CSC-466 Lab 1: Association Rules Mining

Vittorio Dinovi 4/17/18
Billy Gottentstrater

We used the strategy of *plotting* various minimum supports against the number of skyline frequent item sets discovered to observe a reasonable value of the minimum support. A similar approach was done with rules to find a reasonable minimum confidence. The rationale for selection was:

(1) For minimum support, choose a the value with the longest running *plateau* of item sets found before a large spike.

(2) For minimum confidence, choose a the maximum value along the longest *plateau* of rules found

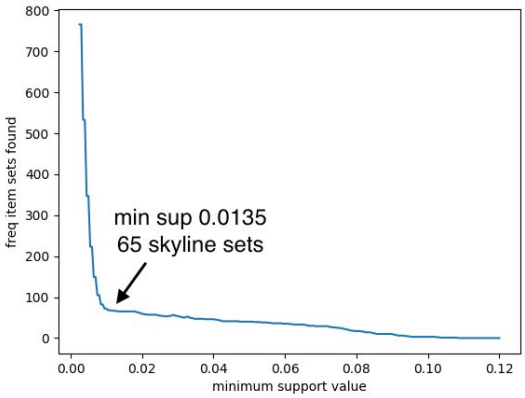
The results for each dataset include the graph as justification for the choice of minimum support and minimum confidence.

** **Note** ** the number of skyline item sets identified in each ***graph*** is a slight overestimate due to a bug uncovered in the skyline extraction function. The supports and confidences derived from the graphs are still correct. Re-plotting these graphs would be very time-costly.

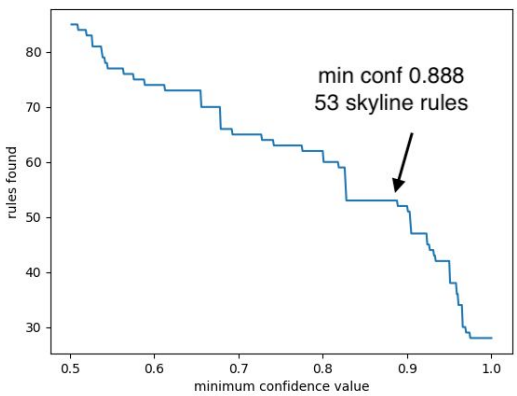
The correct skyline frequent itemsets and skyline rules are included in the logs

Extended Bakery

1000 set



Min. Support = 0.0135



Min. Confidence = 0.888

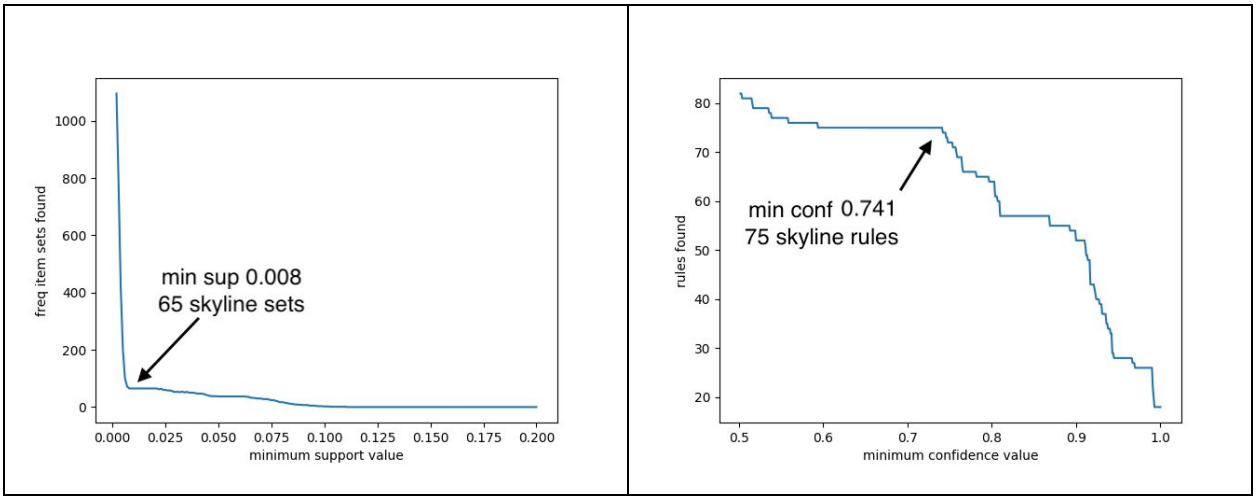
Skyline Frequent Itemsets (26) (cont on next page)

(0.058000) {'Gongolais Cookie', 'Truffle Cake'}
(0.056000) {'Apricot Tart'}
(0.055000) {'Blueberry Danish'}
(0.053000) {'Marzipan Cookie', 'Tuile Cookie'}
(0.049000) {'Almond Croissant'}
(0.049000) {'Strawberry Cake', 'Napoleon Cake'}
(0.047000) {'Vanilla Meringue'}
(0.044000) {'Ganache Cookie'}
(0.042000) {'Chocolate Croissant'}
(0.041000) {'Almond Tart'}
(0.040000) {'Pecan Tart'}
(0.040000) {'Lemon Tart', 'Lemon Cake'}
(0.039000) {'Casino Cake', 'Chocolate Coffee'}
(0.038000) {'Chocolate Meringue'}
(0.038000) {'Cheese Croissant', 'Orange Juice'}
(0.038000) {'Opera Cake', 'Cherry Tart', 'Apricot Danish'}
(0.037000) {'Vanilla Eclair'}
(0.034000) {'Chocolate Eclair'}
(0.034000) {'Berry Tart', 'Bottled Water'}
(0.032000) {'Blueberry Tart', 'Apricot Croissant', 'Hot Coffee'}
(0.031000) {'Apple Tart', 'Apple Danish', 'Apple Croissant', 'Cherry Soda'}
(0.026000) {'Almond Bear Claw'}
(0.024000) {'Hot Coffee', 'Coffee Eclair', 'Almond Twist', 'Apple Pie'}
(0.023000) {'Blackberry Tart', 'Single Espresso', 'Coffee Eclair'}
(0.019000) {'Raspberry Cookie', 'Raspberry Lemonade', 'Green Tea', 'Lemon Lemonade', 'Lemon Cookie'}
(0.018000) {'Vanilla Frappuccino', 'Walnut Cookie', 'Chocolate Tart'}

