Lab Exercise - Factor Analysis

1. Download and Open the Lab2.csv data set. These are real data from a 20-item questionnaire assessing the degree to which people tend to experience a variety of emotions. Participants rate each of the twenty emotions (e.g., upset, attentive) on a 1 to 5 scale in terms of how often they tend to experience the emotion (high scores = more often).

The question is, what are the factors that underlie the 20 emotions? Do these 20 emotions really reflect a smaller set of fundamental emotional dimensions? If so, then how many dimensions/factors are there, and what are they?

a. Just for a perspective, look at the correlations to see if you can address the key questions in factor analysis – how many factors and what are they?
    - Look over the 20 by 20 correlation matrix, and spend a minute or two trying to conduct an "eyeball factor analysis" of the 190 correlations - which emotions go with which?
b. Try to figure out – **how many factors are there**?
    - Look at the scree plot.
c. So, where is the clean drop-off and what does it tell us about how many factors we should examine?

Again, factor analysis is often a back-and-forth process, so we want to go back to the initial phase to make sure that the number of factors that we want it to examine.

d. **"rotate" the factors**, using a specific procedure. As discussed in class, "Rotation" is almost always done, and it improves the clarity of our results. Interpret the results

e. We've already examined the correlations among variables and the scree plot. So we can ignore these now.

f. **Examine the factor loadings** in a factor matrix that has been rotated.

2. Consider the un-rotated and rotated factor matrices in the following table.

Variable	Un-rotated Factors		Rotated Factors	
	I	II	I	II
Mannerlines	0.65	0.57	0.1	0.86
Approval Seeking	0.54	0.54	0.04	0.77
Initiative	0.61	-0.45	0.76	0.08
Guilt	0.63	-0.54	0.83	0.03
Sociability	0.56	0.54	0.05	0.77
Creativity	0.72	-0.59	0.93	0.05
Adult Role	0.67	-0.45	0.8	0.11
Cooperativeness	0.64	0.6	0.07	0.87

a. Do the rotated factors show simple structure?
b. In the rotated factors, which items related to factor I ?
c. In the rotated factors, which items relate to factor II ?
d. Describe the sort of participants who would have a high score on rotated factor II and the sort of participants who would have a low score on this factor.
e. Suggest a name for rotated factor II.

3. The file teachfac.csv contains the following variables:

Name	Label
W1	*Can approach admin with concerns*
W2	*I feel accepted by other staff*
W3	*Too much expected of teachers in this school.*
W4	*I have opportunity for co-operative work with other staff.*
W5	*School's administrators don't know problems faced by teachers*
W6	*I am encouraged in my work by praise, thanks or other recognition*
W7	*Teachers are overloaded with work in this school*
W8	*There are forums in this school where I can express my views and opinions*
W9	*There is a good team spirit at this school*
W10	*There is support from the administration at this school*
W11	*There is no time for teachers to relax in this school*
W12	*There is a lot of energy in this school*
W13	*Teachers frequently discuss and share teaching methods and strategies with each other*
W14	*There is good communication between teachers and administrators at this school*
W15	*The morale is this school can be relied upon when things get tough*
W16	*The admin is this school can be relied upon when things get tough*
W17	*There is constant pressure for teachers to keep working*
W18	*Teachers go about their work with enthusiasm*
W19	*There is good communication between staff members at this school*
W20	*I receive support from my colleagues*

W21 Teachers take pride in this school

a. Just for a perspective, look at the correlations to see if you can address the key questions in factor analysis – how many factors and what are they?
    - Look over the 21 by 21 correlation matrix, and spend a minute or two trying to conduct an "eyeball factor analysis" of the 190 correlations - which emotions go with which?
b. Try to figure out – **how many factors are there**?
    - Look at the scree plot.
c. So, where is the clean drop-off and what does it tell us about how many factors we should examine?

Again, factor analysis is often a back-and-forth process, so we want to go back to the initial phase to make sure that the number of factors that we want it to examine.

d. **"rotate" the factors**, using a specific procedure. As discussed in class, "Rotation" is almost always done, and it improves the clarity of our results. Interpret the results

e. We've already examined the correlations among variables and the scree plot. So we can ignore these now.

f. **Examine the factor loadings** in a factor matrix that has been rotated.

4. Dataset dwellfac.csv contains the responses of a questionnaire on housing. In the questionnaire, participants were asked to rate their satisfaction with each of the following on a scale from 1 to 5 with 5 indicating most satisfaction.

a. Just for a perspective, look at the correlations to see if you can address the key questions in factor analysis – how many factors and what are they?
    - Look over the 20 by 20 correlation matrix, and spend a minute or two trying to conduct an "eyeball factor analysis" of the 190 correlations - which emotions go with which?
b. Try to figure out – **how many factors are there**?
    - Look at the scree plot.
c. So, where is the clean drop-off and what does it tell us about how many factors we should examine?

Again, factor analysis is often a back-and-forth process, so we want to go back to the initial phase to make sure that the number of factors that we want it to examine.

d. **"rotate" the factors**, using a specific procedure. As discussed in class, "Rotation" is almost always done, and it improves the clarity of our results. Interpret the results

e. We've already examined the correlations among variables and the scree plot. So we can ignore these now.

f. **Examine the factor loadings** in a factor matrix that has been rotated.

5. The file Exercise3.csv contains the responses from a survey. In the questionnaire, participants were asked to rate their satisfaction with each of the following on a scale from 1 to 6 with 6 indicating strongly disagree.

Variable	Description
Q1	I'm always worried about what I eat and if it will cause gut discomfort
Q2	I get anxious about what I can eat
Q3	I can't stop thinking about my gut discomfort
Q4	I can't enjoy activities in my life due to gut discomfort
Q5	My gut discomfort reminds me my gastrointestinal tract will never be normal
Q6	I seldom try new foods because I'll experience gut discomfort
Q7	I experience gut discomfort no matter what I eat
Q8	My gut discomfort cause me the most anxiety in my life
Q9	I always need to know where the toilets are when I go out
Q10	I'm always looking out for uncomfortable gut sensations
Q11	If I start feeling gut discomfort I fear something worse will happen
Q12	My first and last thoughts a day are usually about my gut discomfort
Q13	I get anxious when I experience gut discomfort
Q14	When stressed, my gut discomfort acts up even more
Q15	I constantly worry about my gut
Q16	I get anxious if I don't know where the nearest toilet is
Q17	I can't stop thinking about my gut
Q18	My gut feelings cause me to be anxious
Q19	My gut discomfort is out of control
Q20	My gut discomfort makes me anxious all the time
Q21	I can't relax due to my gut discomfort
Q22	My gut discomfort makes me panic
Q23	I'm scared of my gut discomfort
Q24	The anxiety I feel in relation to my gut discomfort overwhelms me
Q25	I limit my activities to avoid anxiety associated with my gut discomfort
Q26	My anxiety only occurs when I experience gut discomfort
Q27	I can have gut discomfort but not anxiety
Q28	I'm always thinking about my gut and if it's OK
Q29	I can't eat without experiencing gut discomfort
Q30	When anxious, I worry about my gut discomfort getting worse
Q31	My gut discomfort cause me the most stress in my life
Q32	I am afraid to experience gut discomfort

Q33	When anxious, my gut discomfort acts up even more

Perform preliminary analysis and clean the dataset if any missing in the dataset impute them using median of the respective variables and then perform factor (repeat the process mentioned in Q3 a-f) until reach a simple structure. Finally check the residual pot and perform reliability analysis.