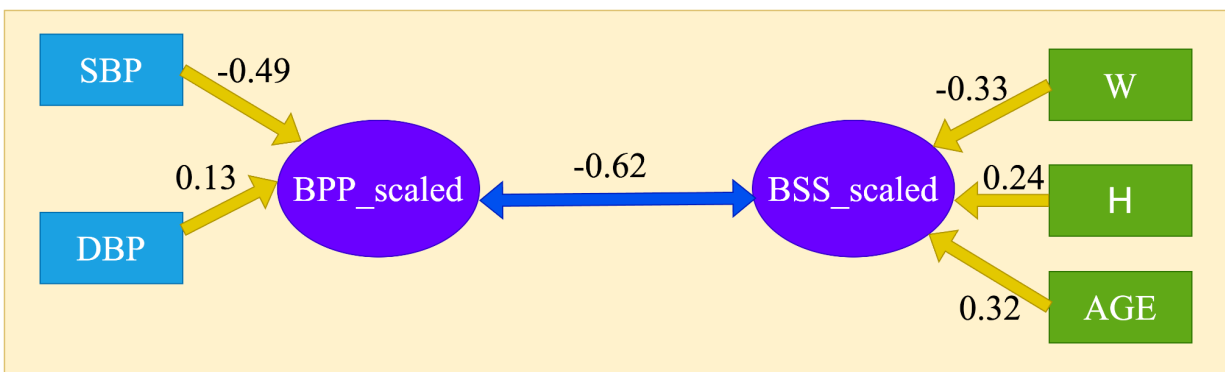


3. What are the canonical loadings and cross loadings of the above pair?

Canonical loadings are for [SBP,DBP]= $[-0.49, 0.13]$ and [W,H,AGE] = $[-0.33, 0.24, 0.32]$

Cross loadings are for [SBP,DBP]= $[0.30, -0.08]$ and [W,H,AGE] = $[0.20, -0.15, -0.20]$

4. Interpret your canonical correlation analysis using the **second** eigen vector.



W, H, and AGE exhibit no significant correlation with BSS_scaled. SBP shows a slight correlation with BPP_scaled, indicating that an increase in SBP is associated with a decrease in BPP_scaled. Notably, BPP_scaled and BSS_scaled are correlated, suggesting that an increase in BSS_scaled corresponds to a decrease in BPP_scaled.

All the codes are attached in CCA_class10_11.ipynb

Marks: 15,10,10,15 =50