Skyline Rules (19) (cont on next page)

(1.000000) {'Vanilla Frappuccino', 'Walnut Cookie'} --> {'Chocolate Tart'}
(1.000000) {'Walnut Cookie', 'Chocolate Tart'} --> {'Vanilla Frappuccino'}
(1.000000) {'Hot Coffee', 'Apricot Croissant'} --> {'Blueberry Tart'}
(1.000000) {'Hot Coffee', 'Coffee Eclair', 'Almond Twist'} --> {'Apple Pie'}
(1.000000) {'Hot Coffee', 'Coffee Eclair', 'Apple Pie'} --> {'Almond Twist'}
(1.000000) {'Hot Coffee', 'Almond Twist', 'Apple Pie'} --> {'Coffee Eclair'}
(1.000000) {'Apple Tart', 'Apple Croissant', 'Cherry Soda'} --> {'Apple Danish'}
(1.000000) {'Apple Danish', 'Apple Croissant', 'Cherry Soda'} --> {'Apple Tart'}
(1.000000) {'Apple Tart', 'Apple Danish', 'Cherry Soda'} --> {'Apple Croissant'}
(1.000000) {'Lemon Lemonade', 'Raspberry Lemonade', 'Green Tea', 'Lemon Cookie'} --> {'Raspberry Cookie'}
(1.000000) {'Lemon Cookie', 'Raspberry Lemonade', 'Raspberry Cookie', 'Green Tea'} --> {'Lemon Lemonade'}
(1.000000) {'Lemon Lemonade', 'Raspberry Cookie', 'Green Tea', 'Lemon Cookie'} --> {'Raspberry Lemonade'}
(1.000000) {'Lemon Lemonade', 'Raspberry Lemonade', 'Raspberry Cookie', 'Green Tea'} --> {'Lemon Cookie'}
(0.974359) {'Apricot Danish', 'Opera Cake'} --> {'Cherry Tart'}
(0.969697) {'Blueberry Tart', 'Hot Coffee'} --> {'Apricot Croissant'}
(0.958333) {'Single Espresso', 'Coffee Eclair'} --> {'Blackberry Tart'}
(0.958333) {'Blackberry Tart', 'Single Espresso'} --> {'Coffee Eclair'}
(0.926829) {'Cherry Tart', 'Opera Cake'} --> {'Apricot Danish'}
(0.888889) {'Coffee Eclair', 'Almond Twist', 'Apple Pie'} --> {'Hot Coffee'}

5000 set



Min. Support = 0.008 **Min. Confidence = 0.741**

Skyline Frequent Itemsets (26) (cont on next page)

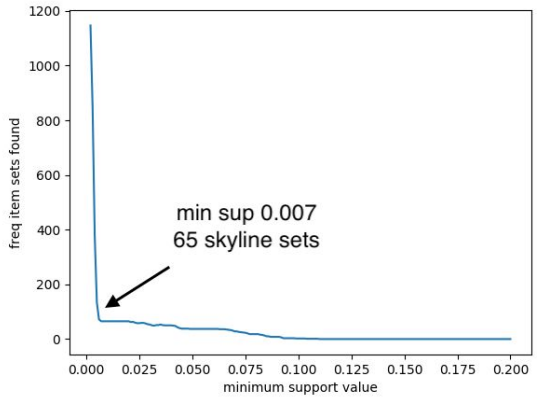
(0.049600) {'Tuile Cookie', 'Marzipan Cookie'}
(0.047200) {'Truffle Cake', 'Gongolais Cookie'}
(0.046000) {'Vanilla Eclair'}
(0.045600) {'Almond Croissant'}
(0.045200) {'Chocolate Meringue'}
(0.044400) {'Pecan Tart'}
(0.043200) {'Chocolate Croissant'}
(0.043000) {'Cheese Croissant', 'Orange Juice'}
(0.042800) {'Almond Bear Claw'}
(0.042200) {'Apricot Tart'}
(0.042200) {'Napoleon Cake', 'Strawberry Cake'}
(0.040800) {'Apricot Danish', 'Opera Cake', 'Cherry Tart'}
(0.040000) {'Blueberry Danish'}
(0.039800) {'Vanilla Meringue'}
(0.038800) {'Ganache Cookie'}
(0.038600) {'Almond Tart'}
(0.038200) {'Chocolate Eclair'}
(0.036600) {'Berry Tart', 'Bottled Water'}
(0.034600) {'Chocolate Coffee', 'Casino Cake'}
(0.033600) {'Lemon Cake', 'Lemon Tart'}
(0.032800) {'Blueberry Tart', 'Hot Coffee', 'Apricot Croissant'}
(0.030800) {'Hot Coffee', 'Apple Pie', 'Coffee Eclair', 'Almond Twist'}
(0.028600) {'Blackberry Tart', 'Coffee Eclair', 'Single Espresso'}
(0.026600) {'Walnut Cookie', 'Vanilla Frappuccino', 'Chocolate Tart'}
(0.022800) {'Cherry Soda', 'Apple Tart', 'Apple Croissant', 'Apple Danish'}
(0.021200) {'Lemon Lemonade', 'Lemon Cookie', 'Green Tea', 'Raspberry Lemonade', 'Raspberry Cookie'}

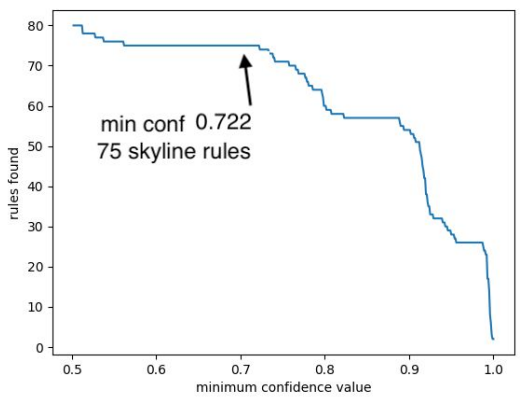
Skyline Rules (19) (cont on next page)

