

purpose → Data Reduction
FA → Latent Variable Discovery.
→ Dimensionality Reduction.

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Types FA → EFA (Exploratory Factor Analysis),
CFA (Confirmatory Factor Analysis),
GPA (Generalized Procrustes Analysis)

→ It basically examines the interrelationships among a large number of variables and then attempts to explain them in terms of their common underlying dimension.

some similarity present factors.

- No Independent variables or Dependent variables
- All variables are considered simultaneously.

caused model.

DV

IV

We may do DV and IV after the factor analysis.

→ It is basically done on the quantitative data (mainly the interval scale).

the determination of a small number of factors based on a particular number of inter-related quantitative variables

Objective → Simplify items/attributes into subsets of concepts or measures (ie extracts maximum common variance from all variables and put them into common source)
all variables are explained by few attributes.

Methods → PCA ⇒ total variance explained by few attributes (no common variance select concept)

CFA ⇒ take common variance concept in the attributes

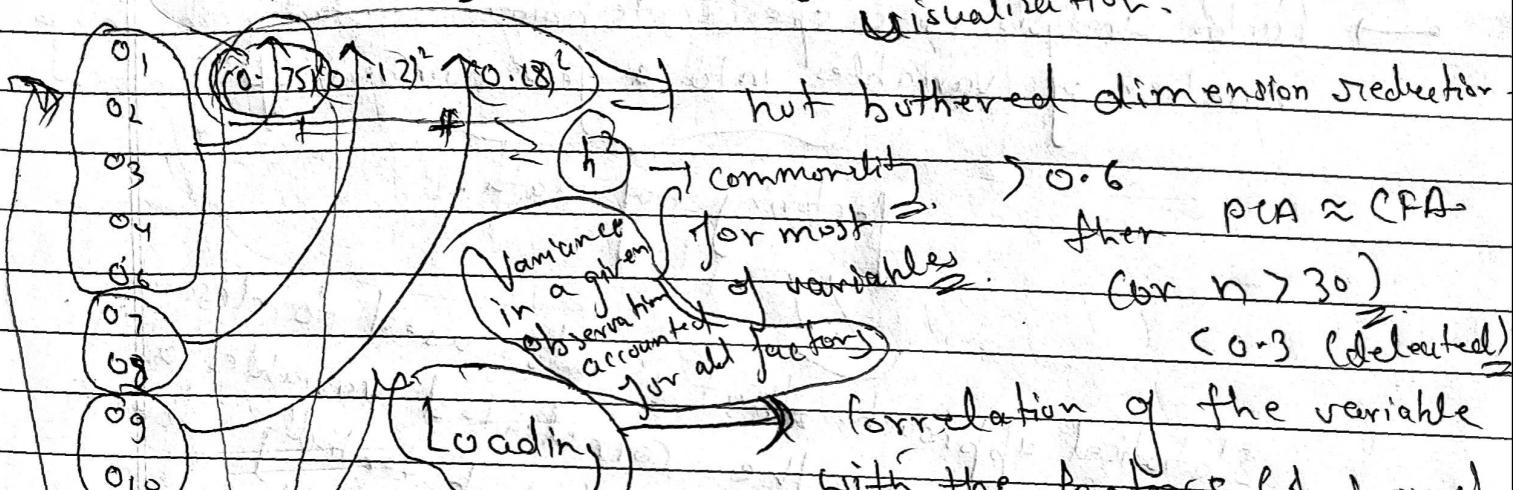
Variance
Unique error
Shared/Common.

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How and when we create the factor in factor analysis.
many

Factor rotation → In this we rotate the factor which help the distribution of variables is much better in the Factor score → for better interpretation and visualization.



correlation of the variable with the factors. (factor score)

Mainly variable is highly correlated with one factor but in some case it may be.

Some correlated with more than one factors.

Due to which it generates huge number of possible models which is not possible for cross loading.