(1.000000) {'Vanilla Frappuccino', 'Walnut Cookie'} --> {'Chocolate Tart'}

(1.000000) {'Walnut Cookie', 'Chocolate Tart'} --> {'Vanilla Frappuccino'}
(1.000000) {'Hot Coffee', 'Apricot Croissant'} --> {'Blueberry Tart'}
(1.000000) {'Hot Coffee', 'Coffee Eclair', 'Almond Twist'} --> {'Apple Pie'}
(1.000000) {'Hot Coffee', 'Coffee Eclair', 'Apple Pie'} --> {'Almond Twist'}
(1.000000) {'Hot Coffee', 'Almond Twist', 'Apple Pie'} --> {'Coffee Eclair'}
(1.000000) {'Apple Tart', 'Apple Croissant', 'Cherry Soda'} --> {'Apple Danish'}
(1.000000) {'Apple Danish', 'Apple Croissant', 'Cherry Soda'} --> {'Apple Tart'}
(1.000000) {'Apple Tart', 'Apple Danish', 'Cherry Soda'} --> {'Apple Croissant'}
(1.000000) {'Lemon Lemonade', 'Raspberry Lemonade', 'Green Tea', 'Lemon Cookie'} --> {'Raspberry Cookie'}
(1.000000) {'Lemon Cookie', 'Raspberry Lemonade', 'Raspberry Cookie', 'Green Tea'} --> {'Lemon Lemonade'}
(1.000000) {'Lemon Lemonade', 'Raspberry Cookie', 'Green Tea', 'Lemon Cookie'} --> {'Raspberry Lemonade'}
(1.000000) {'Lemon Lemonade', 'Raspberry Lemonade', 'Raspberry Cookie', 'Green Tea'} --> {'Lemon Cookie'}
(0.974359) {'Apricot Danish', 'Opera Cake'} --> {'Cherry Tart'}
(0.969697) {'Blueberry Tart', 'Hot Coffee'} --> {'Apricot Croissant'}
(0.958333) {'Single Espresso', 'Coffee Eclair'} --> {'Blackberry Tart'}
(0.958333) {'Blackberry Tart', 'Single Espresso'} --> {'Coffee Eclair'}
(0.926829) {'Cherry Tart', 'Opera Cake'} --> {'Apricot Danish'}
(0.888889) {'Coffee Eclair', 'Almond Twist', 'Apple Pie'} --> {'Hot Coffee'}

20000 set





Min. Support = 0.007 **Min. Confidence = 0.722**

Skyline Frequent Itemsets (26) (cont on next page)

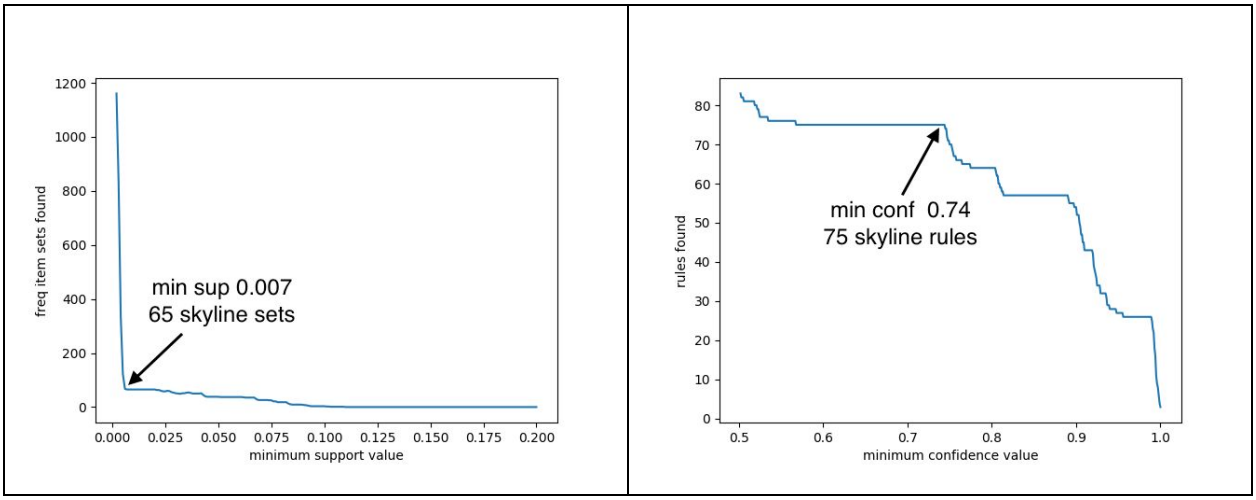
(0.048550) {'Tuile Cookie', 'Marzipan Cookie'}
(0.044600) {'Chocolate Croissant'}
(0.044550) {'Strawberry Cake', 'Napoleon Cake'}
(0.044500) {'Chocolate Meringue'}
(0.044250) {'Almond Bear Claw'}
(0.043900) {'Orange Juice', 'Cheese Croissant'}
(0.043350) {'Gongolais Cookie', 'Truffle Cake'}
(0.043300) {'Ganache Cookie'}
(0.042750) {'Apricot Tart'}
(0.042700) {'Vanilla Eclair'}
(0.042600) {'Chocolate Eclair'}
(0.042400) {'Vanilla Meringue'}
(0.042050) {'Almond Croissant'}

(0.041550) {'Pecan Tart'}
(0.041150) {'Blueberry Danish'}
(0.041000) {'Cherry Tart', 'Apricot Danish', 'Opera Cake'}
(0.040550) {'Almond Tart'}
(0.037000) {'Lemon Tart', 'Lemon Cake'}
(0.035700) {'Berry Tart', 'Bottled Water'}
(0.035700) {'Chocolate Coffee', 'Casino Cake'}
(0.032600) {'Hot Coffee', 'Blueberry Tart', 'Apricot Croissant'}
(0.028250) {'Vanilla Frappuccino', 'Walnut Cookie', 'Chocolate Tart'}
(0.028100) {'Almond Twist', 'Coffee Eclair', 'Apple Pie', 'Hot Coffee'}
(0.026950) {'Single Espresso', 'Coffee Eclair', 'Blackberry Tart'}
(0.021000) {'Apple Croissant', 'Apple Danish', 'Apple Tart', 'Cherry Soda'}
(0.020400) {'Lemon Lemonade', 'Raspberry Lemonade', 'Lemon Cookie', 'Green Tea', 'Raspberry Cookie'}

Skyline Rules (25)

(1.000000) {'Raspberry Cookie', 'Lemon Cookie', 'Raspberry Lemonade', 'Green Tea'} --> {'Lemon Lemonade'}
(1.000000) {'Lemon Lemonade', 'Raspberry Cookie', 'Lemon Cookie', 'Green Tea'} --> {'Raspberry Lemonade'}
(0.998224) {'Almond Twist', 'Coffee Eclair', 'Hot Coffee'} --> {'Apple Pie'}
(0.997555) {'Lemon Lemonade', 'Lemon Cookie', 'Raspberry Lemonade', 'Green Tea'} --> {'Raspberry Cookie'}
(0.997555) {'Lemon Lemonade', 'Raspberry Cookie', 'Raspberry Lemonade', 'Green Tea'} --> {'Lemon Cookie'}
(0.996454) {'Coffee Eclair', 'Apple Pie', 'Hot Coffee'} --> {'Almond Twist'}
(0.995261) {'Apple Danish', 'Apple Tart', 'Cherry Soda'} --> {'Apple Croissant'}
(0.994690) {'Almond Twist', 'Apple Pie', 'Hot Coffee'} --> {'Coffee Eclair'}
(0.992908) {'Apple Croissant', 'Apple Tart', 'Cherry Soda'} --> {'Apple Danish'}
(0.988235) {'Apple Croissant', 'Apple Danish', 'Cherry Soda'} --> {'Apple Tart'}
(0.945790) {'Apricot Danish', 'Opera Cake'} --> {'Cherry Tart'}
(0.939290) {'Cherry Tart', 'Opera Cake'} --> {'Apricot Danish'}
(0.928775) {'Hot Coffee', 'Apricot Croissant'} --> {'Blueberry Tart'}
(0.924714) {'Walnut Cookie', 'Chocolate Tart'} --> {'Vanilla Frappuccino'}
(0.919795) {'Single Espresso', 'Coffee Eclair'} --> {'Blackberry Tart'}
(0.913165) {'Hot Coffee', 'Blueberry Tart'} --> {'Apricot Croissant'}
(0.912763) {'Vanilla Frappuccino', 'Walnut Cookie'} --> {'Chocolate Tart'}
(0.893864) {'Single Espresso', 'Blackberry Tart'} --> {'Coffee Eclair'}
(0.822840) {'Almond Twist', 'Coffee Eclair', 'Apple Pie'} --> {'Hot Coffee'}
(0.807692) {'Apple Croissant', 'Apple Tart', 'Apple Danish'} --> {'Cherry Soda'}
(0.801572) {'Lemon Lemonade', 'Raspberry Cookie', 'Lemon Cookie', 'Raspberry Lemonade'} --> {'Green Tea'}
(0.780209) {'Cherry Tart', 'Apricot Danish'} --> {'Opera Cake'}
(0.778973) {'Blueberry Tart', 'Apricot Croissant'} --> {'Hot Coffee'}
(0.768707) {'Vanilla Frappuccino', 'Chocolate Tart'} --> {'Walnut Cookie'}
(0.733333) {'Coffee Eclair', 'Blackberry Tart'} --> {'Single Espresso'}

75000 set



Min. Support = 0.007 **Min. Confidence = 0.74**

Skyline Frequent Itemsets (26) (cont on next page)

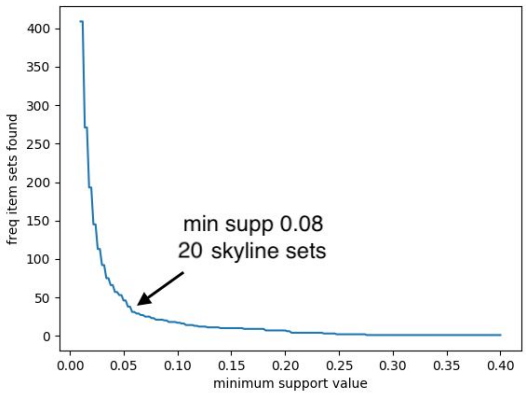
(0.050920) {'Marzipan Cookie', 'Tuile Cookie'}
(0.044093) {'Blueberry Danish'}
(0.043920) {'Truffle Cake', 'Gongolais Cookie'}
(0.043373) {'Pecan Tart'}
(0.043240) {'Ganache Cookie'}
(0.043240) {'Chocolate Croissant'}
(0.043147) {'Napoleon Cake', 'Strawberry Cake'}
(0.043067) {'Cheese Croissant', 'Orange Juice'}
(0.042733) {'Almond Croissant'}
(0.042520) {'Vanilla Eclair'}
(0.042440) {'Almond Bear Claw'}
(0.042387) {'Vanilla Meringue'}
(0.042373) {'Chocolate Eclair'}
(0.042360) {'Apricot Tart'}
(0.042040) {'Almond Tart'}
(0.041933) {'Chocolate Meringue'}
(0.041107) {'Opera Cake', 'Cherry Tart', 'Apricot Danish'}
(0.037800) {'Bottled Water', 'Berry Tart'}
(0.036853) {'Lemon Cake', 'Lemon Tart'}
(0.035240) {'Chocolate Coffee', 'Casino Cake'}
(0.032827) {'Apricot Croissant', 'Hot Coffee', 'Blueberry Tart'}
(0.027920) {'Coffee Eclair', 'Apple Pie', 'Almond Twist', 'Hot Coffee'}
(0.027200) {'Coffee Eclair', 'Single Espresso', 'Blackberry Tart'}
(0.026760) {'Walnut Cookie', 'Chocolate Tart', 'Vanilla Frappuccino'}
(0.020733) {'Lemon Cookie', 'Raspberry Lemonade', 'Green Tea', 'Raspberry Cookie', 'Lemon Lemonade'}
(0.020587) {'Cherry Soda', 'Apple Tart', 'Apple Croissant', 'Apple Danish'}