Nice choice if you have no idea about what common factor may exist.

(a) EFA → Used to discover underlying structure.

Exploring the variables to know the patterns

it does not impose any predetermined structure or assume pre-existing relationships among variables. Or

open-ended exploration of data - and providing valuable insights into the underlying factors present in the dataset.

(b) CFA
Simpler than EFA

Confirm the factor is ideally the research or not. Is a technique used to evaluate, predetermined hypothesis regarding the relationships between variables factors.

Used to test whether data fit a priori expectations for data structure.

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purpose is to determine whether the observed data align with proposed factor structure

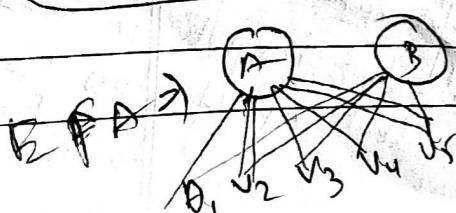
This is used a properly structured equation to test a measurement model whereby on the factors allows for the evaluation

→ Factor Analysis is a special technique reducing the huge number of variables into a few numbers of factors factoring of data.

Statistical approach that is also used to describe fluctuations among the correlated variables and observed in terms of a potentially lower number of unobserved variables (factors).

→ Used for complex concepts such as social status, economic psychological scales, biology, Marketing Research, open research etc.

EFA is data driven approach which allows all items to load on all the factors while CFA need to specify which factors are required to load.



Name of factors is given by the similarity of the variables.

Step 1 Items you want to reduce.

Step 2 Create mathematical combination of variables that maximize variance.

of items.
Measure score on a given factor.

Factor Score

Importance
of variable
in particular
factor

done as factor loading.

Average of factor score by each response

Summeted
Variable

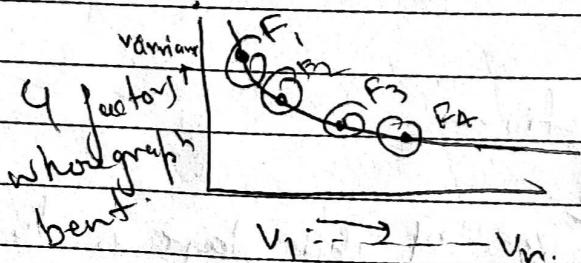
Useful for DV and IV after
the factor analysis.

$$F_1 \\ V_1 \quad V_2 \quad V_3 \quad V_4 \\ R_1 \quad 5 \quad 3 \quad 4 \quad 4 \Rightarrow 16/4 = 4 \\ \text{Summeted Variable}$$

$$R_2 \quad 1 \quad 2 \quad 3 \quad 4 \Rightarrow 8/4 = 2.$$

Factor
finding

Scree plot (Elbow method).



$$F_1 > F_2 > F_3 > F_4.$$

Here we decide number
of no. of factors
if factors no.
large.

Eigen value. (Kaiser / Latent Root).

Teacher's View
reduce - - - - -

$$100\% \rightarrow 14 F \\ 100\% \rightarrow 90\%$$

$$\rightarrow 7 F \\ \rightarrow 60\%$$

~~Interpretation~~

$-0.8 \Rightarrow$ reverse correlated
from 1 to -1

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One crossload's
overcome.

high communality gives the preference

① Variance accounted for by a factor is spread out.

Rotation

Orthogonal (factors uncorrelated)

Oblique (factor correlated)

Varimax | Quartimax | Equimax

↓
weights distributed (1 too) along the column to maximize the sum of squares.
Weights distributed (1 too) along rows.

Steps b)
Factor Analysis

Step 2 find correlation matrix of all variance & compute

Bentel test.

→ Identify variables not related to other variable
→ $r > 0.3$ (for consideration)

Step 3 factor extraction

↓

→ primary objective of this stage is to determine the factors

→ PCA, Maximum likelihood method, Alpha method
Eigen value > 1 or scree plot

Teacher's Signature