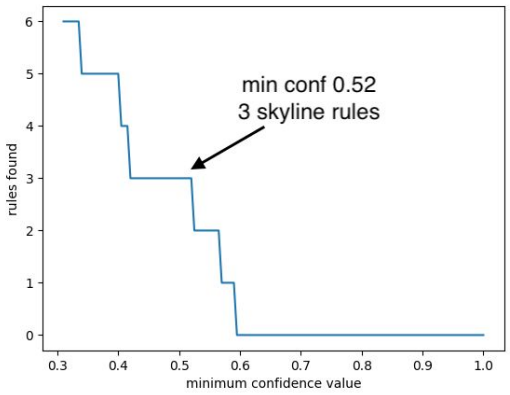
Skyline Rules (25) (cont on next page)

(1.000000) {'Lemon Lemonade', 'Green Tea', 'Lemon Cookie', 'Raspberry Lemonade'} --> {'Raspberry Cookie'}
(1.000000) {'Green Tea', 'Lemon Cookie', 'Raspberry Lemonade', 'Raspberry Cookie'} --> {'Lemon Lemonade'}
(1.000000) {'Lemon Lemonade', 'Green Tea', 'Lemon Cookie', 'Raspberry Cookie'} --> {'Raspberry Lemonade'}
(0.999357) {'Lemon Lemonade', 'Green Tea', 'Raspberry Lemonade', 'Raspberry Cookie'} --> {'Lemon Cookie'}

(0.995247) {'Apple Pie', 'Almond Twist', 'Hot Coffee'} --> {'Coffee Eclair'}
(0.993830) {'Coffee Eclair', 'Apple Pie', 'Hot Coffee'} --> {'Almond Twist'}
(0.992926) {'Cherry Soda', 'Apple Tart', 'Apple Danish'} --> {'Apple Croissant'}
(0.992888) {'Coffee Eclair', 'Almond Twist', 'Hot Coffee'} --> {'Apple Pie'}
(0.991014) {'Cherry Soda', 'Apple Tart', 'Apple Croissant'} --> {'Apple Danish'}
(0.989744) {'Cherry Soda', 'Apple Croissant', 'Apple Danish'} --> {'Apple Tart'}
(0.955377) {'Opera Cake', 'Apricot Danish'} --> {'Cherry Tart'}
(0.947741) {'Opera Cake', 'Cherry Tart'} --> {'Apricot Danish'}
(0.939607) {'Walnut Cookie', 'Vanilla Frappuccino'} --> {'Chocolate Tart'}
(0.936975) {'Walnut Cookie', 'Chocolate Tart'} --> {'Vanilla Frappuccino'}
(0.936834) {'Blueberry Tart', 'Hot Coffee'} --> {'Apricot Croissant'}
(0.928006) {'Apricot Croissant', 'Hot Coffee'} --> {'Blueberry Tart'}
(0.923077) {'Single Espresso', 'Blackberry Tart'} --> {'Coffee Eclair'}
(0.922242) {'Coffee Eclair', 'Single Espresso'} --> {'Blackberry Tart'}
(0.813520) {'Coffee Eclair', 'Apple Pie', 'Almond Twist'} --> {'Hot Coffee'}
(0.811163) {'Lemon Lemonade', 'Lemon Cookie', 'Raspberry Lemonade', 'Raspberry Cookie'} --> {'Green Tea'}
(0.807109) {'Apple Tart', 'Apple Croissant', 'Apple Danish'} --> {'Cherry Soda'}
(0.774234) {'Apricot Danish', 'Cherry Tart'} --> {'Opera Cake'}
(0.754520) {'Apricot Croissant', 'Blueberry Tart'} --> {'Hot Coffee'}
(0.746979) {'Coffee Eclair', 'Blackberry Tart'} --> {'Single Espresso'}
(0.744160) {'Chocolate Tart', 'Vanilla Frappuccino'} --> {'Walnut Cookie'}

Fantasy Bingo





Min. Support = 0.08 **Min. Confidence = 0.52**

Skyline Frequent Itemsets (19)

(0.205761) {'Arden, Katherine'}
(0.201646) {'Ball, Krista D. / Ball, K.'}
(0.160494) {'Butcher, Jim'}
(0.139918) {'Addison, Katherine / Monette, Sarah', 'Bancroft, Josiah'}
(0.127572) {'Bennett, Robert Jackson'}

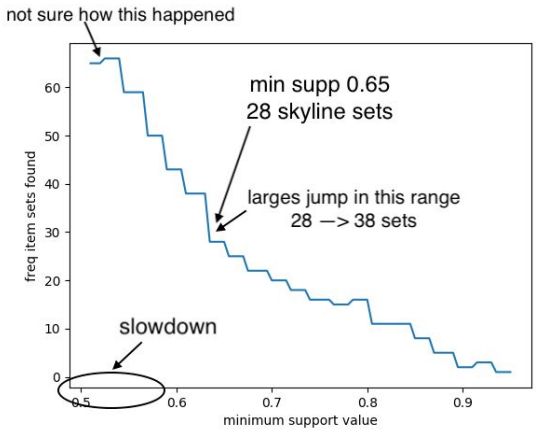
(0.119342) {'Bear, Elizabeth'}
(0.115226) {'Anders, Charlie Jane'}
(0.115226) {'Brennan, Marie', 'Bancroft, Josiah'}
(0.106996) {'Aaronovitch, Ben'}
(0.106996) {'Beaulieu, Bradley P.'}
(0.106996) {'Bancroft, Josiah', 'Chambers, Becky'}
(0.106996) {'Bancroft, Josiah', 'Abercrombie, Joe'}
(0.102881) {'Bardugo, Leigh'}
(0.102881) {'Brown, Pierce'}
(0.098765) {'Atwood, Margaret'}
(0.094650) {'Bancroft, Josiah', 'Aaron, Rachel / Bach, Rachel'}
(0.090535) {'Bujold, Lois McMaster'}
(0.090535) {'Butler, Octavia E.'}
(0.086420) {'Carriger, Gail'}

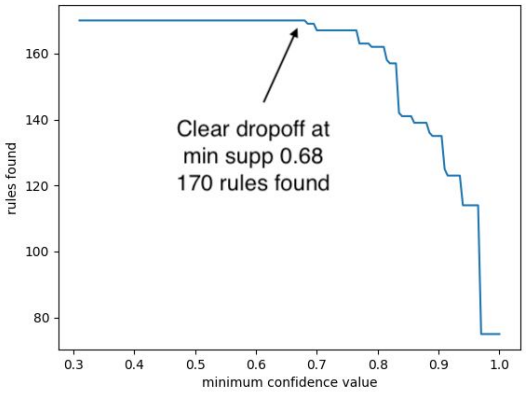
Skyline Rules (3)

Skyline Rules (3)
(0.590909) {'Abercrombie, Joe'} --> {'Bancroft, Josiah'}
(0.566667) {'Addison, Katherine / Monette, Sarah'} --> {'Bancroft, Josiah'}
(0.520000) {'Chambers, Becky'} --> {'Bancroft, Josiah'//}

Transcription Factors

These plots ended up being more difficult to decipher. The support experiences a transition from small gaps in the number of discovered item sets to increasingly larger gaps around 0.65. Thus, this seemed like a reasonable choice for the minimum support. The minimum confidence was much more obvious. After 0.68, the number of rules discovered stopped increasing





Min. Support = 0.65

Min. Confidence = 0.68

Skyline frequent itemsets (28)

(0.673913) {'C/EBPbeta', 'RFX2', 'HSF1_(long)', 'Elk-1', 'HSF2'}
(0.673913) {'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'HSF2'}
(0.673913) {'R1', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'GCF', 'HSF2'}
(0.652174) {'HSF2', 'HSF1_(long)', 'Ets-1', 'c-Rel'}
(0.652174) {'HSF2', 'Ets-1', 'HSF1_(long)', 'Elk-1'}
(0.652174) {'IUF-1', 'GCF', 'RFX2', 'Elk-1'}
(0.652174) {'p300', 'HSF2', 'Ets-1', 'HSF1_(long)'}
(0.652174) {'HSF1_(long)', 'p300', 'HSF', 'GCF', 'HSF2'}
(0.652174) {'C/EBPbeta', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'HSF2'}
(0.652174) {'C/EBPbeta', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'}
(0.652174) {'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'GCF', 'HSF2'}
(0.652174) {'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'}
(0.652174) {'R1', 'HSF1_(long)', 'ARP-1', 'p300', 'HSF', 'HSF2'}
(0.652174) {'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF', 'HSF2'}
(0.652174) {'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF', 'HSF2'}
(0.652174) {'IUF-1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'c-Rel', 'HSF2'}
(0.652174) {'R1', 'HSF1_(long)', 'p300', 'HSF', 'c-Rel', 'HSF2'}
(0.652174) {'IUF-1', 'RFX2', 'HSF1_(long)', 'p300', 'c-Rel', 'HSF2'}
(0.652174) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'c-Rel', 'HSF2'}
(0.652174) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'HSF2'}
(0.652174) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'}
(0.652174) {'R1', 'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'c-Rel', 'HSF2'}
(0.652174) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'HSF2'}
(0.652174) {'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'HSF', 'c-Rel', 'HSF2'}
(0.652174) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'HSF2'}
(0.652174) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'p300', 'GCF', 'HSF2'}
(0.652174) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'GCF', 'HSF2'}
(0.652174) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'GCF', 'HSF2'}

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(1.000000) {'HSF1_(long)', 'Ets-1', 'c-Rel'} --> {'HSF2'}
(1.000000) {'HSF2', 'Ets-1', 'c-Rel'} --> {'HSF1_(long)'}
(1.000000) {'Ets-1', 'HSF1_(long)', 'Elk-1'} --> {'HSF2'}
(1.000000) {'HSF2', 'Ets-1', 'Elk-1'} --> {'HSF1_(long)'}
(1.000000) {'p300', 'Ets-1', 'HSF1_(long)'} --> {'HSF2'}
(1.000000) {'p300', 'HSF2', 'Ets-1'} --> {'HSF1_(long)'}
(1.000000) {'p300', 'HSF', 'HSF1_(long)', 'GCF'} --> {'HSF2'}
(1.000000) {'p300', 'HSF', 'HSF2', 'GCF'} --> {'HSF1_(long)'}
(1.000000) {'GCF', 'HSF', 'HSF2', 'HSF1_(long)'} --> {'p300'}
(1.000000) {'C/EBPbeta', 'HSF2', 'RFX2', 'HSF1_(long)'} --> {'Elk-1'}
(1.000000) {'C/EBPbeta', 'RFX2', 'HSF1_(long)', 'Elk-1'} --> {'HSF2'}
(1.000000) {'C/EBPbeta', 'HSF2', 'RFX2', 'Elk-1'} --> {'HSF1_(long)'}
(1.000000) {'C/EBPbeta', 'HSF2', 'IUF-1', 'HSF1_(long)'} --> {'Elk-1'}
(1.000000) {'C/EBPbeta', 'IUF-1', 'HSF1_(long)', 'Elk-1'} --> {'HSF2'}
(1.000000) {'C/EBPbeta', 'HSF2', 'IUF-1', 'Elk-1'} --> {'HSF1_(long)'}
(1.000000) {'C/EBPbeta', 'HSF1_(long)', 'ARP-1', 'c-Rel', 'HSF2'} --> {'Elk-1'}
(1.000000) {'C/EBPbeta', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'C/EBPbeta', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel'} --> {'HSF2'}
(1.000000) {'RFX2', 'ARP-1', 'p300', 'GCF', 'HSF2'} --> {'HSF1_(long)'}

(1.000000) {'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'GCF'} --> {'HSF2'}
(1.000000) {'RFX2', 'HSF1_(long)', 'ARP-1', 'GCF', 'HSF2'} --> {'p300'}
(1.000000) {'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'p300'} --> {'HSF2'}
(1.000000) {'RFX2', 'IUF-1', 'Elk-1', 'p300', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'ARP-1', 'p300', 'HSF', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'HSF1_(long)', 'ARP-1', 'p300', 'HSF'} --> {'HSF2'}
(1.000000) {'R1', 'HSF1_(long)', 'ARP-1', 'HSF', 'HSF2'} --> {'p300'}
(1.000000) {'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF'} --> {'HSF2'}
(1.000000) {'R1', 'Elk-1', 'p300', 'HSF', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'HSF1_(long)', 'Elk-1', 'HSF', 'HSF2'} --> {'p300'}
(1.000000) {'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF'} --> {'HSF2'}
(1.000000) {'RFX2', 'Elk-1', 'p300', 'HSF', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'RFX2', 'HSF1_(long)', 'Elk-1', 'HSF', 'HSF2'} --> {'p300'}
(1.000000) {'RFX2', 'IUF-1', 'Elk-1', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'c-Rel'} --> {'HSF2'}
(1.000000) {'R1', 'HSF1_(long)', 'p300', 'HSF', 'c-Rel'} --> {'HSF2'}
(1.000000) {'R1', 'p300', 'HSF', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'HSF1_(long)', 'HSF', 'c-Rel', 'HSF2'} --> {'p300'}
(1.000000) {'RFX2', 'IUF-1', 'p300', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'RFX2', 'IUF-1', 'HSF1_(long)', 'p300', 'c-Rel'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'c-Rel'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'Elk-1', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'RFX2', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'c-Rel'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'Elk-1', 'ARP-1', 'p300', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300'} --> {'HSF2'}
(1.000000) {'Elk-1', 'ARP-1', 'p300', 'HSF', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'HSF', 'c-Rel'} --> {'HSF2'}
(1.000000) {'HSF1_(long)', 'Elk-1', 'ARP-1', 'HSF', 'c-Rel', 'HSF2'} --> {'p300'}
(1.000000) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'p300', 'c-Rel', 'HSF2'} --> {'Elk-1'}
(1.000000) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel'} --> {'HSF2'}
(1.000000) {'C/EBPbeta', 'R1', 'Elk-1', 'p300', 'c-Rel', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'p300', 'GCF'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'p300', 'GCF', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'GCF', 'HSF2'} --> {'p300'}
(1.000000) {'RFX2', 'IUF-1', 'HSF1_(long)', 'p300', 'GCF', 'HSF2'} --> {'R1'}
(1.000000) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'p300', 'HSF2'} --> {'GCF'}
(1.000000) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'p300', 'GCF', 'HSF2'} --> {'Elk-1'}
(1.000000) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'GCF'} --> {'HSF2'}
(1.000000) {'C/EBPbeta', 'R1', 'Elk-1', 'p300', 'GCF', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'GCF', 'HSF2'} --> {'p300'}
(1.000000) {'C/EBPbeta', 'HSF1_(long)', 'Elk-1', 'p300', 'GCF', 'HSF2'} --> {'R1'}
(1.000000) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'c-Rel', 'GCF', 'HSF2'} --> {'p300'}
(1.000000) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'GCF'} --> {'HSF2'}
(1.000000) {'R1', 'RFX2', 'Elk-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'R1', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel', 'GCF', 'HSF2'} --> {'p300'}
(1.000000) {'R1', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'GCF'}
(1.000000) {'R1', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'GCF'} --> {'HSF2'}
(1.000000) {'R1', 'IUF-1', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'HSF1_(long)'}
(1.000000) {'IUF-1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'R1'}
(0.968750) {'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'Elk-1'}
(0.968750) {'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'HSF2'} --> {'c-Rel'}
(0.968750) {'R1', 'IUF-1', 'HSF1_(long)', 'ARP-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'Elk-1'}
(0.968750) {'R1', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'GCF', 'HSF2'} --> {'c-Rel'}
(0.967742) {'HSF2', 'Ets-1', 'HSF1_(long)'} --> {'c-Rel'}
(0.967742) {'HSF2', 'Ets-1', 'HSF1_(long)'} --> {'Elk-1'}
(0.967742) {'GCF', 'IUF-1', 'RFX2'} --> {'Elk-1'}
(0.967742) {'HSF2', 'Ets-1', 'HSF1_(long)'} --> {'p300'}
(0.967742) {'C/EBPbeta', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'HSF2'} --> {'c-Rel'}

(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'p300', 'HSF2'} --> {'Elk-1'}
(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'HSF2'} --> {'p300'}
(0.967742) {'R1', 'HSF1_(long)', 'p300', 'HSF', 'HSF2'} --> {'ARP-1'}
(0.967742) {'R1', 'HSF1_(long)', 'p300', 'HSF', 'HSF2'} --> {'Elk-1'}
(0.967742) {'RFX2', 'HSF1_(long)', 'p300', 'HSF', 'HSF2'} --> {'Elk-1'}
(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'c-Rel', 'HSF2'} --> {'Elk-1'}
(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'HSF2'} --> {'c-Rel'}
(0.967742) {'R1', 'HSF1_(long)', 'p300', 'HSF', 'HSF2'} --> {'c-Rel'}
(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'p300', 'HSF2'} --> {'c-Rel'}
(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'c-Rel', 'HSF2'} --> {'p300'}
(0.967742) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'HSF2'} --> {'c-Rel'}
(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'c-Rel', 'HSF2'} --> {'R1'}
(0.967742) {'R1', 'RFX2', 'IUF-1', 'HSF1_(long)', 'HSF2'} --> {'Elk-1'}
(0.967742) {'RFX2', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'HSF2'} --> {'R1'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'ARP-1', 'c-Rel', 'HSF2'} --> {'Elk-1'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'HSF2'} --> {'c-Rel'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'HSF2'} --> {'c-Rel'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'ARP-1', 'c-Rel', 'HSF2'} --> {'p300'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'HSF2'} --> {'Elk-1'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'HSF2'} --> {'p300'}
(0.967742) {'HSF1_(long)', 'ARP-1', 'p300', 'HSF', 'c-Rel', 'HSF2'} --> {'Elk-1'}
(0.967742) {'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'HSF', 'HSF2'} --> {'c-Rel'}
(0.967742) {'HSF1_(long)', 'Elk-1', 'p300', 'HSF', 'c-Rel', 'HSF2'} --> {'ARP-1'}
(0.967742) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'} --> {'c-Rel'}
(0.967742) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'c-Rel', 'HSF2'} --> {'p300'}
(0.967742) {'C/EBPbeta', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'HSF2'} --> {'R1'}
(0.967742) {'C/EBPbeta', 'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'} --> {'GCF'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'Elk-1'}
(0.967742) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'GCF', 'HSF2'} --> {'c-Rel'}
(0.967742) {'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'R1'}
(0.939394) {'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'} --> {'p300'}
(0.939394) {'R1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'IUF-1'}
(0.937500) {'IUF-1', 'RFX2', 'Elk-1'} --> {'GCF'}
(0.937500) {'HSF1_(long)', 'ARP-1', 'p300', 'HSF', 'HSF2'} --> {'R1'}
(0.937500) {'HSF1_(long)', 'p300', 'HSF', 'c-Rel', 'HSF2'} --> {'R1'}
(0.937500) {'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'R1'}
(0.937500) {'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'HSF2'} --> {'R1'}
(0.937500) {'R1', 'RFX2', 'HSF1_(long)', 'p300', 'GCF', 'HSF2'} --> {'IUF-1'}
(0.937500) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'HSF2'} --> {'GCF'}
(0.911765) {'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'HSF2'} --> {'ARP-1'}
(0.911765) {'R1', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'ARP-1'}
(0.909091) {'GCF', 'RFX2', 'Elk-1'} --> {'IUF-1'}
(0.909091) {'C/EBPbeta', 'HSF1_(long)', 'Elk-1', 'c-Rel', 'HSF2'} --> {'ARP-1'}
(0.909091) {'RFX2', 'HSF1_(long)', 'p300', 'GCF', 'HSF2'} --> {'ARP-1'}
(0.909091) {'RFX2', 'HSF1_(long)', 'ARP-1', 'p300', 'HSF2'} --> {'GCF'}
(0.909091) {'HSF1_(long)', 'Elk-1', 'p300', 'HSF', 'HSF2'} --> {'R1'}
(0.909091) {'HSF1_(long)', 'Elk-1', 'p300', 'HSF', 'HSF2'} --> {'RFX2'}
(0.909091) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'c-Rel', 'HSF2'} --> {'ARP-1'}
(0.909091) {'RFX2', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'} --> {'R1'}
(0.909091) {'R1', 'RFX2', 'HSF1_(long)', 'p300', 'c-Rel', 'HSF2'} --> {'ARP-1'}
(0.909091) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'} --> {'ARP-1'}
(0.885714) {'C/EBPbeta', 'HSF2', 'HSF1_(long)', 'Elk-1'} --> {'RFX2'}
(0.882353) {'p300', 'HSF', 'HSF2', 'HSF1_(long)'} --> {'GCF'}
(0.882353) {'R1', 'RFX2', 'HSF1_(long)', 'c-Rel', 'HSF2'} --> {'IUF-1'}
(0.882353) {'R1', 'RFX2', 'HSF1_(long)', 'Elk-1', 'HSF2'} --> {'IUF-1'}
(0.857143) {'C/EBPbeta', 'HSF2', 'HSF1_(long)', 'Elk-1'} --> {'IUF-1'}
(0.857143) {'RFX2', 'HSF1_(long)', 'p300', 'c-Rel', 'HSF2'} --> {'IUF-1'}
(0.837838) {'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'RFX2'}
(0.833333) {'GCF', 'IUF-1', 'Elk-1'} --> {'RFX2'}
(0.833333) {'HSF1_(long)', 'ARP-1', 'p300', 'GCF', 'HSF2'} --> {'RFX2'}
(0.833333) {'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'} --> {'IUF-1'}
(0.833333) {'IUF-1', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'} --> {'RFX2'}
(0.833333) {'RFX2', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'} --> {'HSF'}
(0.833333) {'RFX2', 'HSF1_(long)', 'Elk-1', 'c-Rel', 'HSF2'} --> {'IUF-1'}
(0.833333) {'IUF-1', 'HSF1_(long)', 'Elk-1', 'c-Rel', 'HSF2'} --> {'RFX2'}

(0.833333) {'IUF-1', 'HSF1_(long)', 'p300', 'c-Rel', 'HSF2'} --> {'RFX2'}
(0.833333) {'R1', 'IUF-1', 'HSF1_(long)', 'c-Rel', 'HSF2'} --> {'RFX2'}
(0.833333) {'R1', 'IUF-1', 'HSF1_(long)', 'Elk-1', 'HSF2'} --> {'RFX2'}
(0.833333) {'R1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'} --> {'RFX2'}
(0.833333) {'R1', 'HSF1_(long)', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'RFX2'}
(0.833333) {'R1', 'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'HSF2'} --> {'RFX2'}
(0.833333) {'R1', 'IUF-1', 'HSF1_(long)', 'p300', 'GCF', 'HSF2'} --> {'RFX2'}
(0.833333) {'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'GCF', 'HSF2'} --> {'RFX2'}
(0.815789) {'HSF2', 'RFX2', 'HSF1_(long)', 'Elk-1'} --> {'C/EBPbeta'}
(0.810811) {'HSF2', 'IUF-1', 'HSF1_(long)', 'Elk-1'} --> {'C/EBPbeta'}
(0.810811) {'R1', 'HSF1_(long)', 'ARP-1', 'p300', 'HSF2'} --> {'HSF'}
(0.810811) {'HSF1_(long)', 'Elk-1', 'ARP-1', 'p300', 'c-Rel', 'HSF2'} --> {'HSF'}
(0.810811) {'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'GCF', 'HSF2'} --> {'C/EBPbeta'}
(0.789474) {'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'c-Rel', 'HSF2'} --> {'C/EBPbeta'}
(0.769231) {'p300', 'GCF', 'HSF2', 'HSF1_(long)'} --> {'HSF'}
(0.769231) {'HSF1_(long)', 'Elk-1', 'ARP-1', 'c-Rel', 'HSF2'} --> {'C/EBPbeta'}
(0.769231) {'R1', 'HSF1_(long)', 'Elk-1', 'p300', 'HSF2'} --> {'HSF'}
(0.769231) {'R1', 'HSF1_(long)', 'p300', 'c-Rel', 'HSF2'} --> {'HSF'}
(0.697674) {'HSF2', 'HSF1_(long)', 'c-Rel'} --> {'Ets-1'}
(0.697674) {'p300', 'HSF2', 'HSF1_(long)'} --> {'Ets-1'}
(0.681818) {'HSF2', 'HSF1_(long)', 'Elk-1'} --> {'Ets-1'}